A comprehensive evaluation of outcomes from patient handling interventions

This item was submitted to Loughborough University's Institutional Repository by the/an author.

Additional Information:

- A Doctoral Thesis. Submitted in partial fulfilment of the requirements for the award of Doctor of Philosophy of Loughborough University.

Metadata Record: https://dspace.lboro.ac.uk/2134/6322

Publisher: © Mike Fray

Please cite the published version.
This item was submitted to Loughborough’s Institutional Repository (https://dspace.lboro.ac.uk/) by the author and is made available under the following Creative Commons Licence conditions.

For the full text of this licence, please go to:
http://creativecommons.org/licenses/by-nc-nd/2.5/
Certificate of Originality

This is to certify that I am responsible for the work submitted in this thesis, that the original work is my own except as specified in the acknowledgements or in footnotes, and that neither the thesis nor the original work contained therein has been submitted to this or any other institution for a higher degree.

................................................................. (Signed)

................................................................. (Date)
A comprehensive evaluation of outcomes from patient handling interventions

By Mike Fray

A Doctoral Thesis submitted in partial fulfilment of the requirements for the award of Doctor of Philosophy of Loughborough University


© Mike Fray
Abstract.

Assisting less able people to move in a healthcare setting is a very common occurrence but carries risks to staff and patients. The scientific study of patient handling activities and interventions to help reduce musculoskeletal disorders in the workplace is a relatively new but growing area. Recent literature reviews have identified two key factors, the lack of high quality studies and the lack of strong links between patient handling interventions and reduced musculoskeletal injury.

This study has systematically reviewed the available literature and investigated the potential outcome measures used to show benefits of improved patient handling. A wide range of outcomes has been identified concentrated on the benefits to staff, patients and organisations. No methods were identified to compare different benefits, outcomes or intervention strategies.

This study used mixed methods to develop a tool to compare the results of all types of interventions:

a. Focus group studies in four EU countries recorded a priority list of the 12 most important outcomes from patient handling interventions
b. The most suitable method for examining the 12 outcomes was identified
c. The Intervention Evaluation Tool (IET) was developed as a single measurement tool
d. The IET was translated and used in four EU countries to evaluate its usability and its usefulness to patient handling practitioners

The EU trials and subsequent expert review have given favourable feedback for the IET. The IET creates 12 outcome evaluations with detail and differentiation, and an overall performance score to assist an organisation to target its future interventions. The method can be used to compare interventions, and the performance between organisations and countries across the EU. Though the IET needs more field trials and validity testing it is hoped that a wider application may be to create a benchmarking method that can assist in the improvement of patient handling systems across Europe.
Acknowledgements.

The completion of a part-time, non-funded PhD programme is enough to deter many willing students. Without the personal requirement to move into a research position and the valued support from specific individuals this project would have remained in the to do pile.

Financially I must thank Arjo-Huntleigh ab for the sponsorship of the project. The funds for travel, translations and conference presentations have allowed much EU information to be included. It has made this PhD a very different and unique study.

I have received a huge amount of support from my supervisor and mentor Sue Hignett. The author of ‘Evidence Based Patient Handling’ upon so many of my ideas have been developed she has been a constant driver, assistant, sounding board and colleague through the process. Her focus on delivering high quality research is a great inspiration.

This project was intended to bring together the EPPHE group but I would especially like to thank Leena, Teresa, Olga, Natale and Daniela for their assistance in organising and completing the EU focus groups. It has been a pleasure to work with you all. In addition anyone who attended a group, completed a form, gave me suggestions, translated some words or supported a conference presentation, thank you for your help.

Five years is a long time to have something like this in your life and many things change over that time. I would like to thank my wife and soul-mate Nicky for having the courage to agree to the process and for always believing that it was the right thing to do. I thank Cardi for always understanding when I needed to sit with someone early in the morning when my brain was doing a million miles an hour. I thank Misty for not hitting the delete button when she walked across the keyboard.
My final thought is for those not here to see the end result. I thank my godmother, Sylvia whose bequest paid for my 5 years fees and prompted the start of this journey. But mostly, to my parents, my Dad for the scientific gene and a thirst for knowledge, and my Mother for showing me drive and determination in the face of extreme adversity. I leave this award to you as a lasting tribute.
List of Contents

PREFACE

Abstract iii
Acknowledgements iv
List of Contents vi
List of Appendices xiii
List of Tables xiv
List of Figures xvi
Glossary xvii
List of Acronyms/Abbreviations xix

CHAPTER 1. INTRODUCTION

1.1 A personal perspective 2
1.2 The scope of the problem 3
1.3 Conceptual framework 4
1.4 The research aim 5
1.5 Scope and limitations of the project 5
1.6 Thesis outline 6

CHAPTER 2. BACKGROUND AND CONTEXT

Chapter 2a Literature Review

2a.1 General introduction 10
2a.2 Musculoskeletal disorders in health and social care workers 11
2a.3 European picture 12
2a.4 Interventions studies in a wider context 14
2a.5 Interventions and outcomes 20
2a.6 Outcome measures 23
2a.7 Methods used for patient handling studies. 26

2a.7.1 Individual Patient Handling Risk Assessments and Plans
2a.7.2 Physical Environment Risk Assessments
2a.7.3 Individual observational tools for specific handling tasks
Chapter 2b Systematic Literature Analysis

2b.1 Methodology for literature analysis
   2b.1.1 Data collection
   2b.1.2 Scoring and recording systems

2b.2 Beneficiaries
   2b.2.1 Descriptions of the Beneficiary Categories

2b.3 Intervention strategies
   2b.3.1 Single intervention studies
   2b.3.2 Multiple intervention studies

2b.4 Outcomes and outcome measures
   2b.4.1 Recorded outcomes
   2b.4.2 Recorded outcome measures

2b.5 Measures of success
   2b.5.1 Comparison of patient handling literature reviews

2b.6 Outcome Measurement Tools (OMT)
   2b.6.1 Inclusion criteria
   2b.6.2 Organisational Outcomes
      2b.6.2.1 Organisational performance
      2b.6.2.2 Environment and Equipment Outcomes
   2b.6.3 Staff Outcomes
      2b.6.3.1 Physical workload
      2b.6.3.2 Subjective assessment
      2b.6.3.3 Compliance assessment
      2b.6.3.4 Competence measures
   2b.6.4 Task Outcomes
   2b.6.5 Patient Outcomes
   2b.6.6 Summary

2b.7 Discussion of literature sections
   2b.7.1 Reliance on staff outcomes
   2b.7.2 Comparison of interventions and outcome measures
   2b.7.3 Summary of findings

2b.8 Developing the research process
CHAPTER 3. PREFERRED OUTCOMES IN THE EU: 
A FOCUS GROUP STUDY

3.1 Study design  
3.1.1 Focus group methodology  
3.1.2 Focus group design  
3.1.3 Partner countries  
3.1.4 Participants  
3.1.5 Selection of participants

3.2 Data collection  
3.2.1 Procedure for focus groups  
3.2.2 Group management  
3.2.3 Translation  
3.2.4 Ethics

3.3 Pilot Studies  
3.3.1 Pilot study 1. Health and social care  
3.3.2 Pilot study 2. Expert focus group

3.4 Analysis of focus group data  
3.4.1 Reliability and validity

3.5 Summary

3.6 Focus group results. Pilot studies  
3.6.1 Pilot focus group 1. Health and social care  
3.6.1.1 Participants  
3.6.1.2 Idea Generation (Sheet 1)  
3.6.1.3 Voting (Sheet 3)  
3.6.1.4 Discussion  
3.6.2 Pilot focus group 2. Expert focus groups  
3.6.2.1 Participants  
3.6.2.2 Idea Generation (Sheet 1)  
3.6.2.3 Voting (Sheet 3)  
3.6.2.4 Discussion  
3.6.2.5 Facilitator experience  
3.6.3 Summary of pilot studies

3.7 EU Focus group results  
3.7.1 Introduction  
3.7.2 Participant demographics
3.7.3 Focus group procedure
   3.7.3.1 Generation of ideas (Sheet 1)
   3.7.3.2 Clarification of ideas. Analysis of Transcribed Focus Groups

3.7.4 Organisational Outcomes
   3.7.4.1 Generation of ideas (Sheet 1)
   3.7.4.2 Transcription analysis (Clarification)

3.7.5 Staff Outcomes
   3.7.5.1 Generation of ideas (Sheet 1)
   3.7.5.2 Transcription analysis (Clarification)

3.7.6 Patient Outcomes
   3.7.6.1 Generation of ideas (Sheet 1)
   3.7.6.2 Transcription analysis (Clarification)

3.7.7 Task and ‘Other’ Outcomes
   3.7.7.1 Generation of ideas (Sheet 1)
   3.7.7.2 Transcription analysis (Clarification)

3.8 Important outcomes

   3.8.1 Interventions and outcomes
   3.8.2 Cascade relationships between interventions and outcomes
   3.8.3 Organisational behaviour
   3.8.4 Different outcomes in different categories
   3.8.5 Musculoskeletal health and absence
   3.8.6 Quality of Care
   3.8.7 Compare EU vs. Expert
   3.8.8 Summary of outcomes before voting

3.9 Priority Ordering (Voting)

   3.9.1 Individual participants
   3.9.2 Organisational Outcomes
   3.9.3 Staff Outcomes
   3.9.4 Patient outcomes
   3.9.5 Task and other outcomes
   3.9.6 Scoring the preferred outcomes
   3.9.7 Statistical Analysis
   3.9.8 Conclusion

CHAPTER 4. DEVELOPMENT OF THE INTERVENTION EVALUATION TOOL (IET)

4.1 Introduction

4.2 Methodology

   4.2.1 Selection criteria

4.3 Selected methods for IET
4.3.1 Safety culture
  4.3.1.1 Selection
  4.3.1.2 Data collection
  4.3.1.3 Calculation
  4.3.1.4 Range of scores
4.3.2 MS health measures
  4.3.2.1 Selection
  4.3.2.2 Data collection
  4.3.2.3 Calculation
  4.3.2.4 Range of scores
4.3.3 Competence and compliance
  4.3.3.1 Selection
  4.3.3.2 Data collection
  4.3.3.3 Calculation
  4.3.3.4 Range of scores
4.3.4 Absence or staff health
  4.3.4.1 Selection
  4.3.4.2 Data collection
  4.3.4.3 Calculation
  4.3.4.4 Range of scores
4.3.5 Quality of care
  4.3.5.1 Selection
  4.3.5.2 Data collection
  4.3.5.3 Calculation
  4.3.5.4 Range of scores
4.3.6 Accident numbers
  4.3.6.1 Selection
  4.3.6.2 Data collection
  4.3.6.3 Calculation
  4.3.6.4 Range of scores
4.3.7 Psychological well-being
  4.3.7.1 Selection
  4.3.7.2 Data collection
  4.3.7.3 Calculation
  4.3.7.4 Range of scores
4.3.8 Patient condition
  4.3.8.1 Selection
  4.3.8.2 Data collection
  4.3.8.3 Calculation
  4.3.8.4 Range of scores
4.3.9 Patient perception
  4.3.9.1 Selection
  4.3.9.2 Data collection
  4.3.9.3 Calculation
  4.3.9.4 Range of scores
4.3.10 MSD exposure measure
  4.3.10.1 Selection
  4.3.10.2 Data collection
  4.3.10.3 Calculation
  4.3.10.4 Range of scores
4.3.11 Patient injuries
4.3.11.1 Selection
4.3.11.2 Data collection
4.3.11.3 Calculation
4.3.11.4 Range of scores
4.3.12 Financial
4.3.12.1 Selection
4.3.12.2 Data collection
4.3.12.3 Calculation
4.3.12.4 Range of scores
4.3.13 Summary

4.4 Data collection for the IET

4.4.1 IET Summary Sheet
4.4.2 IET Data 1. Organisational Review
4.4.3 IET Data 2. Safety Culture Audit
4.4.4 IET Data 3. Patient Handling Transfer Observation
4.4.5 IET Data 4. Ward/unit survey

4.5 Scoring the IET

CHAPTER 5. EVALUATION OF THE IET

5.1 Methodology

5.1.1 Pilot visits
5.1.2 UK peer review panel

5.2 IET EU trials

5.2.1 UK Trial
5.2.1.1 Site 1.
5.2.1.2 Site 2.
5.2.1.3 Summary Results for UK Trial
5.2.2 Portugal Trial
5.2.2.1 Site 1.
5.2.2.2 Site 2.
5.2.2.3 Summary Results for Portugal Trial
5.2.3 Finland Trial
5.2.3.1 Site 1.
5.2.3.2 Site 2.
5.2.3.3 Summary Results for Finland Trial
5.2.4 Italy Trial
5.2.4.1 Site 1.
5.2.4.2 Site 2.
5.2.4.3 Summary Results for Italy Trial

5.3 Discussion of EU trials

5.3.1 Positive findings during data collection
5.3.2 Negative findings from trial
   5.3.2.1 IET Data 1. Organisational review
   5.3.2.2 IET Data 2. Safety culture audit
   5.3.2.3 IET Data 3. Patient handling transfer observation
   5.3.2.4 IET Data 4. Ward/unit survey
5.3.3 Limitations

5.4 IET calculation review

5.5 EPPHE review panel

5.6 Recommendations for IET Process

CHAPTER 6. DISCUSSION

6.1 The IET. The concept of a single EU measurement tool.
   6.1.1 Priority outcomes
   6.1.2 Outcome measures for the IET

6.2 The development of the IET
   6.2.1 The 12 Preferred Outcomes
      6.2.1.1 Safety Culture
      6.2.1.2 MS Health Measure
      6.2.1.3 Competence and Compliance
      6.2.1.4 Standardised MSD Sickness Absence
      6.2.1.5 Quality of Care
      6.2.1.6 Patient Handling Accident Numbers
      6.2.1.7 Psychological Well-Being
      6.2.1.8 Patient Condition
      6.2.1.9 Patient Perception
      6.2.1.10 Musculoskeletal Risk Exposure
      6.2.1.11 Patient Injuries
      6.2.1.12 Financial Outcomes
   6.2.2 The IET calculation
      6.2.2.1 The order of preferred outcomes.
      6.2.2.2 Inclusion and Exclusion Criteria
      6.2.2.3 Interaction of 12 sections
   6.2.3 Present and future uses for IET
   6.2.4 Summary of recommendations for next generation of IET

6.3 Validity and reliability
   6.3.1 Reliability
6.4 Future research

6.5 Comparison of IET against other tools

CHAPTER 7. CONCLUSIONS

References

List of Appendices.

A Literature Analysis Full Data (328 studies) 306
i. Included reference list
ii. Full data extraction for literature analysis

B Literature Analysis Intervention Studies (101 studies) 358

C Documentation for Focus Groups 368
i. Ethics proposal permission statement
ii. Focus Group Scenario (Health)
iii. Focus Group Scenario (Social)
iv. Data Collection Sheets
v. Information Sheet for Data Collector

D Field Notes for Pilot Studies 385

E Focus Group Data 391

F Focus Group Results (Voting) 406

G Development of the IET 411

H Accepted version of IET 430

I Data collected from EU trials 491
# List of Tables

## Chapter 2a

<table>
<thead>
<tr>
<th>Table Number</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2a.1</td>
<td>Comparison of EU Countries (Hignett et al 2007)</td>
<td>13</td>
</tr>
<tr>
<td>2a.2</td>
<td>Patient Handling Guidance Documents</td>
<td>19</td>
</tr>
<tr>
<td>2a.3</td>
<td>Intervention strategies used for patient handling</td>
<td>22</td>
</tr>
</tbody>
</table>

## Chapter 2b

<table>
<thead>
<tr>
<th>Table Number</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2b.1</td>
<td>Summary of included studies</td>
<td>36</td>
</tr>
<tr>
<td>2b.2</td>
<td>Summary of analysis included</td>
<td>41</td>
</tr>
<tr>
<td>2b.3</td>
<td>Overview of included studies</td>
<td>42</td>
</tr>
<tr>
<td>2b.4</td>
<td>Results of the beneficiary data</td>
<td>44</td>
</tr>
<tr>
<td>2b.5</td>
<td>Single strategy intervention studies</td>
<td>50</td>
</tr>
<tr>
<td>2b.6</td>
<td>Multi-faceted design of interventions in PH studies</td>
<td>51</td>
</tr>
<tr>
<td>2b.7</td>
<td>Academic quality for the multifaceted studies</td>
<td>52</td>
</tr>
<tr>
<td>2b.8</td>
<td>Higher quality MSD and cost intervention studies</td>
<td>53</td>
</tr>
<tr>
<td>2b.9</td>
<td>Outcomes Per Study</td>
<td>55</td>
</tr>
<tr>
<td>2b.10</td>
<td>Recorded outcomes in all included studies</td>
<td>57</td>
</tr>
<tr>
<td>2b.11</td>
<td>Outcome measures recorded in literature analysis</td>
<td>62</td>
</tr>
<tr>
<td>2b.12</td>
<td>Most frequent outcome measures</td>
<td>66</td>
</tr>
<tr>
<td>2b.13</td>
<td>Statistical testing in the intervention studies</td>
<td>68</td>
</tr>
<tr>
<td>2b.14</td>
<td>Inclusion exclusion for PH Intervention Reviews</td>
<td>71</td>
</tr>
<tr>
<td>2b.15</td>
<td>Findings from PH intervention Reviews</td>
<td>74</td>
</tr>
<tr>
<td>2b.16</td>
<td>Comparison of PHOQS and MARCH</td>
<td>77</td>
</tr>
<tr>
<td>2b.17</td>
<td>Calculation of hoist numbers using HIT process</td>
<td>80</td>
</tr>
<tr>
<td>2b.18</td>
<td>Information required for the MAPO Index calculation</td>
<td>82</td>
</tr>
<tr>
<td>2b.19</td>
<td>Grades of Mobility from the Resident Gallery</td>
<td>84</td>
</tr>
<tr>
<td>2b.20</td>
<td>OMs and OMTs used for the evaluation of physical risks</td>
<td>87</td>
</tr>
<tr>
<td>2b.21</td>
<td>The scoring grid for SOPMAS</td>
<td>89</td>
</tr>
<tr>
<td>2b.22</td>
<td>Summary of the tools included in this review.</td>
<td>91</td>
</tr>
<tr>
<td>2b.23</td>
<td>Matrix of content for included Outcome Measurement Tools</td>
<td>92</td>
</tr>
</tbody>
</table>

## Chapter 3

<table>
<thead>
<tr>
<th>Table Number</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>Facilitators for the EU focus groups</td>
<td>107</td>
</tr>
<tr>
<td>3.2</td>
<td>Different roles and professions in the PHA position</td>
<td>108</td>
</tr>
<tr>
<td>3.3</td>
<td>Methods to improve ‘generalizability’</td>
<td>118</td>
</tr>
<tr>
<td>3.4</td>
<td>UK Pilot: Organisational Outcomes</td>
<td>120</td>
</tr>
<tr>
<td>3.5</td>
<td>UK Pilot: Staff Outcomes</td>
<td>121</td>
</tr>
<tr>
<td>3.6</td>
<td>UK Pilot: Patient Outcomes</td>
<td>122</td>
</tr>
<tr>
<td>3.7</td>
<td>UK Pilot: Performance Outcomes</td>
<td>123</td>
</tr>
<tr>
<td>3.8</td>
<td>Preferred outcomes: Acute health care group</td>
<td>124</td>
</tr>
<tr>
<td>3.9</td>
<td>Preferred outcomes: Long-term health group</td>
<td>124</td>
</tr>
<tr>
<td>3.10</td>
<td>Highest 5 preferred outcomes from cumulative scores</td>
<td>126</td>
</tr>
<tr>
<td>3.11</td>
<td>Participants for Expert Groups</td>
<td>127</td>
</tr>
<tr>
<td>3.12</td>
<td>Expert Pilots: Organisational Outcomes</td>
<td>128</td>
</tr>
<tr>
<td>3.13</td>
<td>Expert Pilots: Staff Outcomes</td>
<td>128</td>
</tr>
<tr>
<td>3.14</td>
<td>Expert Pilots: Patient Outcomes</td>
<td>129</td>
</tr>
<tr>
<td>3.15</td>
<td>Expert Pilots: Task Performance Outcomes</td>
<td>130</td>
</tr>
</tbody>
</table>
3.16 Facilitators and locations for focus groups 133  
3.17 Experience of the participants 133  
3.18 Outcomes from the focus groups 136  
3.19 Re-allocation of ‘other’ outcomes 151  
3.20 Definitions of the most important outcomes 157  
3.21 Organisational Outcomes (Sheet 3) 160  
3.22 Staff Outcomes (Sheet 3) 161  
3.23 Patient Outcomes (Sheet 3) 162  
3.24 Task and Other Outcomes (Sheet 3) 162  
3.25 Range of outcomes included in ranking score sheets 163  
3.26 Total Scores From Ranking (Sheet 3) 164  
3.27 Scores from voting for 12 most preferred outcomes 166  
3.28 The 12 most preferred outcomes in priority order 168

Chapter 4

4.1 Numbers of outcome measures included for IET 172  
4.2 Highest QR for each of the 12 preferred outcomes 173  
4.3 Safety Culture – Selected outcome measures 174  
4.4 Competence and compliance – Selected outcome measures 178  
4.5 Absence or staff health – Selected outcome measures 180  
4.6 Accident numbers – Selected outcome measures 183  
4.7 Psychological well-being – Selected outcome measures 184  
4.8 Patient perception – Selected outcome measures 187  
4.9 MSD Exposure measures – Selected outcome measures 189  
4.10 Financial – Selected outcome measures 191  
4.11 Overview of IET development 193  
4.12 Contribution for each outcome 196

Chapter 5

5.1 Locations for data collection 202  
5.2 Summary results for UK trial 205  
5.3 Summary results for Portugal trial 208  
5.4 Summary results for Finland trial 211  
5.5 Summary results for Italy trial 215  
5.6 EU trials - % scores for each IET section 222  
5.7 Range effect for IET calculation 223  
5.8 EU trials - Section scores and IET total 223  
5.9 Recommendations for IET process 225

Chapter 6

6.1 Alternative question set for Q9-10 236  
6.2 Robson Outcome Level for 12 Outcomes 253  
6.3 Review of included outcomes with Robson Score 254  
6.4 Scores for included intervention studies 258  
6.5 Intervention Scoring System 258  
6.6 Validity of measurements for outcomes in IET 264
**List of Figures.**

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Figure Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chapter 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Design process for the Intervention Evaluation Tool</td>
<td>7</td>
</tr>
<tr>
<td><strong>Chapter 2a</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2a.1</td>
<td>Conceptual framework for OHSMS review (Robson et al., 2007)</td>
<td>16</td>
</tr>
<tr>
<td>2a.2</td>
<td>Simple work system</td>
<td>18</td>
</tr>
<tr>
<td>2a.3</td>
<td>Singleton’s Ergonomics Concentric Rings Model (1974)</td>
<td>21</td>
</tr>
<tr>
<td><strong>Chapter 2b</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2b.1</td>
<td>Intervention Strategies</td>
<td>46</td>
</tr>
<tr>
<td>2b.2</td>
<td>Categories of interventions</td>
<td>47</td>
</tr>
<tr>
<td>2b.3</td>
<td>Sirdal Model</td>
<td>73</td>
</tr>
<tr>
<td><strong>Chapter 3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>Study overview</td>
<td>101</td>
</tr>
<tr>
<td>3.2</td>
<td>Focus group flow and outputs</td>
<td>106</td>
</tr>
<tr>
<td>3.3</td>
<td>Summary of the data collection and analysis for the focus groups</td>
<td>110</td>
</tr>
<tr>
<td>3.4</td>
<td>Focus group procedure</td>
<td>112</td>
</tr>
<tr>
<td>3.5</td>
<td>Terminology for describing focus group data</td>
<td>135</td>
</tr>
<tr>
<td>3.6</td>
<td>Matrix of Organisational Outcomes</td>
<td>139</td>
</tr>
<tr>
<td>3.7</td>
<td>Matrix for Staff Outcomes</td>
<td>145</td>
</tr>
<tr>
<td>3.8</td>
<td>Matrix for Patient Outcomes</td>
<td>148</td>
</tr>
<tr>
<td>3.9</td>
<td>Matrix for Task and Other Outcomes</td>
<td>149</td>
</tr>
<tr>
<td><strong>Chapter 5</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.1</td>
<td>Review and evaluation process</td>
<td>200</td>
</tr>
<tr>
<td><strong>Chapter 6</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.1</td>
<td>The interaction between outcomes</td>
<td>256</td>
</tr>
<tr>
<td>6.2</td>
<td>Strength of outcome by level of interaction</td>
<td>257</td>
</tr>
<tr>
<td>6.3</td>
<td>Recommendations for future research</td>
<td>266</td>
</tr>
</tbody>
</table>
Glossary

Manual handling
To move, support or apply force to a discrete load by hand or bodily force

Patient handling
A specific application of manual handling in a care setting. To assist a person with reduced ability to move, reposition or improve the delivery of a care task. Patient handling can be completed by hand, with aids or by mechanical alternatives.

Patient handling transfers
The movement by patient handling, or by the patient’s independent actions, of a patient from one position to another. The range of transfers in this study is limited to single location transfers bed to chair, toileting, in and out of bath, movement in bed. Movement of a person from location to location will be described as patient transport.

Patient handling techniques
A specific series of movements, actions and use of equipment to move a person from one position to another.

Patient Handling Advisor
A named individual providing patient handling advice to a defined location. In different countries and within countries the job title, job role and areas of responsibility can differ significantly.

Risk Assessment
A process defined by ISO, HSE and the EC directive to identify hazards evaluate the present risks and to implement control measures to minimise the risks. Risk assessment is a process that is widely applied to all forms of risk in manual handling and beyond.

Generic Patient Handling Assessment
The application of manual handling risk assessment processes to the identified hazards in a given area or organisation.

Patient Handling Risk Assessment
The application of risk assessment methods to the patient handling practice of one individual patient to consider their movement and care needs.

Patient Handling Plan
A patient specific document outlining the control measures and movement plans for a single individual patient

Patient Handling Intervention
The implementation of a change in the organisational systems, environment, equipment or methods to complete patient handling tasks in a specified area.
Outcomes
A quality or quantity that is seen as a result of an intervention

Outcome Measure (OM)
An outcome measure is a recorded quantity, quality or value (single or series) that can be identified to compare the before and after intervention state. e.g. equipment provided for a workplace.

Outcome Measurement Tool (OMT)
An outcome measurement tool uses the outcome measure or several outcome measures for internal assessment against a known and traceable set of criteria. The OMT should give rational level data in its final score system. OMTs should measure outcomes and not describe interventions, but an OMT could describe the magnitude of an intervention when there is clearly stated evidence of the links between the intervention and the outcome improvement.

The following glossary terms define research terminology in the context of the Intervention Evaluation Tool (IET) created in this study:

Validity
The validity of any measurement device is the level that the measurements recorded and analysed truly reflect the qualities found in that situation. Many experimentation and data collection errors can reduce the validity of any study. In this study the validity refers to how the IET scores represent the management performance of the ward in managing the risks of patient handling to its staff and patients.

Reliability
In research studies the term reliability reflects the consistency of data collection. In this study the reliability of the IET should show consistent results when a single data collector collects repeated measures at different times (inter-rater reliability) and that if different data collectors collected the IET in the same ward at the same time then they would also collected the same information (intra-rater reliability).

Sensitivity
The sensitivity of the IET is the level by which changes in the data collected are reflected in the calculated scores. Too much sensitivity and small changes in the data would equate to large changes in the scores and too little sensitivity and real changes in the data would not be reflected in the final calculation. Appropriate levels of sensitivity will reflect in the validity of the IET.
## List of Acronyms/Abbreviations

### Terminology
- **MH**: Manual handling
- **PH**: Patient handling
- **PHA**: Patient handling advisor
- **PHRA**: Patient handling risk assessment
- **PHP**: Patient handling plan
- **OH**: Occupational health
- **H&S**: Health and safety
- **HASAW**: Health and Safety at Work etc. Act 1974
- **MHASAW**: Management of Health and Safety at Work Regulations 1992
- **PUWER**: Provision and Use of Work Equipment Regulations 1998
- **MHOR**: Manual Handling Operations Regulations 1992
- **MSD**: Musculoskeletal Disorders
- **MSI**: Musculoskeletal Injuries

### Organisations
- **EU**: European Union
- **EC**: European Council
- **NBE**: National Back Exchange
- **NHS**: National Health Service (UK)
- **NPSA**: National Patient Safety Agency (UK)
- **HSE**: Health and Safety Executive (UK)
- **EPPHE**: European Panel for Patient Handling Ergonomics
- **NIOSH**: North American Institute for Occupational Safety and Health
- **OSHA**: Occupational Safety and Health Administration (US)
CHAPTER 1

Introduction
1.1 A personal perspective

Since 1997 I have been the course tutor for the Postgraduate Programme in Back-Care Management at Loughborough University. This programme educates post-qualification and post experience learners in the scientific background and the implementation processes for managing the risks of patient handling in the full range of health, social care and educational organisations. The model for the role of a Patient Handling Advisor (PHA), either internal or external to care organisations, is better defined and educationally supported in the UK than anywhere else in the world, and the programmes offered in the UK can educate the PHA to Masters degree level. The academic and evidence bases for some areas of the patient handling development are not well defined and the reduced level of information has been paramount in myself taking up the challenge of this research study.

Within this report are a number of personal aims alongside the academic aims of the PhD process based on my many years of teaching, training, research, employment and consultancy in the role of Patient Handling Advisor. As someone who firmly believes in the scientific background to evidence based practice, the development of qualifications to assist the improvement of practice, and data collection to prove the value of any intervention, certain questions have struck a chord through the years. It is some of these professional areas that lack clarity, which I have tried to address in this study.

The two main topics of personal interest are:

- Even when very experienced people in the field of patient handling have been implementing safe systems over a period of years there is a paucity of data to prove that the interventions have been of benefit to the organisation. It has been my experience that people do not fully understand the relationships between interventions and outcomes and how to measure them appropriately.
- The subsequent question, which I want the Patient Handling Advisor to be able to answer, is: How do you know whether your organisation is effectively managing the patient handling risks?
I hope that this investigation not only adds to the body of knowledge in the field, but in providing a clear outline of the relationships between intervention and outcome, and a useable tool, can improve practice in patient handling risk management.

1.2 The scope of the problem

The literature review (Chapter 2) will report the volume of research that has identified the known risks for musculoskeletal injury in the delivery of health and social care. To reduce these potential problems the field of patient handling has developed rapidly since the adoption of European legislation in 1992. The area has seen some research to measure the improvements in the quality of management strategies to improve the delivery of patient handling tasks. A wide range of intervention strategies has been developed, mostly covering the physical engineering solutions, people based interventions of training, instructions and supervision, and organisational solutions of systems and process (Hignett et al., 2003). It is difficult to compare the benefits of these different types of interventions, as any measurable outcome will be structured on the type of intervention.

The problem to be investigated in this project is three fold:

a) Given that there is some evidence that many patient handling interventions have no significant effect on reducing the prevalence of musculoskeletal disorders (Martimo et al., 2008, Amick et al., 2006), with what other values can the outcomes of patient handling interventions be measured?

b) If the outcomes from patient handling interventions can be measured with other values, then how are they to be compared when the wide range of intervention types is considered?

c) Can a combination of outcome measures be developed into a single tool that quantifies the risk management performance for patient handling risks in a given area?
The EC directive (90/269/EEC) is applied to all EU countries, but the systems for implementation are recognised as different across the countries, care settings, areas of special interest, and personal differences of the leaders in the field. This project not only aims to answer the questions above but also to include the views, actions and interests of all countries across the EU. The inclusion of EU factors, and opinions, has been provided by the European Panel of Patient Handling Ergonomics.

1.3 Conceptual framework

The scientific basis for this study is based firmly in the field of the applied scientific approach that is common in healthcare situations. Modern thinking for the improvement of health and social care practice is supported by ‘Evidence Based Practice’. This study is set within the same boundaries and can be defined as an evaluation of ‘current best practice’.

The scientific approach for this investigation is a clear use of mixed methodologies, incorporating both qualitative exploratory methods, and quantitative evaluation and scoring processes. This dual approach also can be described by the inductive and deductive approaches (Bryman, 2008). The literature analysis (Chapter 2) and the selection of tools for the content of the assessment tool (Chapter 4) has exploited deductive theory, exploring the peer-reviewed literature and working towards future observations, but the collection of the focus group data (Chapter 3) to identify the important outcomes was based on the inductive approach.

The application of the study to the environments of health and social care, the involvement of practitioners and experts in data collection, and peer-review more appropriately define the process as realistic research (Pawson and Tilley, 1997), as the project aims to provide a specific evaluation method based upon practitioners’ views to be used in a clearly defined set of circumstances.
1.4 The research aim

The overall research aims are to investigate the relationships between outcomes, outcome measures and the measurements of success for patient handling interventions. This investigation is applied to the practitioner field, and is aimed at delivering useable solutions and a method to create a positive change in both the practitioner and research fields. The second aim of the study is to develop a single tool that measures the important outcomes in a single measure to quantify the benefits between pre- and post-intervention performance.

1.5 Scope and limitations of the project

The EC Directive (90/269/EEC) applies to all manual handling activities across all industries. The very specific application of manual handling investigated in this project was the use of manual actions, with or without the use of aids and equipment for the purpose of patient handling. A growing body of research and practical evidence has been developing since the implementation of the Directive, which shows that most of the tasks and development of safer practice are recorded in health or social care situations. These two fields will constitute the area of investigation in this study, though it is recognised that many other areas will be exposed to patient handling risks.

The Directive on Manual Handling applies to all of the full members of the European Union, and the application of this project is to incorporate a wide representation of all the countries affected. It was not possible to consider accessing all 27 member states and the 3 accession states (www.europa.eu, 2009), so for data collection an appropriate demographic and geographical range was designed.

The area of investigation for this study is to understand the relationship between interventions, outcomes, outcome measures and the measurement of success. A European sample of practitioners was used to define the content of the
Intervention Evaluation Tool. Analysing the available literature and selecting the most suitable methods created the structure and format of the tool. The time and funding limitations of the project did not allow the development and implementation of an intervention trial to evaluate the tool, and that will form the basis for future investigations and projects.

The programme of data collection (Figure 1.1), investigation and analysis has been concurrently completed in four European states for the field trials, but has had the peer-review of many other countries’ to make it a truly international study. Though there has been such involvement, the analysis and interpretation had to be in English. The tool and process that have been developed have had some evaluation and peer-review but in the context of this study the process for full user evaluation and validation will be discussed in the latter stages of the report.

1.6 Thesis outline

The structure of this thesis outlines the full research project in a step-wise logic. This project was completed with the financial assistance of an external sponsor (Arjo-Huntleigh ab) and the clear brief agreed at the outset was to design a tool to measure the success of patient handling interventions in the EU. This tool was to be used by practitioners in the field and if possible as a research tool in future intervention studies. Each stage of the design of the tool is contained within the different chapters of this report. The process for the requirements, design, development and evaluation of the Intervention Evaluation Tool (IET) is shown in Figure 1.1.

Chapter 2a reviews the background literature to identify the position and developments in patient handling since the adoption of EC legislation. To give clarity to the range of interventions, outcomes and the different measurement methods Chapter 2b describes a systematic literature analysis, which allowed the research question to be defined and clear objectives to be included.
The conceptual design of the tool was created from the literature analysis (Chapter 2b) which defined what, and how, outcomes could be measured, and the EU focus group study in Chapter 3 which provided a prioritised list of outcomes that defined the boundaries of the measurements in the IET. The
data collection, results and analysis of the EU focus group study is described in Chapter 3. The design of the prototype tool is described (Chapter 4) and the selection of the most suitable measurements for the 12 included outcomes is explained. The IET experienced several stages of evaluation. Chapter 5 showed the methods used for testing and evaluation for the Intervention Evaluation Tool and discussed the various trials and evaluations across the EU.

This project delivered the Intervention Evaluation Tool as an evaluated prototype and recommendations for the design, documentation and process of use of the tool are described in Section 5.6 and through Chapter 6. Chapter 6 also considered the wider aspects of this project, discussed the findings and their context, and made a variety of recommendations for the future development of this work. Specific direction for the improvement of validity and reliability is outlined in Section 6.4. A brief conclusion completes the report in Chapter 7.
CHAPTER 2

Background And Context

Chapter 2a
Literature Review
2a.1 General Introduction

The overall aim of this research project is to develop a clearer understanding of the relationship between interventions and the measurement of outcomes for patient handling interventions in EU healthcare. To place this research into context, this background chapter explores the available literature in both general and systematic approaches. The initial sections discuss the wider body of literature to cover the contextual setting of interventions, outcomes and outcome measures in the reduction of musculoskeletal risks. The evidence of MSD in nursing and the associated healthcare professions is covered in section 2a.2. The contextual and historical differences between EU countries are discussed in 2a.3 before the relationships of interventions, outcomes and outcome measures in a wider context are described in section 2a.4. Closer focus on patient handling interventions and the measurement of outcomes is described in 2a.5 onwards.

Section 2a describes literature sources from a wider context. The literature for this general review was collected using the search strategies described in section 2b.1 but many of the papers included in this section failed to meet the specific inclusion criteria for the systematic review. Additional material was located by expanding reference lists from included studies and further manual keyword searches in the specific data bases that cover the areas of ergonomics, occupational health and safety, and nursing (i.e. Medline, Science Direct, Scopus, Ergonomics Abstracts, Ovid and Proquest).

To gain a detailed understanding of the relationships between interventions, outcomes and outcome measures for patient handling studies, section 2b includes a systematic literature analysis of all published patient handling interventions. This analysis describes the range of interventions, outcomes and outcome measures recorded by patient handling studies. This in-depth discussion allowed the philosophical issues of patient handling research and the application of evidence in the field to be discussed, and clear research aims and objectives to be described (2b.9).
2a.2 MSD in health and social care workers

The presence of musculoskeletal injury and illness in the health and social care workforce has been reported in many epidemiological studies. The information relating to prevalence of musculoskeletal disorders (MSD) is not just related to front line care workers, but there is also concern relating to ancillary professions: Battevi et al., (2000), Hignett (1996a), Fanello et al., (2002), Hildebrandt (1995), Estryn-Bahar et al., (1990), Baldasseroni et al., (2000), Ore (2003), Smedley et al., (1995), Smith and Secombe (1996) all indicate high prevalence rates among nursing and related personnel. Lu and Yeh (2006) identified musculoskeletal prevalence in care centres, while Menzel (2004) and Menzel et al. (2004) reported factors and rates of musculoskeletal discomfort in nursing personnel. In other health related areas Glover et al. (2005) and Rugelj (2003) showed the raised level of problem in physiotherapists. The extremely high levels of injury seen from the repetitive postures and actions of sonography have been reported in Russo et al. (2002) and Crawford et al. (2002), physical issues in dentistry by Turner et al. (2002), podiatry by Al Nasseeri et al. (2002), and X-ray technologists by Kumar et al. (2004).

The range of studies indicates that MSD in this occupational sector remains a major issue. The perceived high rates of prevalence and the corresponding losses in terms of finance and manpower created the need for action to manage the potential risks not only across the European Union (EU) but worldwide. Studies based on the epidemiological data have identified a range of risk factors in these occupational groups. These risk identification studies identify different factors for different occupational groups. The key series of factors identified is relative to the physical requirements of the work tasks, for example the weights of people being moved, frequency of lifting tasks, hazardous postures and methods (Garg et al., 1991, Owen and Garg, 1991, Owen et al., 2001, Smedley et al., 1995 Stobbe et al., 1988, Winkelmoelen et al., 1994, Knibbe and Friele, 1999, Edlich et al., 2001, Hyytiainen and Saarel, 1990, Engkvist, 2004 and 2008, Fisher et al., 2006, Gagnon et al., 2006, Capiello et al., 2005, Garg et al., 2003, and Menzel et al., 2004). Work organisation factors and shift patterns were identified by Toupin (2006). Psychosocial factors were also identified as
potential risk factors for illness and during the return to work following injury (Baird et al., 2006, Wiitavaara et al., 2007, Daraiseh et al., 2003, and Eriksen et al., 2004). Hazards have also been identified for other areas of the health professions: nursery nursing (Coole and Haselgrave, 2000), hazards in midwifery (Hignett, 1996, Thompson, 2000, and Steele and Stubbs, 2002), X-ray technologists (Kumar et al., 2004), dentistry (Thornton et al., 2004), and hospital cleaning (Carravick et al., 2005).

The growing number of studies that describe the possible interventions to assist MSD reduction have further shown the potential hazards and risks of patient handling methods (Hignett et al., 2003, Nelson, 2006, Amick et al., 2006). The range of these intervention studies will be discussed later in this review.

### 2a.3 European Picture

The epidemiological information, in the previous section, showed that the prevalence of musculoskeletal problems was widespread both geographically and across occupations within health and social care. This knowledge initiated the European Union to create a European Council (EC) directive to help reduce the effects of many health and safety risks to the workers of the EU. The framework directive (89/391/EEC) covers all areas of health and safety in the workplace. This was followed more specifically by the manual handling directive (90/269/EEC), which indicated the participating countries should manage risks related to the manual handling of loads, specifically where there was risk of injury to workers. The manual handling directive was completed on the 29th May 1990 and implementation of country specific regulations was targeted for 1992. EC directives are however general guidance for governments to follow and each country developed different responses in time and detail (Hignett et al., 2007).

The historical development of manual handling practices, systems and intervention strategies in EU countries has for the most part been in isolation from their geographical neighbours. Though some cross boundary discussion
forums have been in operation (e.g. OSHA, The Djuro Group and ISSA Health and Safety Forums) there is still limited transfer of information and sharing of methods or solutions. In 2004 the European Panel of Patient Handling Ergonomics (EPPHE) was formed as a combination of interested parties from two Technical Groups of the International Ergonomics Association (IEA) (T9 and T13). The two aims of the EPPHE group were to improve the dissemination of scientific evidence between the participating countries and to develop and collect more pan-European information from collaborative studies. The initial studies and collaborations from the EPPHE group identified that there were likely to be differences in the structures of health care delivery and questions surrounding the validity of comparison.

Hignett et al. (2007) compared specific measures relating to the provision of healthcare and implementation of the EU directives in countries with EPPHE representation. The study showed that healthcare is primarily delivered by government systems in all these countries, but there were differences in the number of beds per 100,000 in the population, and in the number of registered nurses and healthcare staff employed. The table also shows some differences in the timing for the implementation of regulations to support the directive, and specifically a scarcity of published guidance to assist with patient handling. Only Finland, Sweden and the UK had published patient handling guidance.

<table>
<thead>
<tr>
<th>Country</th>
<th>Pop&quot; (Million)</th>
<th>Hospital beds per 100 000 population</th>
<th>Total healthcare staff (000's)</th>
<th>Implem&quot; of EU directive</th>
<th>Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finland</td>
<td>5.2</td>
<td>723.9</td>
<td>346</td>
<td>1994</td>
<td>1998</td>
</tr>
<tr>
<td>France</td>
<td>60.6</td>
<td>777.6</td>
<td>546</td>
<td>1993</td>
<td>No official guidance</td>
</tr>
<tr>
<td>Germany</td>
<td>82.5</td>
<td>874.4</td>
<td>2 200</td>
<td>1996</td>
<td>No official guidance</td>
</tr>
<tr>
<td>Greece</td>
<td>11.1</td>
<td>487.0</td>
<td>90</td>
<td>1994</td>
<td>No official guidance</td>
</tr>
<tr>
<td>Ireland</td>
<td>4.1</td>
<td>1006.7</td>
<td>98</td>
<td>1993</td>
<td>No official guidance</td>
</tr>
<tr>
<td>Italy</td>
<td>58.5</td>
<td>445.4</td>
<td>1 201</td>
<td>1994</td>
<td>No official guidance</td>
</tr>
<tr>
<td>Portugal</td>
<td>10.5</td>
<td>365.1</td>
<td>120</td>
<td>1993</td>
<td>No official guidance</td>
</tr>
<tr>
<td>Sweden</td>
<td>9.0</td>
<td>358.5</td>
<td>260</td>
<td>1993</td>
<td>2002</td>
</tr>
<tr>
<td>UK</td>
<td>60.0</td>
<td>396.9</td>
<td>1 300</td>
<td>1993</td>
<td>1981</td>
</tr>
</tbody>
</table>
There are recent studies still identifying problems with musculoskeletal health of workers in healthcare occupations, over ten years after the implementation of the manual handling directive. Simon et al. (2008) reported the most recent information from the ‘Nurses early exit study’ (NEXT). The NEXT study shows that high levels of musculoskeletal and psychosocial factors are still prevalent in healthcare workers. Interestingly this study of seven countries, using 21,516 responses, showed that staff in hospitals reported the lowest availability of lifting equipment compared to nursing homes and home care. There was still a good correlation between the amount of physical lifting and bending and the prevalence of back and neck pain in this group, but psychosocial factors showed a stronger link with disability from MSD. In conclusion the paper agrees with Hignett (2003b), Nelson et al. (2006) and suggests that multi-factorial interventions are key to removing risks, and should also take account of psychosocial factors.

2a.4 Interventions studies in a wider context

The application of intervention strategies to the health and safety of workers and service users is widespread. Many publications and methodologies have been described to measure and quantify the intervention type and indeed the outcomes achieved. The use of interventions is also related to the development and the implementation of ergonomics as an industrial science. Both as a methodological science and a philosophy it has user outcomes as its focus. Recent reviews and philosophical papers have considered the effectiveness of intervention strategies and the possible process barriers.

Robson et al. (2007) define an occupational health and safety management system (OHSMS) as ‘A set of interrelated or interacting elements to establish OSH policy and objectives, and to achieve those objectives’, with the qualifying statement that there are difficulties with interpreting the definition as to what elements are activities, management and or systems. Redinger and Levine (1998) suggested that the primary elements of an OHSMS are:

- Management commitment and resources
These key elements describe a sound overview for all safety related interventions, though defining each observed strategy within each title is difficult as most interventions include a mix and match approach, depending on the needs analysis and the organisational structure.

Robson et al. (2007) conducted a systematic review of OHS management interventions to identify the key factors based on the quality of the research data. In some similarities to patient handling reviews, the volume of the high quality data was low with only one study being judged to be of high methodological quality. Interestingly in the description of the review the study concept identified a clear approach to interventions and possible outcome measures. The intervention may itself create implementation measures that relate to an organisation’s response to the suggestion. There are then physical or organisational measures soon after the intervention has been created that may result in the final outcomes towards which the intervention was aimed Figure 2a.1 below. This replicates the framework for patient handling interventions. A proposal for change is made which, dependent on management buy-in (intervention), leads to the implementation of training,
equipment or a change in process (implementation). This leads to intermediate outcomes in the way a task is performed, the uptake of the intervention, or postural/biomechanical effects of the new method. Ultimately the long term goals are related to the individual or organisational outcomes of reduced accident reports or sickness absence from MSD. These could directly or indirectly lead to the financial evaluation. In comparison with the patient handling reviews in section 2b.5.1, the intermediate outcomes identify the changes in causal exposure, and the final outcomes represent the final effect of the intervention at the desired level.

Figure 2a.1 Conceptual framework for OHSMS review (Robson et al., 2007)

Vredenburgh (2002) evaluated proactive and reactive strategies in hospital safety, and found that hospitals that used proactive strategies, e.g. training and selection filters, in addition to re-active repair strategies had an improved safety score. This agreed with the philosophy of Zink (2005) that identified the link between industrial safety and corporate health management, based on the theories of Total Quality Management (TQM). Taveira et al. (2003) and Lee (2005) also discuss the relationship between the implementation of ergonomics and TQM in large organisations. One review that noted positive outcomes
considered participatory ergonomics interventions (Rivils et al. 2008), and showed that participatory ergonomics interventions across a wide range of settings and methods showed positive effects on MSD. This review did include a number of healthcare related and or back pain related studies (e.g. Carravick et al., 2001, Evanoff et al., 1999).

In addition to the examination of OHS interventions there is also the consideration of ergonomics interventions in general when considering the outcomes of MSD and their severity. The definition and scope of ergonomics interventions are wide and in the most part published studies consider a narrow area of application to prove validity. Some papers have considered the wider field of MSD implementation. Whysall et al. (2004) identified the process for consultant ergonomists. Haslam (2002) considered the role and philosophy of health promotion. The justification and effectiveness of ergonomics interventions were examined by MacLoed (2003), Koningsveld et al. (2005) and Kerr et al. (2008). The over-riding finding of these papers is that as a science ergonomics does not collect enough outcome detail to be able to convince others of its importance. This is particularly relevant to the area of cost benefit analysis. The concentration on justifying a financial or MSD quantifiable outcome has proven to be problematic, and in health and social care the cost evaluation is similarly difficult, due to the complexity of the care and the difficulties of costing clinical benefit.

Though this study is concentrating on the process of intervention studies relating to patient handling in health and social care, it is important to appreciate that the wider fields of healthcare risk and the more general approaches of health and safety also overlap in this area. Initially the context of the provision of healthcare and the range of demands on care practitioners may be a useful context. Freisdorf and Marsolek (2005) considered the provision of care tasks as a simple socio-technical system. Figure 2a.2 shows the relationship between the carer, the patient and any mechanical or physical device that is being used for the task that can describe the criteria of a patient handling task operation. Some tasks will involve just the relationship between carer and
patient, but some will also involve mechanical equipment of varying complexities.

Figure 2a.2 Simple work system

For the patient handling scenario this model has many factors that may influence the completion of a specific movement or task. The reference above suggests that for a medical task four factors: patient status, rules and influences, task objectives and available resources add complexity to the actions. The difference for the patient handling task is that it is usually not the primary objective of the care task, and mostly is seen as an action that assists the caregiver to achieve the objective.

The role of ergonomics in the development and evaluation of patient handling tasks is clear, as the model forms a complex man machine interface with a number of organisational and systems overlays. Catino et al. (2005) suggest that this model not only consists of factors within the workplace, but actions and possible errors are considered at individual, organisational and inter-organisational level. Nurse and carer behaviour is certainly affected by peer group information, locally, and national guidance for health, health and safety information and professional standards or guidance, externally.
The completion of patient handling tasks also depends upon standard health and safety rules, regulations and guidance. The UK perspective is clearly defined within the plethora of information disseminated from the Health and Safety Executive (HSE), which covers all areas of workplace settings. The care services are also well advised by different bodies from The Department of Health (DH), Health Services Advisory Council (HSAC), Royal College of Nursing (RCN), other professional bodies and unions such as Unison. There are also other sources of patient handling guidance from specific bodies and documents in Table 2a.2.

**Table 2a.2 Patient Handling Guidance Documents**

<table>
<thead>
<tr>
<th>Description</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DIAG (1999)</td>
</tr>
<tr>
<td></td>
<td>Essential Back-Up (Revised 2002)</td>
</tr>
<tr>
<td></td>
<td>NBE (2002)</td>
</tr>
<tr>
<td></td>
<td>Smith (Ed) (2005)</td>
</tr>
<tr>
<td></td>
<td>Nelson (Ed) (2006)</td>
</tr>
<tr>
<td>Specific practical patient handling guidance</td>
<td>DIAG (1999)</td>
</tr>
<tr>
<td></td>
<td>Smith (Ed) (2005)</td>
</tr>
<tr>
<td></td>
<td>Collins et al., (2006),</td>
</tr>
<tr>
<td></td>
<td>Oregon Nurses Association (2004),</td>
</tr>
<tr>
<td></td>
<td>Guidance for Midwifery. Royal College for Midwives (1999)</td>
</tr>
<tr>
<td></td>
<td>OSHA Guidance 2009</td>
</tr>
<tr>
<td></td>
<td>ACC Worksafe (2003)</td>
</tr>
</tbody>
</table>

This set of recommendations is widely added to by the frequently published best practice advice that appears in journals and professional magazines in the form of professional opinion studies or reviews (Stetler et al., 2003, Strong, 1999, Nelson et al., 2003, Hignett, 2003a, Nelson and Baptiste, 2004, etc.)

All of this direction and information adds to the complexity of the process of completing the handling task in the care setting. In particular, some of the methods and techniques under scrutiny appear contradictory. This leads the
investigation to evaluate how evidence is compiled to evaluate the different handling systems from the different perspectives.

**2a.5 Interventions and outcomes**

Patient handling in the care setting is known to have health effects on the staff involved in these potentially hazardous processes. The reduction of the effects of known hazards and risks is the responsibility of the employer (EC Directive and HSAW etc Act 1974). The process of risk identification, assessment and control is well established in many industries. The HSE (HSE 2006) identifies the 5 steps to risk assessment as

1. Identify the hazards
2. Decide who might be harmed and how
3. Evaluate the risks and decide on precautions
4. Record your findings and implement them
5. Review your assessment and update if necessary

The healthcare industry has embraced this responsibility and accountability and has focused on the safe movement of patients. Advisors in patient handling have, for a number of years, been developing systems that identify the level of musculoskeletal risk for a given patient handling scenario.

This clearly defined process of risk assessment has a number of different contextual considerations in the field of patient handling. Many different approaches and measures have been used to identify the levels of risk, and the residual risks to staff, before and after an intervention has taken place.

This section discusses the variations in the range of risk assessment methods that have been developed. Hignett et al., (2003) indicated from a systematic literature review that the process of implementing risk assessments has a powerful effect on reducing risk to health staff, fourteen studies gave positive evidence to show that interventions were successful when based on risk assessment or risk management methods. Nelson (2006) concurred that the
implementation of the risk assessment process at various levels was an important action to help improve staff and patient safety.

The context of risk assessment as part of the ergonomics process is important. The simple concentric rings model of ergonomics (Singleton, 1974) would show the patient as the centre of the care delivery function (Figure 2a.3). Any potential intervention strategies could include all levels of the work process from the patient, staff, environment and organisation, with the aim of improvements in the work task at all levels.

![Figure 2a.3 Singleton’s Ergonomics Concentric Rings Model (1974)](image)

Table 2a.3 shows the wide range of applications and strategies used for patient handling interventions. It is important to be able to evaluate the range of interventions. The selection of appropriate outcome measures is crucial when evaluating an intervention. The next section describes the different outcome tools and risk assessment methods that have been published and applied to intervention studies for patient handling.
Table 2a.3 Intervention strategies used for patient handling

<table>
<thead>
<tr>
<th>Level</th>
<th>Intervention Type</th>
</tr>
</thead>
</table>
| Organisation | Management systems  
|            | Policies and procedures  
|            | Occupational Health, Human Resources interventions  
|            | Fitness for work  
|            | Risk Assessment systems  
|            | Health and Safety management  
|            | National regulation / guidance  
|            | Peer-leaders / workplace supervision |
| Workplace  | Buildings and facilities  
|            | Equipment provision  
|            | Equipment maintenance  
|            | Workplace layout  
|            | Lifting teams  
|            | Staffing levels  
|            | Health surveillance |
| Staff      | Preparation Phase  
|            | • Training for increased skills  
|            | • Equipment selection  
|            | • Method selection  
|            | Performance Phase  
|            | • Training for increased skills  
|            | • Supervision to increase compliance |
| Task       | Change environment  
|            | Change routine/protocol/technique/method  
|            | Change intended outcome  
|            | Avoidance of high risk tasks  
|            | Equipment use |
| Patient    | Increased involvement  
|            | Participation strategies  
|            | Behavioural change |

(Developed from Hignett ,2003a, Amick et al., 2006 and Charney and Hudson (eds), 2004)
2a.6 Outcome measures

Ergonomics is centred around quantifying and qualifying the demands of work on individuals and understanding their impact on tasks and organisations. There have been tools developed for these purposes. Many ergonomics textbooks are available to describe the numerous processes for quantifying and qualifying work processes, (Wilson and Corlett, 2005, Stanton et al., 2006, Karwowski, 2006, etc.). These tools measure a range of physical, psychological and sometimes organisational outcomes. In addition there are studies that apply working knowledge to the measurement and the improvement of methods and techniques of human performance measurement. Dempsey et al. (2005) surveyed practising ergonomists to show the breadth of tools used in practice.

The following section briefly shows the range of tools that is available for the measuring workplace activities that are appropriate to the field of patient handling.

1. Safety Culture
The nature and measurement of safety culture is explored by Choudhry et al., (2007). Though not suggesting the definitive method of measurement, there is good clarification regarding the importance of positive safety culture and the component parts; organisational and individual behaviours, management commitment, employee involvement, promotional strategies and campaigns and training. Further development of the systems ergonomics approach is described in Flin (2008). The measurement of safety culture in Danish healthcare was explored by Madsen and Anderson (2005). A safety climate questionnaire was evaluated in UK healthcare by Hutchinson et al. (2006) while Julien et al. (2005) used logic trees to examine corporate behaviour.

2. Financial evaluations
The financial evaluation of ergonomics or OHS interventions has been recorded in a series of evaluation papers (Smedley et al., 2005; Siddarthan et al., 2005;
Hendrick 2003; Beevis and Slade 2003; Beevis 2003; Stanton and Baber, 2003; Landstat et al., 2002 and Biddle et al., 2005).

3. Patient Outcomes
The domain of patient outcomes is not well researched outside the clinical outcomes literature, which is beyond the remit of this review. Hogston (1995) considers a series of studies that suggest patient outcomes are identified by nursing staff as the measure of quality of nursing care. Patient satisfaction is an inherent part of that judgement. Aydin et al., (2004) produced a more rigorous review of a state-wide quality evaluation, but failed to describe specific scoring patterns for patient outcomes.

4. Psychological load
The wider field of MSD has embraced the issues of psychosocial factors in many occupational settings. Manual handling tasks however have received little attention in terms of this measure. Bartys et al. (2002), Pretorius and Cilliers (2007) and Bourbonnais et al. (2006) all describe methods that could be applicable to handling occupations.

5. Physical hazards of manual materials handling
The recording and analysis of the physical hazards of lifting are well reported. The development of the NIOSH model is central to this research area. Dempsey (2002), Dempsey et al. (2002), Pinder (2002) and Waters et al. (2007) have all added to the robustness of the original model (Waters et al., 1993)

- Other tools have been compared to the NIOSH model (Russell et al., 2007; Dempsey and Mathiassen, 2006; Dolan and Adams, 2000 and Mastrominico et al., 2005).
- The calculation of compressive forces relative to different lifting postures and tasks have been reviewed (Agruss et al., 2004; Fischer et al., 2007; Kumar and Narayan, 2006; Gagnon, 2003 and 2005).
- The use of new technology for assessment of posture and hazard has been explored (Sutherland et al., 2008; Williams and Medland, 2002; Plamondon et al., 2007; Sutherland et al., 2007; Lamkull et al., 2007; Littlewood and May, 2007 and Lavender, 2000).
• EMG measures to quantify peak and cumulative workload are described by Village et al. (2005) and briefly by Albayrak et al. (2006).
• The relationship between subjective evaluation of handling and physical measures has been compared (Johnson and Hall, 2005; Nastasia et al., 2007; Tak et al., 2007 and Ryan and Haslegrave, 2007).
• Self reported exposure tools have been reported and evaluated (Yeung et al 2002; d’Errico et al., 2007 and Noyes and Bruneau, 2007).
• Physiological measures for dynamic load carriage tasks (Abe et al., 2008 and Wickel and Reiser, 2008).
• Push-pull evaluation methods (Okunribido and Haslegrave, 2008; Lemerle et al., 2008; Marras et al., 2009 and Rice et al., 2009).

In addition to the above methods relating to the recording of back posture and lifting hazards, some additional tools cover other task types and methods (PLIBEL, Klemmert, 1995). The Quick Exposure Checklist (QEC) is a whole body exposure tool for MSD (Brown and Li, 2003 and David et al., 2008). Upper limb assessment tools have been noted (Bao et al., 2007; Occhipinti and Colombini, 2007 and Roman-Liu, 2007). Chung, Lee and Kee (2005) related the measure of postural load to perceived discomfort for other physical exposures. The Manual Handling Assessment Chart (MAC) developed by the HSE has also been reported as a simple risk identifier (Monnington et al., 2003; Tapley and Buckle, 2003; Pinder, 2003 and Mawle, 2005).

6. Methods for quantifying hazards in nursing
The physical and psycho-social hazards of the nursing role are well recognised and several models not specifically related to patient handling have been reported. Ramsay et al. (2006) consider an approach to job hazard analysis based on the OSHA hazard list. The overall physical workload was observed and quantified by Janowitz et al. (2006), the psychosocial work environment for hospital workers was evaluated by Aust et al. (2007), and nurse performance measures were suggested by Gurses and Carayon (2006). Specific models that concentrated on the measurement of trunk loading, lifting hazards or exposure to risk included studies by Ciavarro et al. (2006), Engkvist et al. (1995) and Skotte (2001).
2a.7 Methods used for patient handling studies

Studies concentrating on patient handling identify many different aspects of performance, risk and outcome. The following discussion explores the many methods used both for the analysis of the risks of patient handling and as outcome measures for intervention studies. The tools reviewed in this discussion have different formats and measure different criteria. They are divided into the following categories:

a) Individual Patient Handling Risk Assessments and Plans
b) Physical Environment Risk Assessments
   i. Criteria Based Assessments
   ii. Residual Risk Scores/Evaluations
c) Individual observational tools for specific handling tasks
   i. Postural Analysis Tools
   ii. Biomechanical Assessment Tools
   iii. Exposure Measures
   iv. Subjective Appraisal Measures
   v. Methodological Observation Tools
d) Organisational/Management Structure Audit Tools
e) Financial Models of Assessment

Each different tool type is described in the following sections.

2a.7.1 Individual Patient Handling Risk Assessments and Plans

For a practitioner, the risk assessment process is an evaluation of the identified hazards, and the development of a safe system of work, to allow patient transfers to be repeatedly completed with controlled risks to the carer. The risk factors for a transfer are mostly based on i) the transfer type and location, and ii) the presenting physical, psychological and behavioural condition of the patient to be assisted. Identified hazards can be recorded as either a list of factors (Fray et al., 1999; RCN, 2001; Smith (Ed), 2005 and ACC Worksafe, 2003) or developed as a score matrix. Radovanovic and Alexandre (2004)
scored 8 patient characteristics: weight, height, level of consciousness, mobility in bed, transfer ability, walking, catheters and equipment and special risks. Each characteristic was scored 1-3 giving an overall risk level, low, medium or high, ranging from 8-24.

The development of a safe system of work has not been included in all risk assessment tools. In particular, the scoring systems have had a tendency to stop at the quantification of risk, using these values as a measure of the exposure to risk for a staff cohort, in a given area, based on patient need. This is similar to the nursing model of calculating workload by adding patient dependency scores for a patient cohort.

The development of a safe system of work (SSOW) for completing the transfer has also been subject to much work at practitioner level within healthcare providers in the UK (Fray et al., 1999; Smith (ed), 2005 and Nelson (ed), 2006). In line with the TILEO structure (HMSO, 2004), the instructions given as a result of the hazard identification and evaluation may involve combinations of the following:

- **Task** - Changes to the way the actions are to be completed.
- **Individual Differences** – Managing the skill and physical abilities of the staff to ensure safety
- **Load** – Reducing the manual effort of the task by the supply of aids, equipment or increasing the assistance of the patient being assisted.
- **Environment** – Changes to the location, equipment, buildings design to reduce risks.
- **Other factors**

As practical work-based documents, assuming a healthy and skilled workforce, the consensus for most SSOW’s designed for the completion of each task include as essential information: the transfer type, the number of staff required to complete the transfer, the equipment and environmental changes, and a method statement as to how the task is completed.
2a.7.2 Physical Environment Risk Assessments

In addition to risk assessments for the handling risks associated with an individual patient or handling task, some tools have been designed to assess the potential hazards for an environment or location.

i. Criteria Based Assessments
This type of assessment looks at the needs for a specific situation, task or location. The individual assessments can be collated to give a risk summary for a building or facility. The criteria can be set as a specific need, a piece of equipment or other issue. The risk evaluation process in these tools is to accept or reject the chosen task based on the environmental situation. Scoring mechanisms vary from simple yes/no compliance statements (Fray et al., 1999, p46) to more complex environmental assessments giving a more complex score and summary total. E.g. the Lite Workplace Profile (ACC Worksafe, 2003 p195-200)

Two other tools are used to assess the equipment need for a given care environment. The Hoist Identification Tool developed by Smith et al. (2005) assesses the lifting need in any given environment, based on the Functional Independence Measure (Granger et al., 1993) and the number of staff teams available. It summarises the number of passive and active hoists required. Quick Scan (Arjo Ab, a) is a similar tool to assess the hoisting and bathing equipment required.

ii. Residual Risk Scores/Evaluations
A more complex risk scoring system can be found in two tools looking at the needs of an organisation and comparing these with the level of controls in place to give a residual risk score. Both the MAPO tool (Battevi et al., 2000) and the Care Thermometer (Arjo Ab, b) use measures of the patient group, the tasks completed, the equipment and environment. The Care Thermometer is a derivation of a Dutch
model that has been used in a central government implementation and evaluation process (Knibbe and Knibbe, 2005).

2a.7.3 Individual observational tools for specific handling tasks
A review of outcome measures from patient handling interventions found that many different methods were used to identify the risks to the care giver carrying out the handling task (Fray and Hignett, 2007a). These include measures of physical position, force and repetition or exposure (Putz Anderson, 1988).

i. Postural analysis tools
The effect of body mechanics and shape on the risk level can be measured by certain tools. Some studies have looked at the specific joint angle or physical measures but most measured the risk scores with established posture analysis tools. Two common tools were REBA (Hignett and McAtamney, 2000) and OWAS (Karhu et al., 1977). These consider a range of body part positions and movements and compare them with known MSD risks to develop an ordinal risk level score ranging from high to low risk.

Raine (2001) developed the ‘People Environment Risk’ tool (PER) specifically for patient handling tasks. This used a similar methodology to REBA and OWAS but added several points of reference relating to the neuro-muscular approach to efficient movement (Vasey and Crozier, 1982; Crozier and Cozens, 1998).

ii. Biomechanical assessment tools
Biomechanical load has long been associated with musculoskeletal risk and many studies use these measures to evaluate the outcome of interventions. The risks were primarily related to the calculation of load, torque or compressive forces in the joints of the lower back e.g. NIOSH (Waters et al., 1993). The calculation methods, the level of detail, and the accuracy all showed differences. The observation methods varied from video taping with freeze frame analysis, photographic methods, simple distance measures for turning
moments to high technology methods using electronic goniometry (Skotte, 2001) or the Lumbar Motion Monitor (Marras et al., 1999). A comparison of five such tools can be found in Russell et al. (2007).

iii. Exposure measures
Measures of exposure are not very common. Simple scores of time and total number of repetitions are used as measures of risk exposure. Knibbe and Friele (1999) examined the use of self completing logs to identify levels of risk as a fieldwork tool. This was in some ways similar to the self reported exposure methods described by Yeung et al. (2002). Another tool was developed and evaluated by Janowitz et al. (2006) to measure the physical demands of the hospital environment, but this was not specific to patient handling scenarios. Dempsey and Mathiassen (2006) suggest that the methods of quantifying risk based on a single load or task approach has lost its relevance in modern ergonomics, and cumulative day/shift models of exposure might be an improved method. For this review it is felt that the overall load on the workforce relative to the work demands of each individual care area may be a useful tool to measure the success of any patient handling intervention. The level of MSD in a high dependency care ward should be different to an area where patients are more self caring and mobile.

iv. Subjective appraisal measures
Subjective feedback has been used as a source of information to support interventions. No specific tools were found to measure the intervention effects on the patients but subjective measures of comfort, security and dignity were recorded. In addition there were many subjective assessments of the staff response to the task: the Borg scales for the rate of perceived exertion (Borg, 1998), likert scales for comfort (Nelson et al., 2006), and ease of use for equipment (Connelly et al., 2001).
v. Methodological observation tools
Observational tools have been the subject of much research in the patient handling field. These tools are developed to assess the safety or competency of an individual operator in completing the observed task. All of the tools evaluated in this study developed a checklist score sheet with a list of predefined questions and attainable qualities. Simple checklist criteria were suggested by Alovosius and Sulzer Azarof (1985), Feldstein et al. (1990), Kjellberg (2000 and 1998), St Vincent et al. (1989) and Engels et al. (1997). In part Raine’s PER (2001) also fits these criteria. These question sets have seen some development to give a more detailed analysis; Pate (Kjellberg, 2000); DiNO (Johnsson et al., 2004); and a video analysis tool (Warming et al., 2004). The tools evaluate each observed transfer based on scores for: the preparation for the transfer, the performance of the transfer, and the result of the transfer. Most differ in the tasks that are to be observed, the physical movement criteria under pinning the model, and the success criteria.

Using a different assessment criterion Crumpton and Johnson (2005) highlighted the Benner Scale (Benner, 1984) as a method for measuring the skill level needed to comply with a transfer method. This method has been more clearly defined by the Finnish development of the SOPMAS tool (Tamminen-Peter, 2004) looking at the competency and learning levels required for task completion. The SOPMAS tool has been specifically developed for patient handling and includes reference to body movement and facilitation of the patient.

2a.7.4 Organisational/Management Structure Audit Tools
Health and safety management systems have been widely developed to assess compliance with the management regulations in the UK (MHASAW 1998). The Patient Handling Observation Question Set (PHOQS) tool, developed by Hignett and Crumpton (2005), and based on the RCN competencies (RCN, 2003), was the only audit tool found in the public domain specific to the
organisational and management factors involved to managing the MSD risks of patient handling. The question set included compliance statements and cumulative scores for: policies and procedures, risk management, patient handling assessment, and organisational culture.

Other audit processes have been located within other patient handling guidance documents. The Derbyshire Inter-Agency Group Guidelines (Fray et al., 1999), the All Wales NHS Manual Handling Training Passport and Information Scheme (NHS Wales, 2003) and the Policy Mirror (Arjo Ab c), all identify organisational requirements that can be evaluated as a measure of performance.

2a.7.5 Financial Models
The need for an intervention to be economically viable is important in all areas of musculoskeletal injury prevention. Many studies consider the costing process and the comparison of cost versus benefit, but few have been specifically constructed as tools for patient handling interventions. A general outline was created by Siddarthan et al. (2005) using three scores for measuring the profitability based on US models of accounting:

- Payback Period. How long the project will take to reimburse the investment.
- Net Present Value (NPV). Comparing the initial investment over a period of time and including a discount measure to weaken the future returns as future returns are less valuable than present returns due to inflation.
- Internal Rate of Return (IRR). Defined as the time when the returns meet the present level of investment (NPV=0), calculated as a percentage of the life of the project.

The MARCH tool (Smedley et al., 2005) examined investment in patient handling controls via resource allocation and is similar to the PHOQS tool (section 2.4). Twelve questions were scored 0-2 against pre-set criteria and an overall score (x/24) was calculated.
CHAPTER 2

Background And Context

Chapter 2b
Systematic Literature Analysis
The literature review (Section 2a) has shown that the knowledge level, and level of application in MSD interventions is high but varied. Intervention strategies can approach organisational, physical or personal changes in the workplace, and the outcomes can be recorded via a wide range of risk exposure, physical observation or organisational measures. In order to relate the breadth of tools that have been noted as potential outcome measures for patient handling interventions a formal analysis of the literature has been completed. The aims of this analysis of the available literature were to:

1. Record the intervention strategies that are used in the literature
2. Record the beneficiaries from patient handling interventions
3. Record the outcomes and outcome measures used to evaluate patient handling interventions
4. Investigate what success measures are recorded in the published literature

2b.1 Methodology for Literature Analysis

The same sampling and inclusion/exclusion criteria defined by Hignett et al. (2003) were used in this project. The papers were (a) selected using inclusion/exclusion criteria based on quality and content; (b) appraised using a validated critical appraisal checklist to assess the quality of the research; and (c) assessed by multiple assessors to ensure inter-rater reliability (Downs and Black, 1998). The inclusion exclusion/criteria are defined below and a paper would be:

1. included if it described a named task, piece of equipment or intervention relating directly to patient handling;
2. included as a professional opinion if it met criterion 1 and had:
   a. included references,
   b. critically appraised the literature,
   c. provided a new interpretation of the literature;
3. excluded if it was related to epidemiology of musculoskeletal disorders (usually low back pain) and did not meet 1;
4. excluded if it was not the primary source of a study. The primary source was sought and included;
5. excluded if it was a legal case law report.

In comparison to previous academic systematic reviews (Van Poppel et al., 2004; Bos et al., 2006; Amick et al., 2006; and Martimo et al., 2008) this process is designed to be inclusive. The assessment criteria allow all types of study to be accepted. It is particularly relevant to discuss the format of what constitutes an intervention study as all valid information relating to the performance of patient handling tasks is to be accessed.

- Intervention studies - The classic before and after models of interventions are accepted with or without control groups e.g. RCT, Non-RCT and quasi experimental.
- Comparison studies - Data sets that identify and evaluate multiple methods, techniques or situational differences are accepted e.g. cohort studies, case control or cross sectional studies.
- Case studies - Case studies that evaluate a patient handling task or method with known tools, and compare them against accepted criteria are accepted e.g. descriptive cross sectional studies, case series studies.
- Qualitative evaluations of handling tasks and scenarios and the views and opinions of the patients and staff using them.

One significant difference for this evaluation was the secondary filtering of the studies to identify workplace intervention studies as a subset of the full collection. These studies have specific interest for PHAs as they measure real world changes in behaviour following the intervention. The selection of these papers was based on the following inclusion/exclusion criteria:

1. Include only papers that involve a workplace application of a patient handling intervention
2. Include studies based in the workplace that feature pre to post comparisons, treatment versus control comparisons, or multiple treatment comparisons.
3. Exclusion of professional opinion papers because they inherently will not identify an outcome measure, as no new data are collected and analysed.

2b.1.1 Data collection
The search strategy was based on Hignett et al. (2003 p9). The previous search was completed from 1960-2001 which was extended to December 2008. The original strategy had identified that the most successful sources were Medline, Embase and CINAHL databases. The Proquest access portal was used in addition to support these major sources. It was not possible to follow the complex search strategy reported in Appendix 1 (Hignett et al., 2003) due to time constraints. Every effort was taken to use the same language and search strategies to complete the extension of the search.

The inclusion criteria resulted in a total of 777 papers being identified for scoring, all from the original publication. The dates of included publications ranged from 1975-2008. The oldest, by Dehlin and Lindberg (1975), was from a Scandinavian journal and was one of only a few publications that predated 1980. The number of included papers increased towards the latter years of the sample. The final date of collection was Dec 2008, to allow for analysis.

The research aim of this systematic literature analysis was to explore the published material and report the evidence contained. The data extraction sheets devised for Hignett et al. (2003) were used for the new additions to the sample. Each selected paper was scored twice by independent assessors, and any discrepancy was scored by a third independent assessor.

<table>
<thead>
<tr>
<th>Description</th>
<th>N°.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Papers included from Hignett et al 2003</td>
<td>207</td>
</tr>
<tr>
<td>Total papers found for scoring (2000-2008)</td>
<td>777</td>
</tr>
<tr>
<td>Papers excluded by scoring</td>
<td>656</td>
</tr>
<tr>
<td>Papers included (2000-2008)</td>
<td>121</td>
</tr>
<tr>
<td>Total papers included in analysis</td>
<td>328</td>
</tr>
</tbody>
</table>
2b.1.2 Scoring and recording systems

Appendix A contains the collected information for the 328 studies. For convenience in this section the papers will be referred to in Vancouver style relative to its inclusion number, a full list of the references and numbers is in Appendix A.

The following information was scored and recorded for each of the included papers:

- Beneficiary
- Number of outcomes included in the study
- Outcome recorded
- Outcome measure
- The details of the statistical analysis reported in the paper for each outcome/outcome measure
- The details of the intervention that was used in the study
- The QR score for academic quality. (Downs and Black, 1998)
- Practitioner rating score (Hignett et al., 2003)

As many different assessment criteria have been used for the measurement of outcomes, it is important at this stage to compare the methods. The question of cause and effect is raised about whether the measurement is describing the intervention or an outcome of the intervention. This may be seen in the equipment provision models. In order to clarify future discussions the following definitions will be used.

- **Beneficiary**: The intended target for the resultant improvement of an intervention or comparison trial.

- **Outcome**: An outcome is a quality or conceptual value that describes the intention of an intervention. It can be described by both the target of the improvement, the beneficiary, e.g. staff, patient, and the quality described, i.e. reduction of injuries or reduction of costs.
• **Outcome Measure (OM):** An outcome measure is a recorded quantity, quality or value (single or series) that can be identified to compare the before and after intervention state or compare different methods, e.g. equipment provided for a workplace.

• **Outcome Measurement Tool (OMT):** An outcome measurement tool uses the outcome measure, or several outcome measures, for internal assessment against a known and traceable set of criteria. The OMT should give rational level data in its final score system. OMTs should measure outcomes and not describe interventions, but an OMT could describe the magnitude of an intervention when there is clearly stated evidence of the links between the intervention and the outcome improvement.

In addition to the Downs and Black (1998) scoring system for the academic quality of each paper, the following assessment tools were included in the academic analysis.

**Robson’s Outcome Measure Score**
Based on the relative order of intervention to full effect in the end users, Robson et al. (2007) suggests that there is a ranked order of importance.

1. Outcomes that measure quantities and qualities of the intervention
   a. Provision of equipment, training numbers etc
2. Outcomes that represent a reduction in exposure to known risk factors
   a. Changes in force, postures and method, physiological performance
   b. Measures of skill, compliance, and competence
   c. Subjective measures in patients and staff
3. Outcomes that measure a real effect in the target population in a real situation
   a. Reduction in sickness absence, number of injuries, number of accidents in patients and staff
b. Financial measures or losses

**Ranked list of preferred outcomes**

The EU study described in Chapter 3 created a ranked list of preferences for the outcomes from a practitioner view. Each included study was compared against the list below and the outcome was recorded against 1-13.

1. Safety Culture
2. MSD Measures
   1. LBP, pain
   2. Injuries
   3. Clearly defined discomfort (BPDS)
3. Competence and compliance
4. Absence or staff health
   1. Lost days
   2. Measures of ability to work WAI
   3. Adaptations in work or reduced capacity
5. Quality of care
6. Accident numbers
7. Psychological well being
8. Patient condition
9. Patient perception
10. MSD exposure measures
    1. Included subjective evaluation of effort
    2. Comfort, safety
    3. Risk perception
11. Patient injuries
12. Financial
13. Other, e.g.
    1. Time taken
    2. Equipment evaluation scores
    3. No of staff to complete task
    4. Training numbers
**Hignett Convincing Scale (Hignett et al. 2003)**

The Hignett Convincing Scale was developed to improve the evaluation of usefulness of the data included in the various papers included in Hignett et al. (2003). A five point scale is used to allow the assessor to indicate how important the findings of a study would be to their practice as a PHA. The tables included in Appendix A and B refer to this scale as the Practitioner Rating (PR) for convenience, and to match with previous analysis. The question set is included in the list below. The numerical score is in brackets:

How convinced are you, as a practitioner, by the relevant findings or recommendations from this paper?

- Very convinced, will definitely use this in my practice/teaching (5)
- Fairly convinced, might use this in my practice/teaching (4)
- Borderline, there might be something in this but I need to know more (3)
- Not convinced. But I don’t think its complete rubbish (2)
- Complete rubbish (1)

**Summary**

The analysis details included in Appendix A identify which studies had the highest academic quality, the most valid outcome measure, and the highest level of support from the practitioners and experts in the field of patient handling.

The reasoning behind the different items is as follows:

- The QR gives an academic score for the quality of the study but gives no consideration for the quantity described.
- The Robson Value gives a rating of the power of the quantity described
- The Preferred Outcome Rating is the level of importance of the outcome from the EU study
- The Practitioner Rating (Hignett Convincing Scale), (Hignett et al., 2003) gives a level of judgement from multiple reviewers of the usefulness of the information included in the study
The comparison of the cumulative score will be worthy of investigation in the future.

### Table 2b.2 Summary of analysis included

<table>
<thead>
<tr>
<th>Description</th>
<th>Range</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downs and Black QR</td>
<td>0-100%</td>
<td>Double scored using trained readers. Conflict goes to 3rd reader</td>
</tr>
<tr>
<td>Robson Outcome Value</td>
<td>1-3</td>
<td>MF scored outcomes based on included criteria</td>
</tr>
<tr>
<td>Preferred outcome rating</td>
<td>1-13</td>
<td>Based on focus group analysis (Chap 3)</td>
</tr>
<tr>
<td>Practitioner rating</td>
<td>1-5</td>
<td>Multiple scored using trained readers. Average score included</td>
</tr>
</tbody>
</table>

The methodology created a selection containing 328 studies for all included papers. The included studies reported 598 specific outcome measures to quantify the change in practice. Some studies (35) recorded no outcome measures, as they were descriptive or developmental studies that had no intervention or changes in the workplace. The highest number of outcomes recorded in any study was eight (Garg and Owen, 1994) who conducted a multi-factorial study in a laboratory and then as a field study with four outcomes for each.

A subset of the data was created which included only workplace interventions that recorded a change in observed practice (101). For these studies at least one outcome was required. The range 1-7 saw Nelson et al. (2006) with the highest number of outcomes. The average number of outcomes was higher for the intervention studies (2.33).
### Table 2b.3 Overview of included studies

<table>
<thead>
<tr>
<th>Included studies</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studies included in full review</td>
<td>328</td>
</tr>
<tr>
<td>Number of outcomes recorded</td>
<td>598</td>
</tr>
<tr>
<td>Range</td>
<td>0-8</td>
</tr>
<tr>
<td>Average per study</td>
<td>1.9</td>
</tr>
<tr>
<td>Number of intervention studies included</td>
<td>101</td>
</tr>
<tr>
<td>Number of outcomes recorded</td>
<td>235</td>
</tr>
<tr>
<td>Range</td>
<td>1-7</td>
</tr>
<tr>
<td>Average per study</td>
<td>2.33</td>
</tr>
</tbody>
</table>

The following sections explore the 328 studies for content and quality.

### 2b.2 Beneficiaries

Stakeholders involved in the intervention process were identified as beneficiaries. Their level in the organisation was shown to evaluate whether immediate benefits, such as changes in posture and force, were measured rather than longer term organisational or health related benefits. The beneficiaries were categorised as follows:

1. patient
2. relative,
3. staff (caregiver),
4. organisation (at any level),
5. society,
6. equipment
7. task.

It was observed that some outcome tools could cross categories, so more than one beneficiary could be identified from the same intervention and measured by the same outcome measure. In this analysis it was decided not to allow the double scoring of an outcome. An example of this would be reduced musculoskeletal injury rates that could be scored as both an individual staff outcome and an organisational outcome.
Example 1. Reduced risks of injury, and recorded injury rates to the staff involved in the study were recorded as a staff outcome. Lost time caused by sickness absence, compensation claims or reduced legislative costs were recorded as organisational outcomes.

Example 2. The time taken to complete a task was categorised as a task outcome. But it could be argued that making a task quicker is an organisational benefit. In some physical studies the time taken to complete a task was actually a physical measure of the exposure to risk.

2b.2.1 Descriptions of the Beneficiary Categories
The following definitions have been developed for this analysis:

1. The **patient** category was for the measurement of a successful patient handling task, or any form of physical or subjective feedback that was created by the patient being moved in the trial. This category included clinical outcomes. If the handling method improved the clinical outcome of the treatment programme it is suggested that would be a high level outcome. Though this was defined as a patient outcome there are likely to be longer term links to both organisational and society outcomes.

2. The **relative** category was added when one study identified an observer feedback measure for a specific manual handling application (Waldenstrom and Gotvall, 1991). The outcomes in this paper were subjective feedback from observers, but there may be surveys and studies in the future that include family carers or advocates. In particular this could be expected in the field of social care and home care applications.

3. The **staff** category was expected to be the most frequent. In the main, patient handling interventions have focussed on preventing musculoskeletal injury in employed groups, reducing the musculoskeletal risks for the people completing the task.
4. **Organisation** outcomes were data measures specifically related to the wider collective, rather than the individual at risk from the task being completed. These included the costs of accidents or injuries, or legal actions against the hospital or body involved.

5. Many epidemiology studies relating to the area of back care identify higher level outcomes than the individual organisation involved. It was decided to classify **society** benefits as full profession data or measures relating to society as a whole e.g. health or social care costs.

6. The **equipment** category was used for interventions where the sole purpose was to design a product or device and the outcomes benefitted from that process.

7. The **task** category was identified as outcomes relating to the functional benefits e.g. the time taken to complete a task or a quality measure of the task. These again in the longer term could be organisational benefits as they could be measures of productivity.

**Table 2b.4 Results of the beneficiary data.**

<table>
<thead>
<tr>
<th>Beneficiary</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff</td>
<td>439</td>
</tr>
<tr>
<td>Organisation</td>
<td>76</td>
</tr>
<tr>
<td>Patient</td>
<td>43</td>
</tr>
<tr>
<td>Task</td>
<td>28</td>
</tr>
<tr>
<td>Relative</td>
<td>1</td>
</tr>
<tr>
<td>Training</td>
<td>2</td>
</tr>
<tr>
<td>Equipment</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>598</td>
</tr>
</tbody>
</table>

The beneficiaries were recorded for each defined outcome as per the criteria above. Table 2b.4 shows the number recorded in each category. As expected the prevention of injury to the staff is represented more frequently than all other categories combined. Organisational outcomes represented 12.7% of the total and were mostly comprised of sickness absence and financial outcomes. Patient outcomes in a care centred industry were recorded in only 7.2% of entries. Smaller representations were recorded for task performance, relatives,
training and equipment outcomes. These smaller groups were likely to play little part in future analysis.

The beneficiary of any study is an important denominator as it defines the intention of the study, especially during the workplace intervention studies that contribute strongly to the body of PH evidence. The focus of PH on the reduction of health and safety effects of hazardous actions is evident in this information. The historical creation of new and improved practice to assist patients to move has been driven by the EC Manual Handling Directive (1990), and has created this focus in the research and practice. The number of patient directed outcomes is low and has in part hindered the development of best practice, as the priority of hospital management is in improvements in patient care and the cost efficiency of services. The relationships between the target of the intervention and the type of intervention will be described in the next section.

2b.3 Intervention strategies

A secondary analysis (Section 2b.1) separated studies that describe a true intervention and not a descriptive or developmental study or a laboratory comparison. 101 intervention studies (Appendix B) were identified and are the basis for the analysis in this section.

Interventions have been the focus of much of the research and development of PH methods and risk management. It is the transfer of theoretical and laboratory based studies that should carry most influence in the practitioner field, as they define the actions that the PHA uses to change the behaviours and effects of PH in the organisation concerned. It is an assumption of all research based scientists that the publication of research and the findings of interventions studies have a carry over to real world application. It would be seen in the UK that more easily available general professional literature may have a stronger effect on current practice (e.g. Smith (ed) 2005). It was not
possible due to the constraints of this study to question the level of use of research evidence in the health and social care across the EU.

Publications such as Nelson (ed) (2006), Smith (ed) (2005) and Charney and Hudson (ed)(2006) indicate that the more positive results of PH interventions are found with multi-factorial interventions. To review this statement and practice the body of literature was analysed to examine the range of intervention methods recorded. Previous systematic reviews (Hignett et al., 2003; Amick et al., 2006) also noted intervention strategies and evaluated the quality of each of the studies for comparison. Similar analysis is completed in this review. This allows the evaluation of how successful the study was at demonstrating the effects in a workplace intervention. Hignett (2003a) recorded 22 different intervention strategies in varying patterns. The extension of the sample has raised the number of intervention strategies to 25 and these are listed below:

1. Risk Assessment
2. Equipment provision and or purchase (including training on new equipment)
3. Equipment design/evaluation
4. Equipment maintenance
5. Education and training
6. Work environment redesign, space constraints addressed
7. Work organisation / practices changed
8. Feedback
9. Group problem solving / Team building
10. Review and change of policies and procedures/ safe systems of work
11. Discussion of goals with clients (patient)
12. Injury monitoring, treatment e.g. Return to work
13. Change / introduce patient risk assessment system
14. Introduction of hazard register
15. Audit of working practices/risk assessments
16. Review staffing levels, Increase staffing levels
17. Introduction of lifting team programme
18. Physical fitness training
19. Stress management
20. Medical examination and lifting skill assessment
21. Task analysis, job design analysis
22. Change in uniforms
23. Peer leader, BCA, Ergo coach, local risk assessment facilitator or patient handling supervisor
24. Management systems, change management, organisational structures
25. National regulation

Figure 2b.1 Intervention Strategies (Based on Hignett, 2003.)
Many intervention reviews consider intervention strategies to belong to a small number of categories. The most frequently seen categories consist of organisational, physical/engineering or personal change strategies. The list of 25 strategies identified in these PH intervention studies also aligns with these categories:

<table>
<thead>
<tr>
<th>Category</th>
<th>Intervention strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisational</td>
<td>• Risk Assessment (1)</td>
</tr>
<tr>
<td></td>
<td>• Work organisation / practices changed (7)</td>
</tr>
<tr>
<td></td>
<td>• Feedback (8)</td>
</tr>
<tr>
<td></td>
<td>• Group problem solving / Team building (9)</td>
</tr>
<tr>
<td></td>
<td>• Review and change of policies and procedures/ safe systems of work (10)</td>
</tr>
<tr>
<td></td>
<td>• Discussion of goals with clients (patient) (11)</td>
</tr>
<tr>
<td></td>
<td>• Change / introduce patient risk assessment system (13)</td>
</tr>
<tr>
<td></td>
<td>• Introduction of hazard register (14)</td>
</tr>
<tr>
<td></td>
<td>• Audit of working practices/risk assessments (15)</td>
</tr>
<tr>
<td></td>
<td>• Peer leader, BCA, Ergo coach, local risk assessment facilitator or patient handling</td>
</tr>
<tr>
<td></td>
<td>supervisor (23)</td>
</tr>
<tr>
<td></td>
<td>• Management systems, change management, organisational structures (24)</td>
</tr>
<tr>
<td></td>
<td>• National regulation (25)</td>
</tr>
<tr>
<td>Physical or engineering</td>
<td>• Equipment provision and or purchase (including training on new equipment) (2)</td>
</tr>
<tr>
<td></td>
<td>• Equipment design/evaluation (3)</td>
</tr>
<tr>
<td></td>
<td>• Equipment maintenance (4)</td>
</tr>
<tr>
<td></td>
<td>• Work environment redesign, space constraints addressed (6)</td>
</tr>
<tr>
<td></td>
<td>• Review staffing levels, Increase staffing levels (16)</td>
</tr>
<tr>
<td></td>
<td>• Introduction of lifting team programme (17)</td>
</tr>
<tr>
<td></td>
<td>• Task analysis, job design analysis (21)</td>
</tr>
<tr>
<td></td>
<td>• Change in uniforms (22)</td>
</tr>
<tr>
<td>Personal</td>
<td>• Education and training (5)</td>
</tr>
<tr>
<td></td>
<td>• Injury monitoring, treatment e.g. Return to work (12)</td>
</tr>
<tr>
<td></td>
<td>• Physical fitness training (18)</td>
</tr>
<tr>
<td></td>
<td>• Stress management(19)</td>
</tr>
<tr>
<td></td>
<td>• Medical examination and lifting skill assessment (20)</td>
</tr>
</tbody>
</table>

*Figure 2b.2 Categories of interventions*
Most strategies are considered to be at the organisational level and many are associated with the process of risk assessment and the delivery of appropriate PH solutions. National guidance (25) appeared in two large studies funded and supported by a government body (Australia [303], Netherlands [241]). The structures and authors of other studies suggested that government guidance was being evaluated by the study, but the National Guidance was not described in the details (US [296], Germany [293], Canada [254, 263, 265]).

Equipment and engineering solutions also appeared to be well recorded in the range of included intervention studies. The range of physical interventions included the provision and upkeep of equipment in the workplace, even though there is still a need for a standard approach for how much and which type of equipment is the essential provision in any given area. Physical space was evaluated in six studies but only as a part of more complex intervention strategies [30, 82, 94, 123, 172, 176]. Physical solutions in some studies described the provision of suitable staff numbers and skills for the completion of PH activities. The provision of suitable numbers for care are constantly in debate in the EU as the financial constraints of national health services tighten. The numbers for PH are primarily based upon the knowledge that has been developed from PH practice and research that shows for certain patient dependencies and the use of certain equipment there is a minimum acceptable number over a 24 hour period. One specific solution that is reported in a number of studies is the provision of lifting teams. Only studies from the US cover this approach [6, 70, 87, 198, 199, 324] and most show very positive effects on costs and MSD.

Change strategies on a personal level comprise two approaches, firstly the very common approach of training (see table 2b.5) and the less frequently included occupational health services (12, 18, 19, 20). There are very few interventions published that only treat or manage injuries from PH, as most services offer management for all MSD.

This overview of intervention types describes an ‘ideal’ PH management system where:
- Organisational inputs include a suitable risk assessment system, policies and procedures to create positive safety culture, a participatory approach to implementation of solutions, and suitable personnel to implement and control the PH risks
- Engineering inputs should provide both equipment and environmental solutions for space and movement of patients, and suitable numbers of staff must be available
- Personal behaviours should be assisted by training and any injury or health deficit should be assessed and treated by a suitable occupational health system

The evidence from the different intervention situations is now covered in more detail.

**2b.3.1 Single intervention studies**
41/101 studies included a single intervention strategy with the other studies having various levels of complexity, Engkvist 2006 [82] had the most complex intervention with nine individual methods described. The studies that included only one strategy are tabulated below in Table 2b.5.
Table 2b.5 Single strategy intervention studies

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Included studies</th>
<th>Range</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Equipment provision and or purchase (including training on new equipment) (9)</td>
<td>5, 130, 212, 217, 228, 240, 267, 281, 289</td>
<td>11-83</td>
<td>44.3</td>
</tr>
<tr>
<td>5. Education and training (25)</td>
<td>4, 9, 14, 43, 48, 55, 56, 57, 63, 64, 66, 99, 116, 117, 134, 136, 137, 138, 162, 165, 219, 247, 255, 294, 328</td>
<td>31-86</td>
<td>55.8</td>
</tr>
<tr>
<td>10. Review and change of policies and procedures/ safe systems of work (2)</td>
<td>251, 259</td>
<td>30-67</td>
<td>48.5</td>
</tr>
<tr>
<td>17. Introduction of lifting team programme (5)</td>
<td>6, 70, 87, 198, 199</td>
<td>35-72</td>
<td>54.8</td>
</tr>
<tr>
<td></td>
<td>41</td>
<td>11-86</td>
<td>52.8</td>
</tr>
</tbody>
</table>

The breakdown of the single strategy interventions show only four types used. The most frequent was education and training, which also had the highest average academic score (QR=55.8). This academic score strengthens the evidence that training interventions in isolation are of little benefit (Hignett et al., 2003, Amick et al., 2006, Haslam et al., 2007) as the quality of the studies is comparable with other intervention types. Similarly high academic scores were found in five studies that introduced lifting teams. The provision of lifting teams has been recognised as successful, but culturally the practice remains confined to small sections of the PH population. In the EU, Spain and France have some evidence of lift teams, but the practice is rare in other countries. The extent to which PHAs adopt research evidence is questionable from this evidence, as training shows little benefit from good quality studies, and lift teams shows good benefits in costs and MSD from high quality studies.

In addition the equipment provision and organisational strategies had reduced academic quality scores, but are also seen as essential parts of the risk management process by the PHA.
2b.3.2 Multiple intervention studies

60 studies had more complex intervention strategies. These studies were analysed to create groups of 2, 3 and 4+ intervention strategies to investigate any patterns in the design of interventions.

**Table 2b.6 Multi-faceted design of interventions in PH studies**

<table>
<thead>
<tr>
<th>No</th>
<th>2 Interventions</th>
<th>QR</th>
<th>No</th>
<th>3 Interventions</th>
<th>QR</th>
<th>No</th>
<th>4+ Interventions</th>
<th>QR</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>5, 22</td>
<td>37</td>
<td>19</td>
<td>5, 8, 10</td>
<td>44</td>
<td>1</td>
<td>5, 10, 13, 15, 20</td>
<td>37</td>
</tr>
<tr>
<td>13</td>
<td>2, 5</td>
<td>33</td>
<td>83</td>
<td>2, 5, 10</td>
<td>20</td>
<td>20</td>
<td>1, 2, 5, 10, 13</td>
<td>31</td>
</tr>
<tr>
<td>40</td>
<td>5, 18</td>
<td>31</td>
<td>86</td>
<td>1, 2, 5</td>
<td>63</td>
<td>30</td>
<td>1, 2, 6, 11, 13, 16</td>
<td>50</td>
</tr>
<tr>
<td>42</td>
<td>2, 5</td>
<td>81</td>
<td>151</td>
<td>1, 5, 10</td>
<td>50</td>
<td>52</td>
<td>1, 5, 12, 13, 14</td>
<td>52</td>
</tr>
<tr>
<td>50</td>
<td>2, 5</td>
<td>50</td>
<td>172</td>
<td>2, 6, 7</td>
<td>65</td>
<td>81</td>
<td>2, 5, 18, 19</td>
<td>76</td>
</tr>
<tr>
<td>54</td>
<td>2, 5</td>
<td>100</td>
<td>176</td>
<td>2, 6, 7</td>
<td>27</td>
<td>82</td>
<td>1, 3, 4, 6, 7, 9, 10</td>
<td>58</td>
</tr>
<tr>
<td>62</td>
<td>5, 10</td>
<td>29.5</td>
<td>180</td>
<td>5, 18, 19</td>
<td>58</td>
<td>90</td>
<td>2, 5, 10, 13, 22</td>
<td>35</td>
</tr>
<tr>
<td>69</td>
<td>5, 18</td>
<td>68</td>
<td>254</td>
<td>2, 5, 10</td>
<td>67</td>
<td>94</td>
<td>3, 6, 10, 13</td>
<td>50</td>
</tr>
<tr>
<td>78</td>
<td>2, 5</td>
<td>54</td>
<td>263</td>
<td>2, 5, 10</td>
<td>91</td>
<td>123</td>
<td>1, 3, 5, 6, 7, 9, 10</td>
<td>81</td>
</tr>
<tr>
<td>79</td>
<td>2, 13</td>
<td>44</td>
<td>265</td>
<td>2, 5, 10</td>
<td>59</td>
<td>140</td>
<td>1, 2, 3, 7, 9, 10, 11</td>
<td>58</td>
</tr>
<tr>
<td>163</td>
<td>5, 8</td>
<td>56</td>
<td>280</td>
<td>2, 5, 13</td>
<td>41</td>
<td>149</td>
<td>1, 2, 4, 5</td>
<td>65</td>
</tr>
<tr>
<td>207</td>
<td>5, 8</td>
<td>39</td>
<td>284</td>
<td>5, 15, 23</td>
<td>22</td>
<td>153</td>
<td>1, 2, 5, 8</td>
<td>63</td>
</tr>
<tr>
<td>213</td>
<td>1, 2</td>
<td>63</td>
<td>324</td>
<td>2, 5, 17</td>
<td>37</td>
<td>179</td>
<td>1, 2, 3, 5</td>
<td>28</td>
</tr>
<tr>
<td>226</td>
<td>2, 3</td>
<td>56</td>
<td>(13)</td>
<td></td>
<td>187</td>
<td>1, 5, 8, 10, 13</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>241</td>
<td>10, 25</td>
<td>74</td>
<td></td>
<td></td>
<td>188</td>
<td>1, 2, 5, 7</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>245</td>
<td>10, 12</td>
<td>42</td>
<td></td>
<td></td>
<td>208</td>
<td></td>
<td>Hosp, 2, 5, 9, 12, 18, 20, 21 NH, 1, 3, 5, 13</td>
<td>44</td>
</tr>
<tr>
<td>259</td>
<td>2, 7</td>
<td>52</td>
<td></td>
<td></td>
<td>210</td>
<td>1, 2, 10, 13, 23</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>308</td>
<td>5, 8</td>
<td>26</td>
<td></td>
<td></td>
<td>211</td>
<td>2, 7, 10, 23</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>311</td>
<td>5, 18</td>
<td>89</td>
<td></td>
<td></td>
<td>225</td>
<td>1, 2, 7, 17</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(19)</td>
<td></td>
<td></td>
<td></td>
<td>232</td>
<td>1, 5, 10, 12, 15, 24</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>246</td>
<td>1, 2, 5, 10, 23</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>248</td>
<td>2, 5, 10, 12, 24</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>256</td>
<td>1, 2, 5, 9, 10, 13, 15, 23, 24</td>
<td>73</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>268</td>
<td>1, 4, 5, 12, 24</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>293</td>
<td>2, 5, 7, 8, 23</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>296</td>
<td>2, 4, 5, 10, 12</td>
<td>59</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>299</td>
<td>1, 2, 5, 8, 10, 15</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>303</td>
<td>2, 10, 23, 24, 25</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(28)</td>
<td></td>
</tr>
</tbody>
</table>
The 2 and 3 intervention groups were dominated by interventions 2, 5, 8. The combinations 2, 5 (5) and 5, 8 (3) were most common in the 2 intervention group, and only studies [241] and [245] contained none of those types. In the 3 intervention group, types 2, 5, or 8 appeared in every study included. The combination of 2, 5 appeared in seven studies. The most frequent combination was 2, 5, 10 which appeared four times, and was represented by a series of similar studies from British Columbia [254, 263, 265]. Interestingly the academic quality of the group of papers varied from 67-91, depending upon the theme of the study.

There was a varied list of combinations seen in the more complex intervention strategies (4+). But as in the simpler studies, certain intervention styles appeared more frequently than others. The role of risk assessment (1) in organisations was seen in 19/28 studies, The equipment interventions that included either equipment provision or development/evaluation occurred in 20 and six studies respectively giving 23 studies in all. Education and training interventions (5) were represented in 21 of the included studies and organisational changes (10) such as policy, procedures or management structures were recorded in 15 studies. In the same way as 2, 5 and 8 commanded the small selection studies, all studies in this complex section contained at least one of the group 1, 2 or 3, 5 or 10.

**Table 2b.7 Academic quality for the multifaceted studies**

<table>
<thead>
<tr>
<th>Number</th>
<th>Range</th>
<th>Average QR Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Interventions</td>
<td>26-100</td>
<td>53.9</td>
</tr>
<tr>
<td>3 Interventions</td>
<td>20-91</td>
<td>49.5</td>
</tr>
<tr>
<td>4+ Interventions</td>
<td>22-81</td>
<td>50.9</td>
</tr>
</tbody>
</table>

The academic score for each of the sub-groups showed little difference across any numbers (Table 2b.7).
Table 2b.8 Higher quality MSD and cost intervention studies

<table>
<thead>
<tr>
<th>Criteria</th>
<th>MSD measures for staff</th>
<th>Staff absence as organisational measure</th>
<th>Financial measures from staff absence/claims</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome Included</td>
<td>52</td>
<td>35</td>
<td>18</td>
</tr>
<tr>
<td>QR of 50% and over</td>
<td>30</td>
<td>19</td>
<td>6</td>
</tr>
<tr>
<td>Statistical significance reported</td>
<td>12</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

The key outcomes from PH interventions studies have been those relating to musculoskeletal disorders and the resulting losses of staff time and costs. Table 2b.8 shows the studies that were included for records of staff MSDs, organisational measures for sickness absence, and the financial costs to the organisation. The intervention sub-group included in this part of the study comprised 101 studies and recorded 234 outcomes. 105 (45%) of those outcomes were related to these three types. The quality of many of the studies included is weak, so studies with a QR of 50% or over were filtered. In addition the method for showing a successful intervention in all academic studies is to report statistical significance. Those reporting significance were also filtered. No quality judgements were placed over the reporting of statistical analysis as in Martimo et al. (2008). Some studies reported no significance but many studies reported no statistical analysis.

This filter identified 19 outcomes from the 101 studies. Four studies appeared more than once in the filtered list [163, 213, 251, 293], Collins et al. (2004) [293] recorded three high level outcome measures in a powerful study that investigated implementation of PH practices in nursing homes in the US. Twelve measures were linked to the physical measures of sickness absence. Most measured injury rates but occasionally pain, discomfort or function were
measured. Organisational measures investigated sickness absence primarily, but the financial evaluations showed differences in the level of analysis. Some simply recorded the financial value of days lost, where other studies entered the process of cost benefit analysis. The larger numbers of studies recording changes in MSD signs, symptoms and recorded injuries are not reproduced in the data for sickness absence and financial gain. This interaction between MSD and losses to the organisation is best explained with the two following studies:

- Passfield et al. (2003) [251] showed statistical reductions for MSD reporting and the costs of absence for an organisational intervention
- Yassi et al., (2001) [254] recorded statistical reduction in pain and discomfort, but failed to show significant reductions in costs following a mixed intervention using equipment, training and organisational changes.

This relationship between subjective and workplace based instant reporting of pain, discomfort and injury has frequently shown more differences than the long term and more medically serious injuries that require absence from work. Further analysis on this small group of studies may be of interest to PHA.

In summary, the analysis of the intervention types included in this sub-group showed that a wide variety of intervention types were recorded. The academic level varied across the different types of interventions and outcomes. There was only a small number of high quality studies that could be further analysed to identify specific success in reducing the musculoskeletal effects of PH injuries. 14 out of the 19 included higher quality studies were published from 2001 onwards, which indicates that the levels of intervention studies are improving, and a growing body of evidence may be indicated.

### 2b.4 Outcomes and outcome measures

The 328 studies were analysed for the outcomes and outcome measures that were used to compare the different conditions reported. The included studies
created 598 outcomes and outcome measures, and 39 studies recorded no specific outcomes or measures. Studies that had no outcomes recorded were primarily professional opinion papers, case studies that reported a single intervention without measures, or papers that investigated a PH scenario and made clear recommendations for the future.

Table 2b.9 Outcomes Per Study

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>39</td>
</tr>
<tr>
<td>1</td>
<td>128</td>
</tr>
<tr>
<td>2</td>
<td>76</td>
</tr>
<tr>
<td>3</td>
<td>45</td>
</tr>
<tr>
<td>4</td>
<td>26</td>
</tr>
<tr>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>No studies</td>
<td>328</td>
</tr>
</tbody>
</table>

Table 2b.9 shows the tendency for many of the studies to have only a small range of outcomes in each study. 38.7% (127) of the studies recorded only a single outcome measure in this sample, while 74.2% of the studies had either 0, 1 or 2 outcomes, which shows only 24% of the sample could have delivered a wide range of data sources to create a robust argument for the intervention using the triangulation of data approach.

Where some papers gave a single perspective some chose to give width in the measures used. Engel’s paper (1998) [65] was one that specifically identified a range of outcome measures to enable triangulation of the data. Staff postures were evaluated using OWAS scores, a level of compliance with taught methods was evaluated with a checklist and the subjective opinions of the staff were recorded using a form of Borg’s RPE scale (Borg, 1998). Triangulation of data is an important consideration when investigating the level of detail and the strength of various studies. In addition there were a number of papers that used data from at least three different sources to give validity to the outcomes.
and their future recommendations (e.g. [31, 55, 73, 86, 241, 254, 260, 293] etc.).

The use of multiple outcomes has a bearing on how influential the data from the study could be. During this analysis a scoring system to allow comparison between studies has been under consideration. The QR score values the academic quality of the paper and as a direct comparison is used to compare the value of each study. An addition logic will create stronger contributions for studies with high numbers of outcomes measured e.g. Nelson et al. (2006) [210], with seven outcomes and a number of data sources with a QR of 70%, against Engkvist et al. (2001) [54] who conducted a detailed analysis on a single outcome and gained a QR of 100%. Using the Hignett Convincing Scale (Hignett et al., 2003) in addition to the QR score could add to the quantification of the importance of each study.

2b.4.1 Recorded outcomes
The outcomes for each study were recorded and are summarised in Table 2b.10. The outcomes are presented grouped by their intended beneficiary. The groupings show that staff outcomes are the focus of more studies than other groups. In particular, physical workload, perceptions of work and number of staff injuries were the highest recorded.

The range of outcomes intended by the included studies is wide. All the beneficiaries described in the previous section were represented, but equipment studies and relative perception were infrequent. The largest section reported was the intended changes for staff. Measures for the physical workload, the perception of the staff and records of injuries made up the largest contribution. Other outcomes in this section related to the competence measures of the staff, twenty five competence outcomes were recorded that measured performance of PH tasks and activities, three studies measured competence from an organisational perspective and were representations of safety culture. Measures of the staff knowledge and skill were assessments of information retention and learning but not practical assessment of movement skills, and could be added to the competence scores.
Table 2b.10 Recorded outcomes in all included studies

<table>
<thead>
<tr>
<th>Beneficiary</th>
<th>Outcome</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff (429)</td>
<td>Staff competence</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Staff competence (Org)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Staff injuries</td>
<td>81</td>
</tr>
<tr>
<td></td>
<td>Staff knowledge skill</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Staff perception</td>
<td>127</td>
</tr>
<tr>
<td></td>
<td>Staff use of equipment</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Physical workload</td>
<td>153</td>
</tr>
<tr>
<td></td>
<td>Psychological well-being</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Modified Work</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Number of staff</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Carer perception</td>
<td>2</td>
</tr>
<tr>
<td>Patient (44)</td>
<td>Patient perception</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>Patient result</td>
<td>6</td>
</tr>
<tr>
<td>Organisation (83)</td>
<td>Financial</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Incident/Accident</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Quality of care</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Risk assessment</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Staff absence</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Training numbers</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Audit performance</td>
<td>1</td>
</tr>
<tr>
<td>Task (32)</td>
<td>PH techniques</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Time for task</td>
<td>22</td>
</tr>
<tr>
<td>Equipment</td>
<td>Equipment</td>
<td>8</td>
</tr>
<tr>
<td>Relative</td>
<td>Relative perception</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>598</td>
</tr>
</tbody>
</table>

Perception outcomes appear strongly in both staff and patient sections. PH tasks involve the actions, attitudes and the physical effects on the individuals concerned. In many situations where technology would interfere with the completion of the patient transfers, a subjective assessment is the viable option for data collection. The perception of the use of equipment was recorded under several outcomes because of the different intentions. Some studies that were designed to formally evaluate equipment were categorised under equipment as their target was clear. Other studies that were designed more for reduction of MSD interventions also recorded as part of the study the participants responses to using the equipment, and in some situations the use of equipment in-terms of numbers was also recorded as an effect of the changed work routines.
Patient outcomes were recorded in 43 studies but only six studies recorded anything other than perception of the handling tasks or equipment. These six studies all measured a different characteristic: patient position post transfer [34], development of functional skills [51], infection control [118], resident agitation [188], obstetric [108] and clinical outcomes [258] were all recorded once. Clinical or functional outcomes are powerful in a health care forum, but the lack of these studies shows the low position of patient handling skills and structures in the clinical environment. Many PHA anecdotally suggest that high levels of skill and control in PH activities create a positive health environment and reduce length of stay and improve function, patient satisfaction, improve independence and patient control. But there is little published evidence to support these suggestions.

The task outcomes were less frequent (32), and 22 studies measured the time taken to complete tasks. Further analysis showed that most of these studies that used equipment interventions reported increased time for safe practice. The other outcome recorded with task as a benefit related to changes or improvements in PH technique. Most of the day-to-day interventions of PHA are aimed at developing the most suitable PH techniques, and some of the papers included described that process. There is a clear link between these PH technique papers and the staff competence, staff knowledge and skill outcomes. It may be proven in future years that these PH technique studies disappear as the consensus creates a battery of acceptable PH techniques, and the controversial and hazardous methods are removed from practice. The outcomes will then need to focus on competence and compliance.

Organisational outcomes concentrated on the sickness absence and financial losses from the same. Other organisational outcomes recorded changes or improvements to the management systems. The benefits of risk assessment, training and audit were all recorded in some studies. ‘Quality of care’ drives many healthcare management systems, but could only be identified in a single study [242], again pointing to the lack of perspective from the PHA, and the context of PH in the delivery of care tasks.
The intended outcomes recorded for the studies included show a focus on staff and organisational measures. The next section records the detail of the outcome measures used against all of the recorded outcomes. Table 2b.11 identifies all the individual papers, using each outcome measure for each category.

2b.4.2 Recorded outcome measures

Table 2b.11 records all 328 studies against their outcome and outcome measures. The recorded content of patient handling studies is widely variable. Studies covered many different formats and deliver improvements for different beneficiaries, and used a wide range of outcome measures to prove the differences between conditions. The complexity of the outcome measures showed variation, depending on the area of study and the level of investigation. It was decided that in order to analyse the outcomes, fine detail studies that recorded multiple scores for identical qualities would be scored singly. An example of this was regularly seen in the complex biomechanical studies. A group of subjects would be measured for three dimensional models, with many different physical quantities being included in the analysis (e.g. Schibye and Skotte, 2000; Marras et al, 1999; and Garg et al, 1992). This was recorded as one outcome as the benefit to the staff was recognised as that of reduced biomechanical risk. In a similar way a study that asked a complex battery of questions to ascertain the subjective appraisal of a task also scored a single outcome. Examples of these would be: the use of interviews for staff feedback (Griffiths and McArthur, 1999), questionnaires for staff perceptions (Scott, 1995 and Gingher et al., 1996), observational checklists for environments (Bertolazzi and Saia, 1999), managers knowledge and attitudes (McGuire et al., 1997). In order to avoid inconsistency subjective appraisals that were difficult to separate were also scored as a single outcome measure. An example of this was the views of a patient on security and comfort (Conneely, 1992), where clarity in the question sets did allow for patient comfort and patient security to be scored separately in many studies (Zhuang et al., 2000, and Garg and Owen, 1994).

The improvement of working conditions for the staff comprised the largest number of records (430). Three outcome groups recorded large numbers of
measures, staff injuries, staff perception and physical workload. The recording of staff injuries was a common outcome measure, 52 studies recorded the number of injuries resulting in MSD problems. A further 22 studies recorded pain or discomfort in the workforce. The most common data collection tool reported was the Nordic pain questionnaire (Kuorinka et al., 1987) (e.g. [308]), but many studies used simple workplace reporting systems as evidence. The relevance of the two measures is key, as there is a noteable difference between official reporting systems and the compilation of sickness absence due to work related injuries and the reporting of pain and discomfort in operators still at work. Very few studies used other specific occupational health measures e.g. Workability Index [140] (Toumi et al., 1998) or SF36 (Ware et al., 1993) [226]. There was a noted lack of occupational health interventions and measures across the sample as a whole. MS injuries are reported in many studies but no studies has separated PH injuries or effects as a specific group for investigation.

Given the large number of perception studies, the range of methods for data collection were not so diverse and the use of qualitative methodologies was seldom seen. In most of the studies there was a tendency to quantify the recording of emotion, feeling, etc., with rating scales or ranking assessments, and Likert scales were predominant. 39 studies measured perceived exertion. Significant numbers of these used the RPE (Borg, 1998) and its well used derivitives. A further 31 studies recorded the staff perception of the risks of patient handling tasks and the risks of nursing care in general. Questionnaire studies comprised the largest number of data collection methods in this section. More detailed qualitative studies investigated attitudes [20,43,149,155] or used formal or informal interviews. One study also used verbal protocol analysis [230] to investigate decision making.

The recording of physical workload measures incorporated many outcome measures that have been developed for wider applications than just PH studies. The four most commonly recorded outcome measures in this section were posture analysis (28), forces applied (25), measures of muscle activity with electromyography (EMG) (18) and biomechanical measures (51).
• Postural analysis studies recorded OWAS (Karhu et al., 1977) [234] and REBA [230, 236, 289] (Hignett and MacAtamney, 2000) as preferred choices, but a small number of studies recorded higher level of detail using electronic goniometry or reported actual joint positions and ranges of movement. The contrast in these studies is the inclusion of risk level in the developed tools against implied risk of the studies reporting actual measures.

• Force has long been recognised as a risk identifier in load movement studies and was recorded in 25 studies. The measurement of force indicated a laboratory type study, as the inclusion of the measurement device is contraindicated in usual care activities. Any workplace based studies were required to report RPE (above) as a subjective appraisal. It was surprising that more studies had not measured load over time, which was only recorded for three studies [18, 39, 42]. One high quality study [42] recorded both peak force and cumulative force over time.

• EMG was recorded in 18 studies as a measure of muscle activity, and all required attachments to the participants and laboratory studies were recorded. Most of these studies used EMG as a comparison against other physical measures posture, force, etc., and many reported that EMG is not significantly affected over long shift patterns, due to the short duration of PH tasks.

• Biomechanical measures (51) were also well represented, and required either video analysis or highly technical data collection systems (e.g. Lumbar Motion Monitor [47, 128, 129, 231, 253], etc.). Many studies reported biomechanical load on the individual (e.g. [25, 33, 42, 53, 237, 252, 257, 264, 266, 310] etc) either as applied force or as low back load. An interesting addition to this section is that the inclusion of recommendations for safe limits allows for the definition of safe against unsafe, which is rarely seen in other forms of study (E.g. NIOSH Recommended Weight Limit (RWL) values [31, 43]).
### Table 2.11 Outcome measures recorded in literature analysis

<table>
<thead>
<tr>
<th>Beneficiary</th>
<th>Outcome</th>
<th>Outcome Measure</th>
<th>Included Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Staff (430)</strong></td>
<td>Staff competence</td>
<td>Observed checklist for performance</td>
<td>19, 32, 40, 55, 56, 63, 214, 219, 227, 247, 304, 307</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Compliance with taught methods</td>
<td>42, 162, 165, 180, 207, 211, 218, 255, 293, 324</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hazardous lifts observed/Errors</td>
<td>100, 328</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Self reported compliance</td>
<td>210, 222</td>
</tr>
<tr>
<td></td>
<td>Safety culture</td>
<td>Safety culture measure</td>
<td>230</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Compliance with policy mirror</td>
<td>241</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Organisational support</td>
<td>325</td>
</tr>
<tr>
<td></td>
<td><strong>Staff injuries</strong></td>
<td>Staff injury numbers</td>
<td>6, 11, 17, 21, 43, 52, 55, 65, 68, 70, 71, 73, 78, 79, 81, 86, 98, 103, 116, 149, 163, 174, 179, 190, 198, 199, 208, 210, 211, 212, 213, 217, 223, 224, 225, 228, 229, 239, 246, 248, 251, 254, 256, 260, 263, 268, 276, 280, 289, 308, 311, 324</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pain reporting inc LBP</td>
<td>9, 66, 69, 103, 132, 144, 148, 165, 174, 175, 180, 196, 201, 226, 241, 245, 254, 256, 293, 294, 301, 311</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Self reported injuries</td>
<td>48, 191</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Health surveillance</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MSD risk factors</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Compliance with WRBME</td>
<td>134</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Workability Index</td>
<td>140</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low back disorder model</td>
<td>152</td>
</tr>
<tr>
<td></td>
<td><strong>Staff knowledge skill</strong></td>
<td>Staff knowledge</td>
<td>4, 20, 68, 96, 116, 222, 230, 277, 309</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Self reported knowledge skill</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perception of learning</td>
<td>304</td>
</tr>
<tr>
<td></td>
<td>Effect on staff / workload</td>
<td>Effect on staff / workload</td>
<td>2, 141, 142, 165, 174, 254, 269, 278, 293, 295, 327</td>
</tr>
<tr>
<td></td>
<td>Rating of perceived exertion (RPE)</td>
<td>Rating of perceived exertion (RPE)</td>
<td>5, 19, 39, 49, 57, 72, 73, 86, 88, 93, 105, 107, 109, 113, 114, 132, 172, 181, 183, 184, 185, 214, 229, 233, 236, 237, 244, 252, 257, 274, 275, 280(2), 288, 291, 298, 300, 323</td>
</tr>
<tr>
<td></td>
<td>Comfort and or safety</td>
<td>Comfort and or safety</td>
<td>5, 74, 138, 161, 240, 250, 255, 256, 265, 271, 292</td>
</tr>
<tr>
<td></td>
<td>Use of hoists/equipment</td>
<td>Use of hoists/equipment</td>
<td>10(2), 122, 157, 158, 159(2), 168, 209, 271</td>
</tr>
<tr>
<td></td>
<td>Informal/Formal interview</td>
<td>Informal/Formal interview</td>
<td>12, 32, 37, 56</td>
</tr>
<tr>
<td></td>
<td>Staff/managers attitude survey</td>
<td>Staff/managers attitude survey</td>
<td>20, 43, 149, 155</td>
</tr>
<tr>
<td>Interviews to create hierarchical tree</td>
<td>Rating of preference of methods</td>
<td>Ranking of tasks</td>
<td>Staff assessment of programme</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>--------------------------------</td>
<td>-----------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>29</td>
<td>46, 73, 74, 93, 143, 144, 236</td>
<td>144, 237</td>
<td>81, 207, 210(2), 217, 224, 246, 277</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Staff use of equipment</th>
<th>Staff evaluation of use of equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>7, 17, 36, 38, 45, 46, 86, 168, 209, 233, 236, 256, 295, 304</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physical workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative load per worker</td>
</tr>
<tr>
<td>Heart rate</td>
</tr>
<tr>
<td>Intra-abdominal pressure</td>
</tr>
<tr>
<td>Back fatigue</td>
</tr>
<tr>
<td>Risk exposure measure/risk factors</td>
</tr>
<tr>
<td>MAPO evaluation</td>
</tr>
<tr>
<td>Number of tasks</td>
</tr>
<tr>
<td>Serum concentrations</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Psychological well-being</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff job satisfaction</td>
</tr>
<tr>
<td>Psycho-social stressors</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Modified Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modified work</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of staff required</td>
</tr>
<tr>
<td>Staff patient ratios</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Carer perception</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carer perception</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Patient (43)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff perception of patient effect</td>
</tr>
<tr>
<td>Patient comfort</td>
</tr>
<tr>
<td>Questionnaire for patient control</td>
</tr>
<tr>
<td>Patient security</td>
</tr>
<tr>
<td>Occupier appraisal</td>
</tr>
<tr>
<td>Patient attitude to equipment</td>
</tr>
<tr>
<td>Organisation (83)</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Patient result</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Organisation (83)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Incident/Accident</td>
</tr>
<tr>
<td>Quality of care</td>
</tr>
<tr>
<td>Risk assessment</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Staff absence</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Training numbers</td>
</tr>
<tr>
<td>Audit performance</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Audit performance</td>
</tr>
<tr>
<td>Task (31)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Time for task</td>
</tr>
<tr>
<td>Equipment</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>Criteria scores for equipment</td>
</tr>
<tr>
<td>Accessibility of equipment</td>
</tr>
<tr>
<td>Equipment provided</td>
</tr>
</tbody>
</table>
Organisational outcome measures were concentrated on lost time injuries, or measures of lost time (32) for an organisation and the resulting financial evaluation. Sickness absence was usually reported by simple number scores, but some studies particularly US based, used standardised measures per numbers of the workforce. The recording of financial effects was seen to include three types of data:

- Some studies recorded simple data showing the costs of injuries for a given set of circumstances (15)
- Where possible some studies also reported compensation costs (5) and represented government system information, usually from the US, Canada and Australia.
- Eight studies completed a form of cost benefit analysis to compare costs against losses from the interventions

From the patient, task, equipment and relative outcome groups, a further three groups recorded significant numbers of entries, patient comfort (18) and patient security (11) accounted for most of the patient data input into the analysis, and the time taken to complete the task was reported in 22 studies though many reported increased time when using equipment.

If the inclusion of high numbers of studies using particular outcomes indicates the level of importance of the outcome measures to the PHA population, then any complex measurement tool designed to measure the success of PH interventions could include the topics in Table 2b.12.

Table 2b.12 Most frequent outcome measures

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Outcome Measure</th>
<th>Outcome</th>
<th>Outcome Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff injuries</td>
<td>Staff injury numbers</td>
<td>Task</td>
<td>Speed of task</td>
</tr>
<tr>
<td></td>
<td>Pain reporting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff perception</td>
<td>Perception of risks</td>
<td>Patient</td>
<td>Patient comfort</td>
</tr>
<tr>
<td></td>
<td>Rating of perceived</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>exertion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical workload</td>
<td>Posture analysis</td>
<td>Organisation</td>
<td>Lost time figures/Sickness absence</td>
</tr>
<tr>
<td></td>
<td>Forces applied</td>
<td></td>
<td>Financial values</td>
</tr>
<tr>
<td></td>
<td>Muscle activity (EMG)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Biomechanical models</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
These most recorded 12 outcome measures create a very physical review of PH tasks in healthcare workplaces, and perhaps give an indication of a historical review of the research process surrounding this area. It may be necessary to consider if these outcomes and outcome measures are still the priority of the PHA population in the present.

2b.5 Measures of success

The literature analysis above (2b.3 and 2b.4) has shown the range of outcomes that have been the intentions of the different included studies. In a developing area of clinical practice an important criterion is to identify the level of success, or the level of acceptable performance, in the chosen field. The academic nature of the publications sought in this analysis indicates that the chosen level of success is the recording of statistical difference between the conditions. The power of statistical significance between conditions is most effective when recorded in the workplace applied intervention studies (Appendix 2).

The analysis of intervention trials included 101 studies. The level of statistical analysis was recorded for each study. Success for the intervention was described as achieving statistical significance. No higher analysis was made to examine the sample size, test validity, etc. Table 2b.13 states the number of studies that had different levels of statistical analysis. Approximately one third of the outcome measures (89/235) included in this filtered sample showed positive significance in the data, while 25 showed no significance from the testing, and 51% (121/235) reported no statistical testing in the study.
Table 2b.13 Statistical testing in the intervention studies

<table>
<thead>
<tr>
<th>Description</th>
<th>Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome measures show:</td>
<td></td>
</tr>
<tr>
<td>Statistical significance</td>
<td>89</td>
</tr>
<tr>
<td>No significance</td>
<td>25</td>
</tr>
<tr>
<td>Not statistically tested</td>
<td>121</td>
</tr>
<tr>
<td></td>
<td>235</td>
</tr>
</tbody>
</table>

Included studies

<table>
<thead>
<tr>
<th>No.</th>
<th>Outcome Measure</th>
<th>QR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Staff Outcomes for MSD</td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>Back pain</td>
<td>70</td>
</tr>
<tr>
<td>69</td>
<td>Back pain</td>
<td>68</td>
</tr>
<tr>
<td>163</td>
<td>Injuries</td>
<td>56</td>
</tr>
<tr>
<td>165</td>
<td>Back pain</td>
<td>41</td>
</tr>
<tr>
<td>210</td>
<td>Injury rate</td>
<td>70</td>
</tr>
<tr>
<td>211</td>
<td>Low back pain</td>
<td>70</td>
</tr>
<tr>
<td>213</td>
<td>MSD rate</td>
<td>63</td>
</tr>
<tr>
<td>251</td>
<td>Injury rate</td>
<td>67</td>
</tr>
<tr>
<td>254</td>
<td>Pain/discomfort</td>
<td>67</td>
</tr>
<tr>
<td>256</td>
<td>Injury rate</td>
<td>73</td>
</tr>
<tr>
<td>263</td>
<td>MS injury rate</td>
<td>91</td>
</tr>
<tr>
<td>265</td>
<td>Comfort</td>
<td>59</td>
</tr>
<tr>
<td>311</td>
<td>Severity of back pain</td>
<td>89</td>
</tr>
<tr>
<td></td>
<td>Organisational Outcomes for MSD</td>
<td></td>
</tr>
<tr>
<td>82</td>
<td>Lost time injuries</td>
<td>58</td>
</tr>
<tr>
<td>82</td>
<td>Compensation costs</td>
<td>58</td>
</tr>
<tr>
<td>212</td>
<td>Lost time</td>
<td>26</td>
</tr>
<tr>
<td>213</td>
<td>Days Lost</td>
<td>63</td>
</tr>
<tr>
<td>251</td>
<td>Costs</td>
<td>67</td>
</tr>
<tr>
<td>256</td>
<td>Time lost</td>
<td>73</td>
</tr>
<tr>
<td>263</td>
<td>Costs</td>
<td>91</td>
</tr>
<tr>
<td>265</td>
<td>Injury costs</td>
<td>59</td>
</tr>
<tr>
<td>296</td>
<td>Workers compensation costs</td>
<td>59</td>
</tr>
<tr>
<td>296</td>
<td>Lost work days</td>
<td>59</td>
</tr>
</tbody>
</table>

The most frequently used measure for success is the reduction of MSD in the sample population. Table 2b.13 reports the studies that included statistical significance for staff related MSD data, and organisational related MSD sickness absence data, and the costs of such but does not include studies that completed a cost benefit analysis. Thirteen studies showed significant differences in the measures of staff related MSD rate or MSD related evidence, while [265] reported comfort, [254] reported pain/discomfort and [165,163 and 66] all reported back pain records. The academic scores of this group were high. Only one of the sample showed less than 50 % as a QR score, and the average was 68% (range 41%-91%).
The organisational effects of MSD were reported as sickness absence data, costs of absence, or compensation costs where government data allowed. Again in this small sample the academic score was a high average 61.3% (range 26%-91%) with only one scoring below 50%[212]. This analysis shows that there are some PH intervention studies that show statistically significant positive outcomes against a number of key outcome measures (16). The QR scores of those included studies showed a good level of academic quality for those that recorded staff MSD and the organisational effects of MSD. However, even with this very targeted set of papers there is little in common between the studies in terms of intervention, outcome or outcome measures.

In comparison to the information found in this analysis, and in addition to epidemiological evidence, there has been a growing body of evidence relating to the development of PH intervention strategies for the reduction of the risks of exposure to patient handling tasks. Recently, several reviews of interventions have been published identifying similar but not identical findings from the literature. The range of review papers in general shows a poor success rate for a range of manual handling interventions across a number of areas of application. The findings and methods for these reviews have been compared below and presented in date order. Table 2b.14 shows the methodological processes for each review. PH training has been a focus for many organisations as a PH intervention strategy, even though the potential success has long been questioned. All the studies accepted training interventions, but Bos et al. (2006), Dawson et al. (2007), and Martimo et al. (2008) specifically included those interventions and excluded some other interventions. Haslam et al. (2007) also conducted a large systematic review of manual handling training but included all occupational groups and training applications, so was not included in this analysis.

2b.5.1 Comparison of PH literature reviews
The five reviews of patient handling literature reviews included in Table 2b.14 have many similarities. The strength in academic studies has always been identified with the control of variables and creating a clear link between cause
and effect. This directs all academic reviews to be exclusive of many data sets that do not fall into high academic quality e.g. RCT, CCT. This links very specifically with the guidance produced by NIOSH, which shows how to create an intervention study, collect data and create sound scientific proof that the intervention had been effective (NIOSH, 2001). Hignett et al. (2003) showed many patient handling studies to be outside the RCT, or high academic structures, and that the quality of those studies can also be evaluated to aid comparison.

Secondly the perceived holy grail of occupational health and safety interventions is their effect upon rates of musculoskeletal injury, LBP and sickness absence or disability. None of the exclusive reviews (Bos et al., 2006; Dawson et al., 2007; Amick et al., 2006; Martimo et al., 2008) found any evidence of impact upon patient outcomes or clinical benefits. Fray and Hignett (2007a) in a study of patient handling interventions reported that many patient handling studies include other forms of feedback or outcome measures. The analysis of the included interventions in 2b.5 showed that of the 89 outcome measures that showed statistical significance 67 (75%) described measures that were not MSD related. It is a very limiting strategy to only focus on the single set of MSD outcome measures. The literature included in Hignett et al. (2003) and some of the studies identified in Bos et al. (2006), Dawson et al. (2007), Amick et al. (2006), and Martimo et al. (2008), also recorded other important outcome criteria relating to staff health, musculoskeletal risk factors, subjective or qualitative data (Wiitavaara et al., 2007), performance criteria, patient outcomes etc. To not include studies recording these outcomes appears to be weakening the argument for interventions of any kind.
<table>
<thead>
<tr>
<th>Paper</th>
<th>Inclusion Exclusion Criteria</th>
<th>Study types</th>
<th>Analysis</th>
<th>Studies included</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exclusion: Purely epidemiology. Not primary source. Legal case report</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exclusion: Only used exercise or equipment. Focussed on people not in work/absent. Focused on individual employees</td>
<td></td>
<td></td>
<td>Control group 8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No control group 2</td>
</tr>
<tr>
<td>Dawson et al 2007</td>
<td>Inclusion: Up to 2004 Target group nurses only including aides and students Aim to prevent LBP and back injury Explicitly described education /training LBP and/or back pain and/or back injury</td>
<td>RCT, N-RCT</td>
<td>Methodological quality (Cochrane Review Guidance, Van Tulder et al. 1997) (Table 1 p644) Internal validity and descriptive quality were recorded, papers scored high quality or low quality.</td>
<td>RCT 8</td>
</tr>
<tr>
<td></td>
<td>Exclusion: Laboratory tests of techniques or equipment Mixed care groups no separation of nurse sub group.</td>
<td></td>
<td></td>
<td>NCT 8</td>
</tr>
<tr>
<td></td>
<td>Exclusion: No control group</td>
<td></td>
<td></td>
<td>(16 full, 24 part)</td>
</tr>
<tr>
<td>Martimo et al 2008</td>
<td>Inclusion: Up to 2005 Occupations involving lifting. Aim to reduce MS symptoms Must include training and lifting equipment Outcomes LBP, sickness absence, subsequent disability</td>
<td>RCT, CCT</td>
<td>Cochrane scoring system for RCT (Van Tulder et al., 2003) For the cohort studies (Slin et al., 2003). No details of the scoring system included.</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Exclusion: Only using exercise or equipment Focussed on people not in work due to sick leave Focused on individual employees</td>
<td></td>
<td></td>
<td>(8 included PH)</td>
</tr>
</tbody>
</table>
It is important to discuss the explanation of cause and effect when examining these findings. The higher academic quality reviews are investigating MSD as an effect of the intervention, but many studies also measure the reduction in causal workplace risk factors. The academic argument states that there will always be confounding of the data, unless there is quantification of the reduction in the effect rather than exposure to cause. There is always the question of whether it is sufficient to accept a reduced exposure to known risk factors, or whether the end effect should always be reported. An interesting philosophical question for the reviewers of the literature is to evaluate why, after 20 years of striving to develop patient handling interventions and systems, is there not a much larger body of evidence of higher academic quality? There are good scientific reasons why the body of evidence has not developed to the extent of medical studies. These are:

- The development of high quality RCT type studies relies on the availability of a control group. Workplace studies especially in the complex working environment of the NHS in the UK would be difficult to isolate (Straker et al., 2004).
- It would be difficult to find health care workers that have not had some manual handling training or exposure to manual handling equipment, to use as a controlled cohort.
- It is difficult to avoid confounding of the result by the bias of other workplace factors, such as psycho-social issues and workplace pressures that are constantly changing in these complex environments.
- Healthcare in the UK is now subject to much higher controls in terms of ethics and research governance, again making access to studies more difficult.
- The final point of course is one of ethical research in health and safety matters. Here the issue is that if we consider that an intervention is of benefit then it is difficult to justify not giving the intervention to all, and evaluating the outcomes on a whole population.
The “Sirdal Model” (Figure 2b.3) (Kristensen et al., 2005) goes further in this evaluation to remind researchers that ‘workplaces are not arenas for intervention research; and that their objectives are to produce goods and services. This indicates that it is important that the workplace and all involved in it become beneficiaries of the intervention. This cannot always be said for patient handling interventions.

The summary table 2b.15 below shows the conclusions drawn from the five review papers included in this discussion. It is apparent from this series of reviews that there is no strong evidence to show that patient handling interventions have any effect on MSD and its measures. There is reported in many of the reviews the growing body of evidence that there might be proven benefits if there was a better supply of studies.

One question still remains in whether the other values that can be measured in patient handling interventions are more valid as proof that high quality patient handling interventions are a benefit to the delivery of health care.
<table>
<thead>
<tr>
<th>Paper</th>
<th>Findings and conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hignett et al 2003</td>
<td>Training interventions in isolation have little benefit. Multifactorial interventions are likely to show the most benefit over a range of outcome measures. There is positive evidence of moderate value to show that a range of equipment reduces exposure to patient handling risks.</td>
</tr>
<tr>
<td>Bos et al 2006</td>
<td>Branch specific occupational interventions for the reduction of musculoskeletal symptoms may be effective, especially when training and education are combined with other interventions.</td>
</tr>
<tr>
<td>Dawson et al 2007</td>
<td>No strong evidence to support any firm conclusions. Moderate evidence that training in isolation is not successful and multidimensional interventions are effective.</td>
</tr>
<tr>
<td>Amick et al 2006</td>
<td>A moderate level of evidence for the effect of OHS interventions on MSK in healthcare settings. This relates to most of the high and medium high quality studies showing positive effects. There were no negative effects from any intervention. There was moderate level of evidence for multi-component patient handling interventions and physical exercise interventions. Due to the low number of included studies, there was insufficient evidence to identify any individual intervention successes: Patient handling training, Back school, Cognitive behavioural interventions, Exercise and patient handling and stress management, Injury prevention programs, Participatory ergonomics, Equipment and training combinations, Health management programmes.</td>
</tr>
<tr>
<td>Martimo et al 2008</td>
<td>‘No evidence that training with or without lifting equipment is effective in the prevention of back pain or consequent disability. Either the advocated techniques did not reduce the risk of back injury or training did not lead to adequate change in lifting and handling technique’. The cause and effect relationship and the efficacy of RCT in real working environments is identified as a limitation in this area of research.</td>
</tr>
</tbody>
</table>

In comparing the content of the analysis in this study with the published literature reviews, there is some evidence that PH interventions have positive effects on MSD and the related costs, but also there is an important part to play in considering the other forms of outcome measures. In this format of
This analysis has identified one further weakness with the science of PH intervention studies as an applied science, and that is the lack of success measures outside the statistical analysis of difference between conditions. Some postural analysis tools and biomechanical models have developed safe levels of performance, but there seems to be a reluctance to report studies with a realistic measure of safety in the analysis. This is surprising as there have been a number of tools developed over the recent past that attempt to develop a risk exposure approach to patient handling, and indicate the level of success based on a number of different approaches.

A final consideration of this analysis is that when examining the collective knowledge regarding PH interventions and other types of PH studies the range of measures considered makes it extremely difficult to compare interventions. Five high quality academic reviews showed differing interpretations of the same body of literature when considering the single target of MSD reduction. This analysis shows that three quarters of the significant outcome measures are excluded by the focus on MSD. The question remains as to whether the reduction of MSD is the only valued outcome or improvement, or whether the practitioner in the role of PHA would prefer other measures, or whether a combination of measures may give a better evaluation of intervention strategies.

2b.6 Outcome measurement tools (OMT)

Given the range of outcomes and outcome measures recorded in the assessment of patient handling interventions, success criteria have rarely been reported. Recent studies have developed models that record the exposure to risk or performance measures for the management of PH risks. These tools are defined below as Patient Handling Outcome Measurement Tools. This section
outlines the different OMT reported, and both describes the use of, and compares the methods of the different formats.

- **Outcome Measurement Tool (OMT):** An outcome measurement tool uses the outcome measure or several outcome measures for internal assessment against a known and traceable set of criteria. The OMT should give rational level data in its final score system. OMTs should measure outcomes and not describe interventions. An OMT could describe the magnitude of an intervention when there is clearly stated evidence of the links between the intervention and the outcome improvement.

2b.6.1 Inclusion criteria

Only validated OMTs specifically designed to compare the outcomes of patient handling interventions against a known set of criteria will be further discussed. The question of cause and effect is raised about whether OMTs describe an intervention or an outcome of the intervention. This was seen in the equipment provision models reported below.

A review of OMs (Fray and Hignett 2007a) found that the four key beneficiaries for outcomes for patient handling interventions are:

- Organisational measures (2b.6.2)
- Staff outcomes (2b6.3)
- Task performance measures (2b6.4)
- Patient outcomes (2b6.5)

This breakdown was repeated in the extended analysis in section 2b.2. This review considered how OMTs analyse patient handling intervention outcomes, and how they measure success around the given criteria. Importantly this review compares the different OMT and examines if they could be used to develop a more definitive tool to evaluate the overall strength of an intervention, or to allow comparison between types of intervention strategies and outcomes (Fray and Hignett 2007b).
2b.6.2 Organisational Outcomes

The measurement of organisational commitment to the prevention of MSD from patient handling actions seems to be well defined in OMTs in two groups.

1) Organisational performance
PHOQS (Hignett and Crumpton, 2005) and MARCH (Smedley et al., 2005) both evaluated the organisational performance in terms of policy, accountability, risk assessment, supervision and communication. MARCH also included financial commitment in their criteria.

2) Equipment Provision
MAPO (Battevi et al, 2006), HIT (Smith et al., 2005), Quick Scan (Arjo ab a), Care Thermometer (Arjo ab b and Knibbe and Knibbe, 2005) all assess the need for equipment and information in the workplace. Some of the OMs used by the two groups are overlapping.

2b.6.2.1 Organisational performance
The first comparison looks at PHOQS and MARCH. From an initial analysis the level of questions appear superficially similar. The two lists of questions are displayed in Table 2b.16

<table>
<thead>
<tr>
<th>MARCH (Total Score 24)</th>
<th>PHOQS (Total Score 30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. Defined management responsibility for manual handling issues at board level (2)</td>
<td>i. Have you had an internal manual handling audit in the last 2 years (1)</td>
</tr>
<tr>
<td>ii. Written, trust wide policy for manual handling (2)</td>
<td>ii. Was your last internal audit: a service provision audit, an equipment or training audit, local monitoring or supervision (2)</td>
</tr>
<tr>
<td>iii. Score on H&amp;S section of risk management audit on Controls Assurance baseline assessment 2000 (2)</td>
<td>iii. Do you have a general manual handling risk assessment system? Is it: organisation wide, local level, task specific, No risk assessment system (2)</td>
</tr>
<tr>
<td>iv. Routine collection of data on sickness absence and ill-health retirement (2)</td>
<td>iv. Are completed risk assessments held: centrally, locally, both, none at all (2)</td>
</tr>
<tr>
<td>v. Data on manual handling incidents collected routinely and presented to study team on request. (2)</td>
<td>v. Are manual handling risk assessments reviewed at least annually (1)</td>
</tr>
<tr>
<td>vi. Salary allocation for manual handling specialists per 1000 staff</td>
<td></td>
</tr>
<tr>
<td>vii.</td>
<td>Time per 1000 staff of manual handling specialists allocated to advising about risks and controls (2)</td>
</tr>
<tr>
<td>viii.</td>
<td>Guidelines on referral to occupational health department for nurses with back problems (2)</td>
</tr>
<tr>
<td>ix.</td>
<td>Rapid access to physiotherapy for nurses with back problems (2)</td>
</tr>
<tr>
<td>x.</td>
<td>Level of manual handling training (2)</td>
</tr>
<tr>
<td>xi.</td>
<td>Records of attendance for manual handling training and a proportion of nurses with attendance last year (2)</td>
</tr>
<tr>
<td>xii.</td>
<td>Proportion of clinical wards with accessible lifting equipment. (2)</td>
</tr>
</tbody>
</table>

| vi. | Is the review system: formal, informal. (1) |
| vii. | Are patient mobility assessments held in: care plans, separate forms, both. (1) |
| viii. | Are patient mobility plans held: with the patient, elsewhere (2) |
| ix. | If elsewhere is there a reason (1) |
| x. | Do you have appointed manual handling supervisors: for all wards and departments, some wards and departments (2) |
| xi. | How is contact maintained with the manual handling supervisors and their competence ensured: formal training sessions, formal staff meetings, informal meetings initiated by the BCA, informal meetings initiated by the supervisor, ad-hoc meetings (5) |
| xii. | How do the manual handling supervisors maintain their contact with the staff and ensure their competence: training records, assessing the quality of the patient mobility assessments, entries in patient records and notes, ward meetings/handover, personal development plans, problem solving sessions, case conference/mdt meetings, Other format training, informal documentation, others (10) |

These two tools have different aims. The MARCH tool evaluates the organisational commitment to the processes of managing MSD in the organisation. It recognises the processes of managing illness in the workplace with measures of sickness absence, access to occupational health and rapid access physiotherapy. The initial investigation (Section 2a.7) and considered the MARCH tool as a financial investment model. When compared with PHOQS this is confirmed as the assessment uses organisational systems that require funding as outcome criteria. It is important to note that the MARCH tool evaluates the commitment to the intervention and not necessarily the outcome itself.

The PHOQS tool was developed as an audit tool for HSE inspectors and examines management in an organisation. The use of the Controls Assurance baseline (CNST, 2009) measure in the MARCH tool does lead the tool towards a measure of safety culture, but is not specifically a measure of patient handling.
safety culture, compared to the PHOQS tool. Work by Knibbe and Knibbe (2006b), Knibbe et al. (2007) and Nelson (ed) (2006) suggests that time and responsibility allocation to someone in the organisation can play a key role in implementing and improving the compliance with good patient handling practice. A follow up study for the HSE, evaluating the PHOQS tool (Hignett and Crumpton, 2004, and Hignett and Crumpton, 2007), found that the organisations with a high PHOQS score for safety culture showed more positive levels of compliance and higher levels of knowledge and decision making in several clinical tasks.

A method to evaluate the organisational commitment and safety culture would be valuable for comparing organisations. It is important to link these values with the more important process of financial evaluation of the impact on sickness absence, and the longer-term effects for managing MSD in the organisations. This should be able to identify the commitment in terms of expert staff time, equipment provision, risk management systems that are in place, and equate these costs with the potential losses of MSD (See Table 2b.10).

2b.6.2.2 Environment and Equipment Outcomes
The second group of tools looking at organisational commitment to the process of managing MSD in the workplace measures the provision of equipment and safe working environments. Hignett (2003a) found that the provision of a wide range of equipment in a patient handling environment produced a positive effect on potential problems. The range of equipment included hoists, bed provision, and transport devices as well as a number of small aids. Not all of the tools listed seek to quantify the range of equipment and suitable environmental changes.

a) Quick Scan.
The first tool is a simple descriptor of hoists, bathing equipment and slide sheets. The Quick Scan (Arjo ab a) is developed as an assessment tool for a given location e.g. a ward, and bases the calculation of required equipment on the following:

- One slide sheet per person requiring help
- One active hoist can provide 30 transfers per day
- One passive hoist can provide 25 transfers per day

The evidence or rationale that was given for these data is unclear. The report generated by a Quick Scan assessment calculates the number of care tasks needed for the patient dependencies observed. The calculation of equipment needed is based on the ergonomics standards outlined in the Dutch Government convenents (Knibbe and Knibbe, 2005), the resident gallery for patient dependencies (Arjo ab d) and records the number of staff, available aids and equipment. The calculation of equipment need is based on the number of transfers required for 24 hour care.

b) Hoist identification tool (HIT).

The Hoist Identification Tool (Smith et al., 2005) analyses only the hoist requirement for a given area. The process has some interesting methods for quantifying the equipment by comparing the dependency scores (FIM), the number of available teams, and the number of beds to calculate hoisting needs. As with the Quick Scan it was not indicated how the calculation was derived. The number of hoists was calculated using a ‘Key Number’, which was equal to the number of beds / number of teams available at the busiest period. This was then compared to the typical number of patients with FIM scores of 1 or 2 for passive hoists, i.e. the highest dependencies, and 3, 4, 5 for active hoists. This gives a ratio value which equates to the number of hoists required. Table 2b.17 indicates the number of hoists required.

Table 2b.17 Calculation of hoist numbers using HIT process.

<table>
<thead>
<tr>
<th>Calculation</th>
<th>Ratio Value</th>
<th>Number of hoists required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical number of patients in FIM category</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If key number &gt; 3</td>
<td>2 minimum</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0-1</td>
<td>1 or 2</td>
</tr>
<tr>
<td></td>
<td>1-2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>2-3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>3-4</td>
<td>4</td>
</tr>
</tbody>
</table>
If patient may need barrier nursing  Add 1 hoist
If patient may be very heavy  Add one high capacity hoist

The anomaly for the HIT calculation is that the number of hoists for a given area is derived not only from the number of patients requiring assistance, but the number of nursing teams that are available to use them. So if a poorly funded centre decided to reduce the staff teams available, then they could reduce their equipment needs according to the tool. There is no inclusion in the tool to define maximum transfers per day per team, etc., as with MAPO (Section 3.2.1.2.3). It would be interesting to compare the use of the HIT tool in high dependency nursing homes with the acute healthcare setting, where the availability of staff may be different.

Both tools, Quick Scan and HIT, have limited use as a measure of improved patient handling performance, due to the limited evidence described and the lack of measure for an organisational system supporting the use of equipment. Both show the commitment to provision via the financial outlay.

Two tools that have had a process of much greater development and evaluation are MAPO and the Care Thermometer.

c) MAPO

MAPO was originally created as an assessment tool to get an understanding of whether care delivery institutions were managing the risks associated with patient handling (Battevi et al., 2000). The development and evaluation of the tool has been well documented and has some testing for internal validity and reliability (Battevi et al., 2006). The evidence base for the development of the tool examines the NIOSH guidelines for lifting (Waters et al., 1993), epidemiology data collected in development, identified risk factors for MSD in health care workers, and the guidance from EN 9130 list to outline how many activities can be completed with specific pieces of equipment.

Subsequent studies in Italy have used the MAPO tool as a measurement device to assess the progress of the implementation of the EU directive; including
Fortuna and Ricci (1999), Battevi and Menoni (2006a and 2006b) Battevi et al. (2000). In addition it has been translated and evaluated for use in two other EU countries described by Fray et al. (2006) and Cotrim et al. (2006).

The calculation of the MAPO Index involves the development of four factor scores (Menoni et al., 2004). The system is based on residual risk scoring i.e. each noted deficiency adds to the end MAPO Index score. Higher MAPO Index scores equate to higher levels of residual risk. The MAPO score has four risk levels <1.5, 1.5-5.0, 5.01-10.00, and >10.00.

Table 2b.18 Information required for the MAPO Index calculation

<table>
<thead>
<tr>
<th>Factor</th>
<th>Values Measured</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifting Factor</td>
<td>Nº non co-operative patients Nº partially co-operative patients Total Nº staff over 24hr period Nº of hoists available Nº of small lifting aids available</td>
<td>NC PC OP LF AF</td>
</tr>
<tr>
<td>Wheelchair Factor (WF)</td>
<td>Type and Nº wheelchairs and potential failures in stock. Equates to numerical sufficiency</td>
<td>MSWh</td>
</tr>
<tr>
<td>Environmental factor (EF)</td>
<td>Type and Nº bathroom/showers and potential limitations in design. Equates to numerical sufficiency of average score per ward Type and Nº toilets/WC and potential limitations in design limitations. Equates to numerical sufficiency of average score per ward Type and Nº wards and potential limitations in space and design. Equates to numerical sufficiency of average score per ward Mean score for environment calculated from MSB + MSWC + MSW against known values to create MSE and EF</td>
<td>MSB MSWC MSW MSE</td>
</tr>
<tr>
<td>Training Factor (TF)</td>
<td>Simple values for adequate training, information only or no training</td>
<td></td>
</tr>
</tbody>
</table>
Table 2b.18 shows all the information and calculated scores derived in the MAPO process. The MAPO calculation takes these factors into account in the following formula:

$$\text{MAPO INDEX score} = [(\frac{\text{NC}}{\text{OP}}) \times \text{LF} + (\frac{\text{PC}}{\text{OP}}) \times \text{AF})] \times \text{WF} \times \text{EF} \times \text{TF}$$

The values for residual risk remain low for areas with adequate staffing and a good variation of equipment and accommodation. In the evaluation of the tool in a UK acute hospital (Fray et al, 2006) all areas scored low, as did an unpublished study by Coman (2007) of Australian elderly care facilities. The Portuguese evaluation (Cotrim et al, 2006) however showed higher levels of risk, and was reported as a reasonable evaluation for their healthcare system. A further study by Barroso (2007) has also suggested the usefulness of the tool in Portugal.

d) Care Thermometer (CT)
The Care Thermometer (Arjo ab b) is derived from the Lift Thermometer produced and evaluated in the Netherlands (Knibbe and Knibbe, 2005). This tool was originally defined to be used as part of a suite of tools recommended by the authors. This suite of tools includes the evaluation of organisational and managerial commitment, the provision of equipment for a given environment and aspects of training and competency of the caregivers.

The process of defining the model is based on the ergonomics guidelines for the safe care environment that have been adopted by the Dutch authorities as working standards (Knibbe and Knibbe, 2005). The guidelines give very specific guidance for the environmental and equipment requirements for the management of six specific patient handling tasks.

- Patient movement within a bed
- Lateral transfers of a patient between two flat surfaces
- Sitting to sitting transfers
- Postures that increase static loading in bathing
- Care activities on the bed including anti-embolus stocking application
• Load lifting, pushing and pulling

These guidelines were based on evidence from research studies (Brinkhoff and Knibbe, 2003) and very specifically followed biomechanical force limits for push, pull, lift and finger force applications, and guidance for prolonged periods of static work. They were developed with peer group involvement and adopted for government enforcement in 2002.

The original definitions of the Lift Thermometer examined compliance with the guidelines, based upon a three level patient dependency assessment. This equated to the independent, partially co-operative and non-co-operative levels used in the MAPO tool. The Care Thermometer has a ‘Mobility Gallery’ that initially identified five levels of dependency but has different patient groups to include special needs e.g. bariatric, elderly, learning disabilities etc (Arjo ab d). The physical assessment criteria for the patient gallery are in Table 2b.19.

Table 2b.19. Grades of Mobility from the Resident Gallery (Arjo ab d)

<table>
<thead>
<tr>
<th>Class</th>
<th>Dependence</th>
<th>Assistance from carer</th>
<th>Patient activity</th>
<th>Patient stimulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Independent</td>
<td>Not physically demanding for carer</td>
<td>Verbal guidance may be necessary</td>
<td>Stimulating activity is relevant</td>
</tr>
<tr>
<td>B</td>
<td>Depending on carer</td>
<td>Assistance is not physically demanding for carer</td>
<td>Patient is active</td>
<td>Stimulating activity is relevant</td>
</tr>
<tr>
<td>C</td>
<td>Depending on carer</td>
<td>Assistance is potentially physically demanding for carer</td>
<td>Patient is active</td>
<td>Stimulating activity is relevant</td>
</tr>
<tr>
<td>D</td>
<td>Depending on carer</td>
<td>Assistance is potentially physically demanding for carer</td>
<td>Patient is (nearly) completely passive</td>
<td>Stimulating activity is relevant</td>
</tr>
<tr>
<td>E</td>
<td>Depending on carer</td>
<td>Assistance is potentially physically demanding for carer</td>
<td>Patient is (nearly) completely passive</td>
<td>Stimulating activity is not relevant, desirable or permitted</td>
</tr>
</tbody>
</table>

The model requires a clear set of data to be input into the calculation spreadsheet. Initial data include the total number of patients in the ward area and total full time equivalents for the staff. These data are defined by each task in the original Dutch government guidelines, and require a decision as to
whether the task has been controlled or not by the provision of the correct equipment. All data follows the format below:

- Task completed
- Mobility level of resident
- Number of residents engaged in this activity
- Number of residents for whom the equipment is being used

Any patients not managed in the method stipulated in the guidelines score as a residual risk. The residual risks are then scored and the outstanding risks are displayed in a number of graphical presentations. The web-based tool www.carethermometer.com (Arjo ab b) has an overall risk rating to give a Care Temperature as a percentage. The most recent model of the tool also defines two new factors:

- Quality of care indicators, based upon the access to activity status of a ward or environment i.e. if the equipment or staff are not available then access is restricted.
- Passivity level, the over use of equipment making patients more passive.

e) Comparing MAPO and Care/Lift Thermometer.
The two models described have many similarities, in that they both describe outstanding risk scores, and both have specific methodologies relating to how much equipment should be provided to control the risks. The MAPO tool is very highly dependent on the ratio of available staff to the care needs of the patient group. In the CT the relationship is evident, but is more task specific. The CT concentrates very specifically on the patient handling tasks outlined in the six guidelines, where the MAPO tool also includes more information relating to the physical dimensions of the care environment. A competent observer completes both tools, but the MAPO tool records the physical environment, whereas the CT records how many patient specific handling issues are controlled by the environment, and the level of equipment provided.

Both tools have had involvement with practitioners from different countries, and both tools have needed to consider the processes and criteria to be a truly European measure of intervention success.
2b.6.3 Staff Outcomes

Table 2b.4 shows that 439 out of 598 of the outcomes recorded, relate to staff completing patient handling actions. Further analysis of the outcome measures in Table 2b.11 identified injuries, perception measures and physical workload as the most widely used methods to measure performance. Mostly the physical and subjective risks to the staff are compared, by using the quantities as OM, i.e. as a pre- and post-intervention comparison. The outcomes can be further divided into groups based upon the qualities and quantities measured.

2b.6.3.1 Physical workload

The largest group of OMs are measures of physical factors. Historically, load handling has found a relationship between physical exposure and the risks of MSD (Smedley et al., 1995, Hignett, 1996a, Josephson et al., 1997). Many different ways have been used to measure force, body position etc for a number of work types. Few of the outcome measures were devised specifically for use in healthcare or patient handling. The key exception is REBA, a model of postural risk analysis developed by Hignett and McAtamney (2000). Many of the tools have been validated and meet the definition of OMT, having internal criteria for success based on evidence and, in many cases, also delivering rational level data for reasonable comparison between pre- and post-intervention. As these studies have mostly been developed outside the field they were omitted from this comparison discussion. The worth and values of most of the posture, exposure and force tools have been reported and cross examined in other areas (Russell et al., 2007; and Dempsey and Mathiassen, 2006).

Fray (2006) showed a full review of all the physical tools that have been recorded in patient handling studies. The review of outcome measures section 2b.4 and table 2b.11 record the range of values used for patient handling studies. Most of the recorded OMs in the analysis do not contain internal assessment criteria and as such cannot be utilised as OMTs. Table 2b.20 compares some of the familiar OMs used to measure staff outcomes with the included OMTs.
Table 2b.20 OMs and OMTs used for the evaluation of physical risks

<table>
<thead>
<tr>
<th>Risk</th>
<th>Outcome Measures (OM)</th>
<th>Outcome Measurement Tools (OMT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure</td>
<td>Injury records</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Self completed logs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of lifts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Volume of lifting</td>
<td></td>
</tr>
<tr>
<td>Posture</td>
<td>Joint angles</td>
<td>OWAS</td>
</tr>
<tr>
<td>Biomechanical</td>
<td>Force measures</td>
<td>REBA</td>
</tr>
<tr>
<td></td>
<td>Movement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Speed or acceleration</td>
<td>Biomechanical models</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E.g. NIOSH.</td>
</tr>
<tr>
<td>Physiological</td>
<td>Heart rate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oxygen uptake</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EMG</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intra-Abdominal Pressure</td>
<td></td>
</tr>
</tbody>
</table>

2b.6.3.2 Subjective assessment

Staff perception is commonly recorded as an outcome for patient handling interventions via forms of subjective feedback. The qualities used for OMs are based on physiological response e.g. effort, rate of perceived exertion etc, comfort or discomfort and usability of equipment. No specific tools have been developed to try to clarify assessment for these qualities.

2b.6.3.3 Compliance assessment

The third group of staff outcomes is that of compliance monitoring. This area has seen a higher level of application to the patient handling field. Even though much evidence has been gathered to question the effectiveness of training (Hignett et al., 2003), the patient handling risk management processes still use training, and as such need methods to evaluate outcomes. Three observation tools have been devised specifically to measure the ability of a carer to follow the agreed procedure.

The three models; Kjellberg et al. (2000), Johnsson et al. (2004), and Warming et al. (2004), were developed in Sweden and Denmark with much internal comparison between the different approaches. All have been subjected to a high level of analytical rigour for validity and reliability. Each of these models has good supporting evidence and delivers a clear measure of the outcome. It
is not so clear if the combined score delivers a satisfactory outcome, but the data allow for a very easy comparison of pre- and post-intervention studies.

The major differences relate to how the tools should be used. Due to the complexity of the models, Kjellberg et al. (2000) and Warming et al. (2004) are described as video analysis tools where DiNO (Johnsson et al., 2004) can be conducted in real time. Only the DiNO tool has measures relating to the success of the transfer (result phase). All tools measure the preparation and the actual performance phase. The final, and most significant difference is the understanding of the movement principles that underpin the movement assessment. Warming uses the work of Schibye et al. (2003), but the Swedish models have developed movement principles as part of the tool.

The approach of Kjellberg et al. (2000), has been used in three further studies by the author group (Johnsson et al., 2002; and Kjellberg et al., 2003 and 2004). DiNO is the only tool that has been used outside its author group. Lomi et al., (2006) translated the model and the movement principles into Greek for a trial and evaluation, and found the transferability of the model to be effective. Wonnacott (2006), Groves (2008) and MacGregor (2009) found the language describing the movement phases difficult and needed extra descriptions to facilitate a robust scoring system.

2b.6.3.4 Competence measures
The final tool is SOPMAS (Hantikeinen and Tamminen-Peter, 2002). It has some similarities with the Benner skill ratings (Benner, 1984) used by Crumpton and Johnson, (2005). SOPMAS is based on a learning taxonomy, with skill and understanding levels in the methods and interactions that a carer has with a patient during a transfer. Where the Benner scale is a simple learning outcome, not specifically applied to patient handling, SOPMAS has clear links with the movement protocols of patient handling. The grid score system has five levels of skill and four components to grade (Table 2b.21), thus an average or total score can be derived. A comparative study of the scoring system was conducted with the DiNO tool (Johnsson et al., 2004) as part of the validation.
process for DiNO. The SOPMAS tool has subsequently been used in studies by the author but has not had translated evaluations.

Table 2b.21 The scoring grid for SOPMAS

<table>
<thead>
<tr>
<th>Learning level</th>
<th>Interaction with patient</th>
<th>Patient’s movements</th>
<th>Posture and movements of nurse</th>
<th>Environment and assistive devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prestructural</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unistructural</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi-structural</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relational</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extended abstract</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As the scoring system assesses the learning and skills inherent in an individual, it is difficult to see how the tools of compliance (3.2.3.2) and competence (3.2.3.3) can be used in widespread data collection. All however can be used as measures of comparison of pre- and post-intervention. Though the tools were made to measure training outcomes, there could be a use to assess the provision of equipment and a safe working system, as this may allow the worker to use the recommended transfer technique. The number of studies that use DiNO show it may have the most useful applicability in terms of reliability, translation and speed of use.

2b.6.4 Task Outcomes

Performance or task outcomes are less frequently monitored in intervention studies (Table 2b.11). Task measures that have been used relate to time factors and speed issues, but there are very good measures, in some trials, of the success of a transfer or task, e.g. better sitting positions, etc. No outcome measurement tools were located to investigate task measures.
2b.6.5 Patient Outcomes

Practitioners will always suggest that the patient outcomes are paramount in patient handling tasks, but patient handling outcomes have been seldom recorded. The analysis recorded in this study found only six studies that included patient results as outcome measures. Fray and Hignett (2007a) showed that more recent studies are including patient outcomes, mainly focusing on patient perception e.g. safety, comfort, security, but no OMTs have been found investigating these OMs.

2b.6.6 Summary

Many outcome measures have been used to measure changes in performance in patient handling interventions. These measures have been categorised into two groups, outcome measures and outcome measurement tools. Outcome measurement tools are assessment tools with internal criteria for evaluating the performance against the identified levels. These in turn have a direct scientific and evidence based link to the process of harm or loss.

The outcome measurement tools were compared against the beneficiary categories in section 2b.2. Financial organisational outcomes and patient outcomes and task performance outcomes were not supported in the OMTs recorded. The range of OMTs complemented and duplicated some data sources. The range of tools can be amalgamated to give a value judgement across the whole area of performance, in managing the risks associated with patient handling in a healthcare organisation.

The definition of an outcome measurement tool sets out the key requirements for inclusion in this study. Table 2b.22 lists the criteria for all the tools in this section. Unlike more physical assessment tools e.g. the NIOSH lifting index (Waters et al., 1993), none of these tools identify a clear strategy for pass or fail criteria. The care thermometer and the MAPO index do state clear levels of outstanding risk, which could be interpreted as fail criteria for high levels of risk. This means most of these tools can only be used as OMs to compare pre- and post-intervention levels of risk, and do not indicate a successful intervention.
Table 2b.22 Summary of the tools included in this review.

<table>
<thead>
<tr>
<th>Tools</th>
<th>Outcomes measured</th>
<th>Clearly identified criteria for comparison.</th>
<th>Score Systems (Final Score Format)</th>
<th>Success level stated</th>
</tr>
</thead>
<tbody>
<tr>
<td>MARCH</td>
<td>Organisational commitment</td>
<td>Controls Assurance Standards (UK)</td>
<td>Yes/No (x/24)</td>
<td>No</td>
</tr>
<tr>
<td>PHOQS</td>
<td>Safety culture</td>
<td>RCN Competencies</td>
<td>Yes/No (x/30)</td>
<td>&gt; or = 40% positive answers</td>
</tr>
<tr>
<td>MAPO</td>
<td>Equipment, n° staff, training, environment.</td>
<td>NIOSH Epidemiology EN 9130 MAPO Index (Complex Ratio data)</td>
<td>MAPO Index (Complex Ratio data) Red amber green</td>
<td></td>
</tr>
<tr>
<td>Care Thermometer</td>
<td>Tasks, n° staff, equipment.</td>
<td>Dutch Convenent standards Care Temperature (%)</td>
<td>% Red amber green</td>
<td></td>
</tr>
<tr>
<td>Quick Scan</td>
<td>Hoisting and slide sheet provision.</td>
<td>Dutch Convenent standards Equipment needed</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>HIT</td>
<td>Hoisting provision.</td>
<td>Hoists needed</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Pate</td>
<td>Staff compliance (video)</td>
<td>Safe principles</td>
<td>24 rated scores, 0-1. (x/24)</td>
<td>No</td>
</tr>
<tr>
<td>Warming et al</td>
<td>Staff compliance (video)</td>
<td>Safe principles</td>
<td>23 rated scores. (x/202)</td>
<td>No</td>
</tr>
<tr>
<td>DiNO</td>
<td>Staff compliance</td>
<td>Safe principles</td>
<td>16 rated scores, 0-1. (x/16)</td>
<td>No</td>
</tr>
<tr>
<td>SOPMAS</td>
<td>Staff Competence</td>
<td>Learning taxonomy</td>
<td>5 rated taxonomies (0-5)</td>
<td>Above iii</td>
</tr>
</tbody>
</table>

Table 2b.22 gives a visual and graphical comparison of the range of OMTs to show the areas of duplication and difference. It may be that, as the research programme defines the priority of patient handling outcomes and the key indicators, this range of outcome measurement tools may be included in the process of comparison for intervention studies. The omission of success criteria from most of the models is a concern, and further work is needed if these are to be included in the final process.
## Table 2b.23 Matrix of content for included Outcome Measurement Tools.

<table>
<thead>
<tr>
<th>Key Outcome Identifier</th>
<th>Quality</th>
<th>Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organisation outcome</td>
<td>Financial evaluation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sickness absence</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OH management</td>
<td></td>
</tr>
<tr>
<td>Organisational commitment</td>
<td></td>
<td>MARCH</td>
</tr>
<tr>
<td>Patient handling safety culture</td>
<td></td>
<td>PHOQS</td>
</tr>
<tr>
<td>Task outcome</td>
<td>Hoisting Equipment</td>
<td>MAPO</td>
</tr>
<tr>
<td></td>
<td>Other handling aids</td>
<td>MAPO</td>
</tr>
<tr>
<td></td>
<td>Environment provision</td>
<td>MAPO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Care</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quick scan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HIT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>quick scan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pate, Warming</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DiNO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SOPMAS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff outcome</td>
<td>Physical outcome measures</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Laboratory observation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Field observation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Posture / exposure / biomechanics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Posture / exposure / biomechanics</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compliance with safe methods</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Video observation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Field observation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pate, Warming</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DiNO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Skill levels and competencies</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SOPMAS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient outcome</td>
<td></td>
<td>Only subjective assessment criteria</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2b.7 Discussion of literature sections

It has been shown through this analysis of the body of literature that methods have been developed to measure the success of patient handling interventions. Outcome measurement tools have been developed to calculate a series of scores against known standards. In addition there have been some academic reviews that identify the success of each individual study. NIOSH (2001) identified a range of criteria to enhance the value of measuring intervention studies. Academic quality scoring systems have been devised to compare studies, including epidemiological studies (Genaidy et al., 2007). High quality scientific studies are assessed primarily by Cochrane methodologies (Van Tulder et al., 2003). Wider more inclusive reviews of the literature can also be assessed (Downs and Black, 1998; and Slin et al., 2003).

In addition there are methodologies to collect bodies of evidence to suggest that collective effects also have a rating of their success. These methods are commonly used to create evidence based practice models and set targets for the level of evidence produced in each specific area (Slavin, 1995; Cooper and Hedges, 1994; Franche et al., 2004; Bernard, 1997; and Faculty of Occupational Medicine, 2000).

The examination of the interventions, outcomes and outcome measures in patient handling studies has revealed different interpretations of the evidence, and has raised specific questions to be discussed.

2b.7.1 Reliance on staff outcomes

The historical development of the role of patient handling advisor is, in the UK, surrounded by the legislative process and the need for the NHS and other Statutory Services to defend themselves against prosecution. This coupled with the vigilance and direction of the HSE has created a body of evidence that in the main identifies the potential injuries to the staff as the key outcome measure. Unfortunately the literature reviews discussed in 2b.5.1 show that the evidence collected has not allowed a direct link to be made between the intervention and the longer-term outcomes of musculoskeletal ill health. An
example of this is the numerous studies that identified postural changes in the staff carrying out patient handling tasks, but then did not carry out longer-term reviews to identify whether the rate of MSD or injury had been affected. This dichotomy fits into the relationship between cause and effect. The academic reports and reviews have considered the analysis of MSD rate to be paramount, but given the lack of evidence it may be necessary to develop arguments that support the development of patient handling management systems, based on the reduction of exposure to known risks for MSD. The evidence developed from these studies gives a wider body of literature to repeat the review processes, to identify the components of successful patient handling interventions.

The reliance on and the concentration of the studies on staff based outcomes has reduced the links with patient and task outcomes. Only 7.4% of the outcomes recorded in the survey were patient outcomes (Table 2b.10). A further 5.3% gave some outcomes for task performance that measured changes in the time or techniques of patient movement. This lack of data to support patient outcomes has distanced patient handling from the clinical field. Modern healthcare is driven by productivity, and the success of clinical interventions in a timely and error free fashion. So why has there been no patient handling studies that have used clinical outcomes to prove that high quality handling results in better clinical outcomes?

A range of clinical outcomes could be easily identified to move patient handling into the clinical care field.

- The use of single patient use items, i.e. slings and slide sheets, may reduce the spread of infection.
- The use of competent risk assessment and handling techniques may reduce fear, aid support and improve rehabilitation outcomes for patients with mobility issues.
- The use of mechanical hoist options may improve sitting positions and patient comfort when transferring from seat to seat.
- The use of improved handling skills could reduce hospital stays or improve the quality of rehabilitation for patients.
• The utilisation of appropriate risk assessment and equipment provision may increase the perceptions of patient independence and inclusion in the care process.

There is a gap in the body of knowledge surrounding the study of patient handling, and further research needs to identify whether patient handling interventions can be measured with clinical outcomes?

2b7.2 Comparison of interventions and outcome measures
The research evidence developed showed little to identify the relative merit of one outcome against another or to place one beneficiary at higher priority. Even the series of outcome measurement tools that have been peer reviewed (2b.6), all measure outcomes of the interventions at different levels against different criteria:

- Organisational level assessment is identified by PHOQS (Hignett and Crumpton, 2005)
- Ward based tools identify equipment and training deficits and ultimately staff risks are identified by MAPO (Menoni et al., 2004), MARCH (Smedley et al., 2005), and the Care Thermometer (Arjo ab b, 2007) HIT (Smith et al., 2005)
- Training and personal compliance with specific methods are examined by DiNO (Johnsson et al., 2004) and SOPMAS (Tamminen-Peter, 2004)

It could be argued that PHOQS, MAPO, MARCH and the Care Thermometer are tools that measure the level of the intervention against an agreed set of criteria. SOPMAS and DiNO measure the end user, so they are truly outcome measures that prove whether the training or advice has made a difference in the task completion. This again fits the dichotomy question of cause and effect. This could be an indication that one method or measure is regarded as a higher level than another, but that priority is developed by the authors of each OMT. It is unclear how the application of the research evidence by the practitioners (PHA) is completed. Cross comparisons of the different OMTs in different countries from their origin have proved unsuccessful in validating their use (Cotrim et al., 2006, Fray et al., 2006, Lomi and Lomi, 2006, and Tamminen-
Peter et al., 2008). It should be expected in the application of evidence to the workplace that a higher priority be given to effect measures. More importantly the reduction of injuries or reduced sickness absence should be ranked higher than the reduction of exposure to musculoskeletal risk. This is likely to identify by default that longer-term longitudinal studies from a poor starting position are more powerful in terms of their outcome measures.

Given the lack of convincing evidence that PH interventions reduce MSD rates, and without any potential comparison between the wide range of outcome measures reported in this analysis, then it is difficult to identify where the investment for future change should targeted.

2b.7.3 Summary of findings

- There is a wide range of evidence from patient handling intervention research.
- Only academic scoring systems seem to be available for ranking the success of the intervention type.
- Outcomes described in PH studies can be qualified by the position in the continuum between intervention and outcome (Robson et al., 2007)
- It is possible to measure the success of a patient handling intervention by following the scientific evaluation processes.
- It is possible to create evidence based best practice using the scoring systems outlined.
- None of the described outcome measures or outcome measurement tools have any comparison of content of the outcomes, or any relative values for the beneficiary of the outcome. The process for evaluating PH interventions is flawed because the intervener selects the outcome measure or outcome measurement tool to justify the intervention.
- Without a convincing comparison between the different outcome measures it is difficult to design and target future intervention strategies with any level of confidence
2b.8 Developing the research process

At present the relative values of patient, staff, organisation or indeed higher society based outcome measures are unknown, and the merits of any intervention can only be judged in terms of the tools by which it is measured. There have been differences observed in the literature analysis in the details of how each study was reported:

- **Beneficiaries**
  The question for investigation is how one study rates of higher importance than another. The first comparison will be relative to who or what benefits from the outcome measure. Should a patient benefit, in particular a clinical benefit, rate higher than a staff measure? Should an organisational measure that relates to the provision for many staff be rated as higher than a single practitioner measure e.g. posture or force? Should population data or society data be rated as the highest due to its area of application being universal to all individuals?

- **Cause and effect**
  A similar discussion could be made for the cause and effect data explored in the literature discussion. It could be argued that real world findings related to the actual measured effects of an intervention raise its power in any comparison, rather than the reduced exposure to risk factors. Care however needs to be taken not to negate the studies and information that has proved a link between cause and effect.

- **Area of applicability**
  It may be possible to rate intervention studies on the area of the healthcare field that the data could be applied to. There is a logical progression in the power of a study related to a) the level of statistical significance expressed in the study and b) the sample size included in the study, or c) the population to which the findings can be inferred. A formal statistical analysis would be required to answer this question, which is outside the limits of this study.
Comparing outcome measures

Several outcome measurement tools have been developed to compare measures from a workplace against known criteria. It might be possible to rate interventions by comparing these outcome measurement tools. How does a MAPO amber compare to a SOPMAS III, to a PHOQS 24/30?

It is these issues that have created the requirement to develop this research project, and examine in detail the measurement of success for patient handling interventions, and the success criteria by which to evaluate them. The drive to evidence based practice in many areas of healthcare has increased the need to identify comparative ratings between different sources of data. It is the aim of this study to identify a tool that will be able to recognise the comparative value of each study or data set and allow priorities to be set. This research project is to investigate the relationships between outcome measures, and evaluate if there is a consistency of perception across the EU? It is the aim of this long-term study to identify if it is possible to measure what makes for a successful patient handling intervention?

Research Question:
Can a single measurement tool be created to measure the success of patient handling interventions in a healthcare setting?

Aims:

- To define what outcome measures are preferred by patient handling practitioners across the EU
- To evaluate and select the most suitable methods for measuring the identified outcome measures
- To develop a tool that can be used to compare the relative values of different patient handling interventions, studies and trials.
Objectives:
1. Identify the most important outcome measures considered by practitioners involved in the prevention of patient handling injuries
2. Conduct a series of data collections to compare the important outcome measures from a sample of EU countries
3. Analyse the data from the EU countries and create a priority list for the preferred outcome measures
4. Evaluate the best methods for measuring the preferred outcomes
5. Use the data to create a tool to compare all types of patient handling interventions
6. Test the model in a UK pilot study
7. Test the model in the sample of participating EU countries

Benefits of the Research
The programme should result in real benefits for patient handling in many ways.
1. The first is an accepted method for evaluating the success of a back care / manual handling intervention. This will allow the tailoring of resources and solutions to give known benefits with measurable outcomes.
2. The success criteria will be used to identify the skills and educational needs for manual handling advisors across Europe.
3. There will be better across border collaboration for the management of risks for patient handling situations.
Chapter 3

Preferred Outcomes in the EU: A Focus Group Study
**Introduction**

This chapter describes the methodologies and methods for the data collection in four EU countries, to record which outcomes were preferred by practitioners in the patient handling field when completing patient handling interventions. The focus group study forms a significant part in the data collection and links with the literature analysis (Fig 3.1).

---

**Figure 3.1 Study overview**

The opinions and preferences from four EU countries (UK, Finland, Portugal and Italy) were collected and compared to the views of two expert focus groups, that were collected at two separate international academic conferences. Qualitative and quantitative methods were used to analyse the suggestions and definitions created by the groups, to create a list of the most preferred outcomes. The final group represented in 12 outcomes, which were widely represented across all the participating groups, and the voting system allowed
them to be ranked as the most influential outcomes to be measured. The highest ranked 12 outcomes were taken forward to be included in the IET (Chapter 4). For consistency the EU groups will be referred to as the UK, Finland, Portugal and Italy groups rather than the British, Finnish, Portuguese or Italian though this is not grammatically correct.

3.1 Study design

The range of outcomes and outcome measures (described in Chapter 2) show a complex picture. They can be described by the recipient of the benefit, for example staff issues, but organisational outcomes and patient benefits are then also noted. They can also be recorded by where in the process of intervention to resultant effect the value is observed (Robson et al., 2007). This data set does not create a comparison, or prioritise the different outcome measures. This initial phase produced a list of the most important outcomes by clarifying their definitions and recording the exact outcomes that are required by people in the patient handling field.

3.1.1 Focus group methodology

As the aim for this phase of the study is to record the opinions of the PHA across the EU, rather than the definition of physical qualities or dimensions, the approach will use qualitative methodology. This phase will record and prioritise which outcomes are most important to PHAs. There are many methods for ascertaining personal information and attitudes or feelings: direct observation, interviews, questionnaires, attitude scales or standardised tests (Robson, 2002).

Due to the range of roles of PHA it is unclear how much the collective group understands about outcomes, and the process of ranking or prioritising the importance. King (1994) states that a qualitative research interview is a suitable method when:

- The study focuses on the meaning of a particular phenomenon to the participants
- Individual perceptions of a process are studied
- Individual historical accounts are to be recorded
- Exploratory work is required before a quantitative study can be completed
- A quantitative study has been carried out and a comparison or further explanation is required.

All of the above stipulations apply in this study where:
- The focus of the study is the perception of outcomes, outcome measures and outcome measurement tools for patient handling interventions
- The individual's opinion is sought
- Each PHA will have different experience and knowledge
- There will be different health systems across the EU
- The priorities and relative value of each outcome, or type of outcome, needs to be sought before the model can be developed
- Some quantitative analysis has already been completed in the systematic analysis of the outcome types in the peer reviewed and quality scored literature

The literature review identified the key themes of the outcomes, so focus groups should identify individual differences or similarities between the PHAs across the different EU groups, and give specific examples of each. The use of interviews also allows for interaction between the interviewer and the respondent, e.g. probing and prompting are known and accepted techniques for the interviewer (Robson 2002). Given that the level of understanding regarding the chosen or priority outcomes might be unclear in the respondent, the face-to-face data collection methods would be the best option (Mason, 2002; and Krueger and Casey, 2000).

The time constraints and the international nature of this EU comparison study added further complexity. The process was repeated and translated in four European countries. Time constraints suggested that the group interview format could improve the efficiency of the data collection. The boundary between a ‘focus group’ and a ‘group interview’ is unclear and the terminology has become interchangeable in recent years (Robson, 2002). With either
model the benefits of the group structure should prove suitable due to the reasons below:

- The nature of the group interview improves the amount and range of data by collecting from several people at the same time.
- Natural quality controls on data and opinion exist as the group dynamic will restrict extreme views.
- The group dynamic helps maintain the focus on the important topics and it is fairly easy to identify the similarities and differences in the group.
- Participants tend to enjoy focus groups.
- The methods are relatively inexpensive and can be quickly set up.
- Participants can be empowered to comment and provide information that they may be reluctant to offer in other environments.

(Robson, 2002)

In support of the methods Kamberelis and Dimitriadi (2005) note, in a critical summary of focus groups in research practice, ‘On a practical level focus groups are efficient in the sense that they generate large quantities of data from relatively large numbers of people in a relatively short time. In addition because of their synergistic potentials, focus groups often produce data that are seldom produced through individual interviews.’ In further discussion they suggest that the effects are better observed in homogenous groups of people, as in this study.

3.1.2 Focus group design

Robson (2002) identified limitations for the focus group interview. The key issue in time limited studies is the focus of the group. Powney and Watts (1987) describe two types of group interview; a respondent interview where the interviewer remains in control of the process and informant interviews, where the direction is lead by the group’s emotions and information. As the focus of this study is the outcome measures for patient handling interventions, rather than personal emotion or attitude, it was decided that a more directed study was appropriate.
Higgins (1994) describes the ‘Nominal Group Technique’ as a method that allows a focus group to individually record their own thoughts based on a set scenario, before a group discussion on the exploration of ideas and preferences. This approach was used with Langford and McDonagh’s (2003) four stages, as follows:

1. Generation of ideas
   A patient handling scenario created the ideas and prompted the participants to create discussion (Appendix C)

2. Recording of ideas
   Data collection sheets allowed recording by the individual. The tape recording and transcription allowed for further analysis after the event. (Appendix C)

3. Clarification of ideas
   The recording and observation allowed for clarity and discussion of the key issues. To allow a better generation of discussion, and explanation, of the individual outcome measures, it was decided to allow the facilitator to collate all the documented outcomes during a short recess in the programme. The outcomes were then discussed by the group systematically. An opportunity was allowed for the group to add further outcome measures to the list as the discussion developed.

4. Voting on ideas.
   The final data collection sheet allowed an order to be selected by the participants (Appendix C). Each participant was requested to list their highest priority outcomes in order of importance.

The outputs from the four focus groups were (Fig 3.2):

a) Initial recordings of preferred outcomes for the scenario (Generation of ideas).

b) Transcriptions of the discussions of the compiled list (Recorded ideas).

c) Transcriptions of group discussion (Clarification of ideas)

d) Ranked lists of the five highest priority outcomes (Voting).
3.1.3. Partner countries

This project utilised existing links with the EPPHE group. Hignett et al. (2007) described some of the national differences between health and social care provision and in the different approaches taken to meet the EC Manual Handling Directive (90/269/EEC). The countries recruited to participate in the study gave a good range of different service levels, country population, and the systems created to manage patient handling issues. Focus groups were completed in each country using the defined procedure. Up to 12 participants could be accepted in each group. The facilitators, and their affiliations, of the EU groups are listed in Table 3.1.
Table 3.1 Facilitators for the EU focus groups (Hignett et al., 2007)

<table>
<thead>
<tr>
<th>Country</th>
<th>Pop (mill)</th>
<th>Locn.</th>
<th>Patient handling systems</th>
<th>Liaison and centre</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>60.0</td>
<td>NW</td>
<td>Well defined job roles and documentation</td>
<td>Mike Fray, Loughborough University</td>
</tr>
<tr>
<td>Italy</td>
<td>58.5</td>
<td>SE</td>
<td>Primarily in Occupational Health</td>
<td>Natale Battevi, EPM, University of Milan</td>
</tr>
<tr>
<td>Finland</td>
<td>5.2</td>
<td>NE</td>
<td>Physiotherapy managed process</td>
<td>Leena Tamminen-Peter, Finnish Institute of Occupational Health</td>
</tr>
<tr>
<td>Portugal</td>
<td>10.3</td>
<td>SW</td>
<td>Weaknesses in access to ergonomics support</td>
<td>Teresa Cotrim, University of Lisbon</td>
</tr>
</tbody>
</table>

3.1.4 Participants

There are many stakeholders in the process of patient handling interventions. This project aimed to be inclusive and to gain the representation of all those involved in the design and implementation of patient handling interventions, for example: patient handling advisors, nursing managers, hospital risk managers, H&S advisors, occupational health nurses or managers, staff involved in transfers, and patients (past or present). Silverman (2001) suggests that the position and role of people involved in qualitative studies is an important factor in the validity of the results. It is clear that a senior manager whose focus is on financial results and robustness in a challenging market place would be different in outlook from a nurse supervisor focussed on patient care and the physical demands of a care task. This study recruited a range of people who fulfilled the role of the Patient Handling Advisor (PHA). The validation of models measuring the performance relative to patient handling management systems is further discussed in Chapter 4.

Healthcare and social care across the EU have different delivery systems, individuals and roles for the management of patient handling systems (Hignett et al., 2007). The role of Patient Handling Advisor (PHA) can be taken by a range of professions and levels of staff (Table 3.2). The EPPHE has considered the different roles within their forum and the process and description of how to best fulfil this position is being written in an ISO Technical Report presently (CEN/TC 122/WG 4 and ISO/TC 159/SC3/WG4). The following
professional groups are noted in Europe as being represented in the role of PHA.

**Table 3.2 Different roles and professions in the PHA position**

<table>
<thead>
<tr>
<th>Role</th>
<th>Profession</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury prevention and management</td>
<td>Occupational health medics or nurses. Ergonomists</td>
</tr>
<tr>
<td></td>
<td>Occupational safety professionals</td>
</tr>
<tr>
<td></td>
<td>Work based physiotherapists</td>
</tr>
<tr>
<td>Professional advisors</td>
<td>Higher skilled individuals within the healthcare professions (Nurse, physiotherapist etc)</td>
</tr>
<tr>
<td>Training design and delivery</td>
<td>Professional trainers from any discipline or an educational background</td>
</tr>
<tr>
<td>Workplace supervisors</td>
<td>Usually from the care professions</td>
</tr>
<tr>
<td>Higher management</td>
<td>Risk or safety managers or senior healthcare managers with a role for patient handling in the organisation</td>
</tr>
</tbody>
</table>

**3.1.5 Selection of participants.**

The aim of the sample strategy is to obtain a ‘homogenous’ group rather than ‘heterogenous’, as the facility of conversational development is improved in homogenous groups (Kamberelis and Dimitriadis, 2005). For this study purposive sampling (Stake, 1994) was used to allow for a homogenous group to be developed based on each participant having similar skills, backgrounds and experience. A structure of the requirements to be a participant was developed and circulated to all facilitators. These included: experience in offering advice and management of patient handling issues in health or social services, either in hospital or the community setting; and some responsibility for patient handling advice within their organisation. Beyond the initial requirements each facilitator used their own established networks and recruited from their own geographical area from the individuals that were known to be practicing as PHAs.
3.2 Data collection

The following section describes the process for completing the focus groups, and collecting and analysing the data.

3.2.1 Procedure for focus groups

The process was developed using guidance on the completion of focus groups (Mason, 2002; Krueger and Casey, 2000; Robson, 2002; and Denzin and Lincoln, 2005). It was important to make the process as clear as possible as the translation to the three other EU languages meant that the primary researcher (MF) was not able to directly facilitate the groups. An information sheet (Appendix C) was developed for the facilitator (MF and EU facilitators) to outline the process and timings.

The systematic literature review (Table 2b.11) resulted in four distinct categories of outcome measures.

i. Organisational,

ii. Staff,

iii. Patient

iv. Performance of the task.

The data collection sheets were designed using with these categories to allow comparison. Figure 3.3 describes the outline of the structure of the data collection, summarises the flow of the focus group study, and shows how the different phases interact, to create the prioritised list of outcomes that will be used in the development of the IET (Section 4).
<table>
<thead>
<tr>
<th>Phase</th>
<th>Focus groups</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilot Studies</td>
<td>UK Acute health&lt;br&gt;UK Long term care&lt;br&gt;Expert Panel Athens&lt;br&gt;Expert Panel Boston</td>
<td>• Compare outcomes from two samples&lt;br&gt;• Compare outcomes with practitioner data</td>
</tr>
<tr>
<td>EU Studies</td>
<td>UK&lt;br&gt;Finland&lt;br&gt;Italy&lt;br&gt;Portugal</td>
<td><strong>Recording</strong>&lt;br&gt;• Sheet 1 analysis to define outcomes&lt;br&gt;• Transcript coding to define outcomes&lt;br&gt;• Sheet 3 analysis to define outcomes&lt;br&gt;<strong>Clarification</strong>&lt;br&gt;• Compare 3 sets of outcome definitions&lt;br&gt;• Agree final definitions&lt;br&gt;• Re-coding of transcripts using definitions&lt;br&gt;<strong>Voting</strong>&lt;br&gt;• Sheet 3 scoring to rank outcomes</td>
</tr>
<tr>
<td>Output</td>
<td></td>
<td>Ranked list of outcomes</td>
</tr>
</tbody>
</table>

**Figure 3.3 Summary of the data collection and analysis for the focus groups**

1. **Generation of ideas**
   After an initial introduction the participants were given the scenario (Appendix C). Specific information was given to direct the participants to consider the measurement of outcomes rather than intervention style.

2. **Recording**
   Data sheet 1 (Appendix C) was given at the onset, and the participants completed all sections without discussion with the other group members. When all participants had completed their own list, Data sheet 1 and the coloured pens were collected. The facilitator of the session compiled a discussion list of
all the outcomes and measures that were listed in the different categories. This list formed the first data set to be analysed (See Focus Group Results Section 3.7) and the structure of the discussion. There was no requirement to follow the list exactly but it was a useful checklist to create, assist and direct discussion, to allow the comparison and detail of the selections to be clarified.

3. Clarification
Sheet 1 was returned to the participants as an aide-memoir for the discussion. A second data sheet (2) was circulated with a different coloured pen. Participants were informed that any additional points should be added to sheet (2) if they considered that outcome or outcome measure to be important.

The responsibility of the facilitator was to ensure that the key areas of organisational, staff, patient and performance were all covered and that any unusual points identified in the initial data sheets were clarified. Time management was a role for the facilitator, as approximately one hour was allowed for the discussion. When the discussion was complete data sheet (3) was circulated for completion.

4. Voting
Sheet (3) asked the participants to rank the preferred top five ranked outcomes that they would like to be measured in their organisations.

All data collection documents for the EU groups were professionally translated by a third party and distributed to the EU facilitators for checking. Any corrections were made before the groups were convened (Appendix C).

Figure 3.4 outlines the steps for data collection during the focus group.
Stage | Procedures
--- | ---
Pre-meeting preparation | The focus group conducted in the host language
 | The facilitators made familiar with the focus group process with detailed instructions and attendance at an expert panel
 | Formal statements for the introductions given to the EU group facilitators
 | Formal set of information regarding the completion of the sheets
 | A clear series of questions for the facilitator for the discussion
 | Invitation to participate

Focus group preparation | Introduction to focus group
 | Information Sheet
 | Consent forms
 | Job titles, qualifications and experience of all participants is collected
 | Descriptions of the categories discussed with the participants for clarity before data collection begins

i) Generation of ideas | Detailed patient handling scenario
 | Participants complete Sheet 1

ii) Recording of ideas | Facilitator collects individual outcomes recorded on Sheet 1
 | Facilitators to create discussion point list from Sheet 1

iii) Clarification | Discussion group based on issues collated (Whispering interpreter and discussion tape recorded)
 | Discussion closed
 | Participants complete Sheet 2

iv) Voting | Participants rank 5 most important outcomes from all discussions (Sheet 3)
 | Collect all data sheets and close discussion.
 | Debrief

Figure 3.4 Focus group procedure (Sheets 1,2,3 in Appendix C)

3.2.2 Group Management
The management of the discussion group was dependent upon the EU facilitator. Every effort was made to standardise the process and reduce possible variation between the different EU participants and facilitators (Barbour, 2007; Langford and McDonagh, 2003; and Robson, 2002). To manage this constructively and increase the level of control in the data collection:
a. A clear procedure was developed for all facilitators to follow as they lead the discussion.
b. The lead researcher (MF) attended all focus groups to observe and guide the data collection and support the facilitators.
c. Whispering translation was provided for the lead researcher (MF) to allow the discussion to be followed.
d. The lead researcher assisted in the development of the list of discussion points from the collated Sheet 1.
e. If points of clarity were required the lead researcher had an opportunity to seek further discussion through the facilitator.

3.2.3 Translation
A systematic review of studies using a translator (Wallin and Ahlstrom, 2006) showed that the role of the translator has not been closely scrutinised in many studies. But the role of the translator in the research and their background level of understanding should be noted. The open flow of discussion directed by the facilitator was recorded throughout. The whispering translation delivered by the interpreter was also recorded. This allowed the possibility of dual translation, and an extra level of scrutiny, as the EU language tape was sent to a third party for transcription and then for translation separately.

The dual translation also allowed for the different processes of facilitation to be observed, e.g. examination of terminology and different understandings placed on language by the discussion leader. The translation issues are likely to be raised on two levels in the EU groups, as both the facilitator and the translator will be open to personal interpretation. Several levels of control were introduced to limit the variations.

- The facilitators were invited to attend a focus group run by the researcher to familiarise them with the process (Portugal and Finland facilitators attended the Boston Panel, Italy and Finland facilitators attended the Athens Panel).
- The translators were recruited through the departments assisting with the project, to ensure some knowledge of terminology and language
Specific guidance and information for the EU comparison group facilitators was defined to allow for consistency.

The primary researcher (MF) was present for focus groups to maintain close observation on the process.

For the UK groups and the Athens Expert group a secondary observer was used to keep field notes and to note any unusual occurrences during the process (Appendix D).

The recording and translation process was as follows:

- Whispering real time translation was provided for the researcher (MF) and was audiotape recorded.
- The discussion group was audiotape recorded.
- Professional transcription was performed in the host language.
- The transcription was professionally translated into English.
- The whispering translation was transcribed separately.
- The whispering transcript and the EU language translation were compared and compiled to make a single script for analysis.
- The facilitators met with the researcher (MF) to check validity of both transcription and translation.

This dual translation format meant that the regular checking process of back translation from English to the source language was not required, as two independent translations had already been provided.

### 3.2.4 Ethics

Ethical approval was granted appropriate to each site and in accordance with Loughborough University procedures.

### 3.3 Pilot studies

In addition to the main data collection from the four EU focus groups two pilot studies were also completed.
3.3.1 Pilot study 1. Health and social care
The delivery of care in acute health and the longer-term settings of community health, social care and educational systems varies greatly. The role of the PHA covers all care settings and is subject to the varieties of care delivery. To examine if there were differences in the outcome preferences, the UK data collection consisted of two distinct groups. One containing PHA from acute health organisations and one from community health settings, or longer term social and children’s services. There agreement in the range of outcomes recorded and the rankings of preferred outcomes between the two groups. There was no need to separate the two groups in future studies (Fray and Hignett, 2007b). The two UK groups were amalgamated for further analysis and single combined groups were completed in the three other EU countries. (A summary of the findings can be found in Appendix E.)

3.3.2 Pilot study 2: Expert focus groups
Two focus groups were conducted in two conference settings (Athens, 2007 and Boston, 2007) to explore the potential differences between the role of the academic and the practitioner for the following reasons:

- An opportunity for all EU facilitators to attend an expert panel to experience the format before leading their own sessions.
- Inclusion of interested academics, some from outside the EU for comparison with the practitioner data
- Recruited from delegates attending the conference with an active participation in patient handling research.

(A summary of the findings can be found in 3.6.)

3.4 Analysis of focus group data
Perakyla (2005) outlines that in qualitative research of the spoken word, there are two main types of data that might be investigated and analysed: interviews and naturally occurring conversation. In a similar way, there are two areas of interest for analysis and those are the linguistic interactions of the conversation
and the themes or contents that are discussed. In this study it is clear that the analysis of the transcribed focus group interviews are to be analysed for thematic content. The purpose of the analysis is to identify the relative importance of the outcomes considered for each individual, and within each of the homogenous groups.

Three data sets were collected and the content was analysed as described below:

a) The lists of possible outcomes from Sheet 1 (Recording)
b) The transcriptions of the discussions (Clarification)
c) The ranked lists of the preferred outcomes (Voting)

a) The initial recordings of the possible outcomes were analysed for content recorded (Sheet 1). Each outcome recorded within each of the sections was grouped in the classification of organisation, staff, patient and performance of task. Complete lists were produced for comparison between the different EU groups. All documented outcomes were included in this initial review and were scored for frequency of inclusion.

b) The discussion sections were recorded. The transcription of the whispering interpreter, and the translation of the EU discussion, were combined to make a single document for analysis. The NVivo 7 package (QSR International) was used to identify the content of discussion completed during this phase. The original text collection from Sheet 1(a) was coded using categories from the literature review. This analysis gave an opportunity to evaluate the original key themes against those suggested within the group. Tesch (1990) identifies this form of analysis as content analysis in terms of the language and recorded text, and secondly as thematic analysis when incorporating the comprehension or the meaning of the discussion. Krueger and Casey (2000) suggest that all focus group interviews are derivations of the ‘long table’ approach. As all comments and discussions need to be understood in real time, the importance and comparison of the outcomes were analysed as found. There were several factors that needed to be interpreted in the focus
group data to examine the importance of the issues discussed. Frequency of mentions, the specificity of the description, the emotion of the speaker and the extensiveness of the description all create levels of importance within the transcript (Krueger and Casey, 2000). The emotional input of the participant was not possible to analyse due to the effects of translation and transcription. The analysis allowed each outcome and discussion theme to be grouped. This thematic and content process will be presented as a flow of analysis, and importantly as a set of complex definitions for the key themes.

c) The final data collected were the priority lists created by the participants at the close of the focus group interview. These were scored and ranked on a 5-point scale. The rankings were accumulated over the full EU sample and resulted in a priority list (Section 3.7).

d) Defined themed groups were recorded from the discussion transcriptions (b) and from the ranked data sets (c). As a secondary comparison the thematic analysis was repeated using the 12 most important themes to ensure stability in the identified themes.

e) Statistical analysis was completed on the ranked lists using Kendall’s Concordance (Seigal and Castellan, 1988) to explore similarities between the EU groups and the expert groups.

3.4.1 Reliability and validity
There has been much written surrounding the questions of evaluating the quality of focus group work and qualitative research. The two issues of note are reliability (Bryman, 1988:p77) and validity (Hammersley, 1990:p57).

Issues of reliability are primarily managed by the organisation of the data collection (Bryman, 1988); the collection of field notes as an active observation, the collection of secondary observer field notes, discussion of the field notes and transcription as soon as possible after the event, and journals of the coding
formats (Bryman, 1988; Hammersley, 1992; Spradley, 1979; and Kirk and Millar, 1986).

Hammersley (1990) describes validity as a true record of what was spoken and intended, and truth as ‘the extent to which an account accurately represents the social phenomena to which it refers’. The validity of this study is enhanced by:

a. Analysis of the UK pilot studies to compare health and social care
b. Comparison of four different EU sources
c. Comparison of two expert focus groups against practitioner data
d. Flexibility to allow the participants to create an individual set of preferred outcomes on Sheet 1 (Generation of ideas)
e. Secondary selection of documented outcomes on the repeated Sheet 2
f. Inclusion of all written outcomes in the discussion forum allowed all opinions and options to be analysed (Recording of ideas)
g. Comparison of the discussion group transcripts and the ranked outcomes from Sheet 3 (Clarification against voting)
h. Expert review of findings (EPPHE panel, Nov 2009, Chapter 5)

Silverman (2001:p233) would suggest that by addressing the areas of analytic induction, constant comparison and comprehensive data treatment this study design allows a high level of strength, and the derived set of definitions for the required outcomes should be ‘generalizable’ to the wider field of patient handling advisors. Table 3.3 shows how the procedures in this study meet the different validation methods.

Table 3.3 Methods to improve ‘generalizability’. (From Silverman 2001)

<table>
<thead>
<tr>
<th>Method</th>
<th>Study response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analytic induction</td>
<td>d, e</td>
</tr>
<tr>
<td>Constant comparison</td>
<td>c, f, g, h</td>
</tr>
<tr>
<td>Comprehensive data treatment</td>
<td>a, b</td>
</tr>
</tbody>
</table>
3.5 Summary

The methods described use the opinion and considerations of PHA’s from four EU countries to develop a prioritised list of outcomes from patient handling interventions. All focus group discussions were completed in the host language, with translated documentation and a local facilitator. The discussions were interpreted in real time for the primary researcher, and the audiotape of the discussion was translated independently. The data collection has taken guidance from many publications to enhance the reliability and validity of the data that is collected. The results of the focus groups are presented in Sections 3.6 and 3.7.

3.6 Focus group results. Pilot studies

The results from the different focus groups will be reported in this section. The two sets of pilot studies will be briefly discussed to show the reliability and validity in the data collection methods and the four EU groups will be discussed in detail in the later sections. The pilot study review will cover only the documented responses to Sheets 1 and 3. The full analysis of the transcript will be included in the EU study (Section 3.7). The analysis will indicate that repeated comparisons of the data were completed to improve the validity of the findings.

3.6.1 Pilot focus group 1. Health and social care

Two UK pilot focus group interviews were completed as described in 3.3.1, containing participants from acute healthcare and long-term health or social care separately. The aim of this initial pilot was to compare the data from the two groups of participants (Figure 3.3).

3.6.1.1 Participants

The participants all completed the appropriate consent agreements before the interview. The selection criteria, for the group were based on a convenience sample of people who volunteered through a geographical special interest group. One focus group recruited eight PHAs from acute healthcare hospitals.
The eight participants represented six different organisations from Sheffield, Chesterfield, Birmingham, Derby, Mansfield and Leicester. All were employed in their organisations as PHAs at various levels and with varied experience. The second focus group recruited 6 participants from the long-term care sector. The six participants represented three organisations, one from NHS primary care, three from social services care and two from educational services. Geographically they represented Derbyshire and Nottinghamshire. One of the social services representatives was less experienced than the general group but was employed part time as a PHA. This participants notes lacked detail compared to the other members of the group.

Data were collected from all participants for all three stages. In addition notes were collected by an independent observer for both groups, to analyse the process and content of the group (Appendix D). Each of the focus groups was completed in a timely fashion and the allotted time of 2 hours was sufficient. All data sheets were numbered with the participant table position, and no personal details were recorded on the data sheets. The researcher recorded the table position and individual to facilitate the transcription. As the researcher knew the group, a personal occupational and educational history was collected retrospectively to complete the data set.

3.6.1.2 Idea Generation (Sheet 1)
Sheet 1 was structured by the beneficiary status recorded from the literature review i.e. organisational, staff, patient and task performance. The results from Sheet 1 were reviewed during the focus group to create the discussion point list, and after the focus group session to ensure inclusion of all outcomes. The recorded outcomes are shown below in Tables 3.4 to 3.7, being grouped by the beneficiaries. Each of the tables compares findings from the acute health group relative to the long term care group.
Table 3.4 UK Pilot: Organisational Outcomes

<table>
<thead>
<tr>
<th>Theme</th>
<th>Acute Health Care</th>
<th>Long Term Health or Social Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff accidents or absence</td>
<td>Sickness absence</td>
<td>Financial costs of staff</td>
</tr>
<tr>
<td></td>
<td>Accident reports</td>
<td>Loss of experience</td>
</tr>
<tr>
<td></td>
<td>Replacement staff costs – Retention</td>
<td>Staff turnover</td>
</tr>
<tr>
<td>Costs of litigation</td>
<td>Decreased Litigation</td>
<td>Absence</td>
</tr>
<tr>
<td>Others</td>
<td>Compliance</td>
<td>Return to work data</td>
</tr>
<tr>
<td></td>
<td>Bed Blocking</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No of risk assessments</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Patient complaints</td>
<td></td>
</tr>
</tbody>
</table>

Outcomes related to the frequency and costs of accidents and sickness absence were important in both groups (Table 3.4). The language used by the groups varied a little, with the long-term care group being more financially oriented in the wording. For example, social care is self-insured under local council schemes that may account for a different focus. Patient complaints and the function of delayed discharge were core to the acute health group.

Table 3.5 UK Pilot: Staff Outcomes

<table>
<thead>
<tr>
<th>Theme</th>
<th>Acute Health Care</th>
<th>Long Term Health or Social Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff accidents or absence</td>
<td>Incidents and accident figures</td>
<td>Decreased Injury and absence</td>
</tr>
<tr>
<td></td>
<td>Injuries</td>
<td>Occupational health data</td>
</tr>
<tr>
<td></td>
<td>Treatment services and outcomes</td>
<td>Health</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment provision</td>
<td>Equipment provision</td>
<td>Equipment provision</td>
</tr>
<tr>
<td>Staff perception</td>
<td>Staff feel valued</td>
<td>Decreased effort RPE</td>
</tr>
<tr>
<td></td>
<td>Fatigue</td>
<td>Confidence in methods</td>
</tr>
<tr>
<td></td>
<td>Job satisfaction</td>
<td>Discomfort</td>
</tr>
<tr>
<td>Training outcomes / behaviour</td>
<td>Training figures</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Knowledge and training records</td>
<td>Level of supervision</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Comply with training</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quality and style of</td>
</tr>
</tbody>
</table>
Table 3.5 shows the staff outcomes. The overlapping of the outcomes is shown in this section. Sickness absence as a staff measure featured strongly from both groups. This shows that there is both an organisational measure and a staff measure for sickness absence. The perception of workload was well represented in both groups, and in part indicates an awareness of psychological factors (e.g. job satisfaction), being valued and physical factors. Some outcomes would fit the description of intervention descriptions, e.g. training numbers/records, in addition to observation values for how the task was completed (See Robson measures section 2b.1.2).

Table 3.6 UK Pilot: Patient Outcomes

<table>
<thead>
<tr>
<th>Theme</th>
<th>Acute Health Care</th>
<th>Long Term Health or Social Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damage to patient</td>
<td>Injury, Shear/friction damage, Infection control measures</td>
<td>Injury, Unsafe</td>
</tr>
<tr>
<td>Patient perception</td>
<td>Comfort, Perceived confidence, Satisfaction</td>
<td>Comfort, Attitude</td>
</tr>
<tr>
<td>Patient condition</td>
<td>Improved patient independence</td>
<td>Improvement in condition, Improved independence, Decreased recovery time</td>
</tr>
<tr>
<td>Others</td>
<td>Decreased complaints, Standardisation of methods</td>
<td>Consistency, Quality of care, Hospital admissions, Audit/feedback</td>
</tr>
</tbody>
</table>

Patient outcomes (Table 3.6) showed considerable similarity across the three areas of damage to the patient, patient perception and the possibility of improving or worsening a patient condition. The introduction of the term ‘quality
of care’ could link with many other outcomes linked with patient perception of patient handling tasks.

Table 3.7 UK Pilot: Performance Outcomes

<table>
<thead>
<tr>
<th>Theme</th>
<th>Acute Health Care</th>
<th>Long Term Health or Social Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Productivity</td>
<td>Speed</td>
<td>Efficiency of time</td>
</tr>
<tr>
<td>Safety and competence</td>
<td>Appropriate use of equipment</td>
<td>Efficiency of effort</td>
</tr>
<tr>
<td></td>
<td>Competence-Skills</td>
<td>Competency</td>
</tr>
<tr>
<td></td>
<td>Safety</td>
<td>Compliance with methods</td>
</tr>
<tr>
<td></td>
<td>Documentation</td>
<td>Decreased incidents</td>
</tr>
<tr>
<td>Others</td>
<td>Use of ergonomics tools</td>
<td>Plans and documents</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Equipment available</td>
</tr>
</tbody>
</table>

The performance outcomes (Table 3.7) showed reduced variation with outcomes for productivity measures, safety and competence, and the documentation of risk assessments or handling plans.

It was found that, throughout the four categories, there was major agreement between the acute healthcare and the longer term health and social care groups, though some specific differences were noted in the definition of the terms. The dual reporting of many outcomes was noted for further consideration (Section 3.7). The identification of different levels of outcome measures (Robson et al., 2007) also was recorded, and what may be perceived as a positive outcome to a PHA may simply be a record of their intervention, rather than an effect of their actions.

3.6.1.3 Voting (Sheet 3)

The scores for the acute and long term groups are recorded in Tables 3.8 and 3.9. At the stage of the pilot focus group analysis all outcomes in Sheet 3 were included, though outcomes that were clearly linked were recorded as the same. For example; patient comfort, dignity, development of independence were all
recorded as patient assessed ‘Quality of Care’ measures. Each participant’s ranking scored 5 points, for the most favoured, and 1 for the least favoured. The scores for each row are added to give a cumulative total.

Table 3.8 Preferred outcomes: Acute health care group

<table>
<thead>
<tr>
<th>Outcome recorded</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce staff MSD and sickness absence</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td></td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>Reduce incidents/accidents</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Appropriate and sufficient equipment/resources</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Quality of care: improve patient comfort, independence dignity</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Decrease patient injury</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Increase compliance with safe systems</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Job satisfaction/morale</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Decrease claims</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Patient satisfaction reduced complaints</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Replacement costs for staff</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Improved risk assessment &amp; documentation</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Attitude to make M&amp;H part of best practice</td>
<td>5</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Improved knowledge/Competence</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Moving and handling as patient safety issue</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Improved insurance rating</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Access to training programmes</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Consistency of care</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Efficiency of performance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Efficiency of performance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Preventative research</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

Table 3.9 Preferred outcomes: Long-term health group

<table>
<thead>
<tr>
<th>Outcome recorded</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>7</th>
<th>8</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce staff MSD and sickness absence</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>8</td>
<td>5</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>Reduce incidents/accidents</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Appropriate and sufficient equipment/resources</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Quality of care: improve patient comfort, independence, dignity</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Decrease patient injury</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Increase compliance with safe systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Job satisfaction/morale</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Decrease claims</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Patient satisfaction reduced complaints</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Replacement costs for staff</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Improved risk assessment &amp; documentation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Attitude to make M&amp;H part of best practice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Improved knowledge/Competence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Moving and handling as patient safety issue</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Improved insurance rating</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Access to training programmes</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Consistency of care</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>Efficiency of performance</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Efficiency of performance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Preventative research</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>
3.6.1.4 Discussion

The format of the focus group interview seemed to be successful, as a large amount of data was collected, and the process allowed the participants to express their own preferred outcomes, both in the discussion forum and in the individual written documentation.

Some general points were identified about the process:

- The completion of Sheets 1 and 2 during the focus group interview gave a good spread of data for discussion.
- There was good agreement between the acute health and long-term social groups.
- Lapses and omissions were corrected in general on Sheet 2.
- Participants with lots of ideas needed two sheets of paper (e.g. Long term group participant 4.)
- Double recording of outcomes was noted across organisation, staff, patient, and performance categories.

The records of the independent observers were scrutinised and the following issues were noted (AH = Acute health group, LT = Long term group):

- The process of creating the list of topics from the collected sheet 1 allowed discussion to flow well (AH).
- There was a clear concern from both groups that measuring the chosen outcomes might be difficult in their organisations (AH, LT).
- Many reasons why the outcomes were not measured were suggested (AH, LT).
- Both observers noted time factors with the additional translation requirements for the EU groups.
- Some participants did not relate to the relationship between interventions and outcomes.

There were some concerns related to the beneficiary categories on Sheet 1 (Generation of ideas). There were discrepancies over the beneficiary category where the outcome was recorded. These differences were also found in the coding of patient handling studies in the literature analysis (Section 2b.4). The
The clearest example was the recording of accidents and musculoskeletal injuries as both organisational and staff outcomes. This indicated that in the main data collection clear definitions had to be developed. The findings showed very close agreement between the two groups for content and breadth of included outcomes.

In the voting stage (Sheet 3) all participants were asked to score the highest five outcomes. The earlier data found there were similarities across the two groups. This was more evident when examining the highest cumulative scores for the two groups. Table 3.10 shows that four of the five highest ranked outcomes are recorded in both groups. Scores are shown as a total score and a percentage for each group.

**Table 3.10 Highest 5 preferred outcomes from cumulative scores**

<table>
<thead>
<tr>
<th></th>
<th>Acute Health Group (N=8) Total (%)</th>
<th>Long Term Health Group (N=6) Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reduce staff MSD and sickness absence 30 (25.0)</td>
<td>Reduce staff MSD and sickness absence 18 (20.0)</td>
</tr>
<tr>
<td>2</td>
<td>Quality of care: improve patient comfort, independence dignity 11 (9.2)</td>
<td>Appropriate and sufficient equipment/resources 12 (13.3)</td>
</tr>
<tr>
<td>3</td>
<td>Improved risk assessment &amp; documentation 11 (9.2)</td>
<td>Quality of care: improve patient comfort, independence dignity 12 (13.3)</td>
</tr>
<tr>
<td>4</td>
<td>Reduce incidents/accidents 10 (8.3)</td>
<td>Job satisfaction/morale 11 (12.2)</td>
</tr>
<tr>
<td>5</td>
<td>Appropriate and sufficient equipment/resources 9 (7.5)</td>
<td>Reduce incidents/accidents 10 (11.1)</td>
</tr>
</tbody>
</table>

It was concluded that due to the similarities in Sheet 1 and Sheet 3, the EU groups could accept PHA from acute and long-term health backgrounds. The breadth and conformity of the list of outcomes also indicated that it would be suitable to merge the two UK pilots together, and include them in the full study.

### 3.6.2 Pilot focus group 2. Expert focus groups

Two expert panel focus groups were completed in Athens, Greece in 2007 and Boston, USA in 2007. The expert panel focus groups were recorded and analysed in the same way as described earlier (Section 3.3.1). Both expert panels were facilitated by the lead researcher (MF).
3.6.2.1 Participants

Information was not collected about the experience and qualifications of the expert panel as the participants were representatives on the EPPHE, or people who were either presenting or attending an international research conference. The Athens expert panel had representation from groups that have developed certain tools and risk indices to measure the outcomes of patient handling. The participants in the two expert panels are in Table 3.11.

**Table 3.11 Participants for Expert Groups**

<table>
<thead>
<tr>
<th>Focus Group</th>
<th>No. participants</th>
<th>Countries Represented</th>
<th>Observers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Athens, Greece</td>
<td>5</td>
<td>Italy 3 (EU facilitator) Finland 1 (EU facilitator)</td>
<td>SH (LU, UK)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Netherlands 1</td>
<td>EW (Arjo NL)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>LS (Arjo SW)</td>
</tr>
<tr>
<td>Boston USA</td>
<td>5</td>
<td>Germany 1</td>
<td>SH (LU, UK)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>USA 1</td>
<td>LTP (Finland)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Belgium 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Portugal 1 (EU facilitator)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Australia 1</td>
<td></td>
</tr>
</tbody>
</table>

3.6.2.2 Idea Generation (Sheet 1)

As expected, there was a slightly different focus from these more academic individuals. Table 3.12 shows there was still a focus on the sickness absence data, but there was more discussion about how and what would be measured. There was a long discussion regarding the benefits and problems of the MSD prevalence as an outcome leading to the costs, and the financial burden of high accident rates, and high MSD rates as the most frequently recorded outcomes. Participants from Germany and Belgium (Boston Panel) both registered the audit and accreditation process that was specific to their own health care systems. The Athens panel recorded both safety culture and quality of care as organisational intervention measures, which differs from the previous pilot study.
Table 3.12 Expert Pilots: Organisational Outcomes

<table>
<thead>
<tr>
<th>Theme</th>
<th>Athens Panel</th>
<th>Boston Panel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff accidents or absence</td>
<td>Sickness leave</td>
<td>Health status</td>
</tr>
<tr>
<td></td>
<td>Increased worker fitness</td>
<td>Decreased MSD rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Retirement/leaving post</td>
</tr>
<tr>
<td>Costs of litigation</td>
<td>Decreased claims</td>
<td>Costs of absence</td>
</tr>
<tr>
<td></td>
<td>Decreased patient claims</td>
<td>Costs of Training</td>
</tr>
<tr>
<td>Financial</td>
<td>Cost benefit overtime</td>
<td>Compensation costs</td>
</tr>
<tr>
<td></td>
<td>Productivity</td>
<td>Image of organisation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accreditation/audit/screening</td>
</tr>
<tr>
<td>Organisational values</td>
<td>Quality of care</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Safety culture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Decreased exposure to tasks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Policy</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.13 Expert Pilots: Staff Outcomes

<table>
<thead>
<tr>
<th>Theme</th>
<th>Athens Panel</th>
<th>Boston Panel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff accidents or absence</td>
<td>MSD symptoms</td>
<td>No of accidents/incidents</td>
</tr>
<tr>
<td></td>
<td>Injuries</td>
<td>MSD’s</td>
</tr>
<tr>
<td></td>
<td>Health measures</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Decreased back pain</td>
<td></td>
</tr>
<tr>
<td>Risk indices</td>
<td>MAPO index score</td>
<td>% control measures</td>
</tr>
<tr>
<td></td>
<td>Risk index</td>
<td>implemented</td>
</tr>
<tr>
<td>Physical observation</td>
<td>Comfort</td>
<td>Discomfort</td>
</tr>
<tr>
<td></td>
<td>Postures</td>
<td>Posture</td>
</tr>
<tr>
<td></td>
<td>Subjective response</td>
<td>Time stress</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Weight lifted</td>
</tr>
<tr>
<td>Equipment</td>
<td>Use of equipment</td>
<td>Acceptance</td>
</tr>
<tr>
<td></td>
<td>Compliance</td>
<td>Use of equipment</td>
</tr>
<tr>
<td></td>
<td>Training skills</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td>Workplace surveys</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Satisfaction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decreased complaints</td>
</tr>
</tbody>
</table>
Table 3.13 shows the outcomes recorded as benefitting the staff. There was a focus on the provision and use of equipment. The research evidence has suggested that equipment provision and use, reduce the effect of biomechanical loading, and in particular the lifting component. This is an interesting concept and one for further discussion in the full evaluation of the priority outcomes (Section 3.8.8). The panel discussed a mix of MSD outcomes versus the physical exposure measures of force and postures. These two outcomes are separated by the Robson classification, as MSD outcomes is a real measure in the target population (level 3), and reduced exposure to physical risk is not (level 2) (Robson et al., 2007).

**Table 3.14 Expert Pilots: Patient Outcomes**

<table>
<thead>
<tr>
<th>Theme</th>
<th>Athens Panel</th>
<th>Boston Panel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient perception</td>
<td>Safety</td>
<td>Fear/Safety</td>
</tr>
<tr>
<td>Patient injury/accident</td>
<td>Perceived satisfaction</td>
<td>Anxiety</td>
</tr>
<tr>
<td>Patient condition</td>
<td>Well being</td>
<td>Acceptance</td>
</tr>
<tr>
<td></td>
<td>Quality of care</td>
<td>Understanding</td>
</tr>
<tr>
<td></td>
<td>Injury/damage</td>
<td>Quality of care</td>
</tr>
<tr>
<td></td>
<td>MSD’s</td>
<td>Falls</td>
</tr>
<tr>
<td></td>
<td>Falls accidents</td>
<td>Skin condition / tears/ ulcers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mobility</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Night disturbances</td>
</tr>
</tbody>
</table>

Patient outcomes (Table 3.14) showed much similarity across three areas of patient injury, patient perception and the possibility of improving or worsening a patient condition. Further discussion in the focus group again raised concern about how the measures would be calculated, as there was a clear understanding of the complexities of apportioning the cause of patient condition to a single factor. This did not reduce the wish of the groups to have a measure of patient factors as an assessment tool. Table 3.15 showed agreement in outcomes recorded against task performance, where competence and compliance and efficient work practices were important.
Table 3.15 Expert Pilots: Task Performance Outcomes

<table>
<thead>
<tr>
<th>Theme</th>
<th>Athens Panel</th>
<th>Boston Panel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method of completing task</td>
<td>Compliance with procedures</td>
<td>Compliance</td>
</tr>
<tr>
<td></td>
<td>Use of equipment</td>
<td>Competence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Assessment systems</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Professionalism</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Efficiency</td>
</tr>
</tbody>
</table>

3.6.2.3 Voting (Sheet 3)
The expert panel data was combined to give a single set of scores and is presented and discussed in section 3.9.

3.6.2.4 Discussion
There was a small change in the focus of the comments recorded in these expert panels, but many similarities in the topics in the UK pilot focus groups.

The expert panels were different to the UK Pilot focus groups, and some important findings were recorded in the field notes (Appendix D), for example:

- Some participants raised the concern that their responses would be different if they considered the questions as a researcher or as a practitioner. It was the perception of the researcher (MF) that these concepts were the same, as measuring the outcomes from a patient handling intervention do not rely on what intervention takes place. The group discussed the role of the scenario and understood that they were not to design the intervention, but outline methods for measurement of the improvements.

- Two of the participants needed a translator and consequently could not enter the discussion as freely as others.

- One participant had major difficulties with the concepts expected in the focus group. The responses to Sheet 1 spread over four pages and were a mixture of management targets, intervention strategies and very specific outcome measures. For example ‘The money available dictates the type of intervention’ and ‘the type of intervention dictates the type of measures used’. This participant also could not complete the ranked
selection (Sheet 3), and commented that they ‘felt pressured into giving answers that were not correct’ and felt ‘pressed through a channel’.

- The comments from this participant suggested that there were significant differences in some countries in the role of the PHA, which may prove to be confounding. These difficulties caused that participant's information to be removed from the analysis, and any follow up research would not be completed in that country until the full IET had been developed and proven in other locations.

- The independent observer considered that the scenario was unnecessary for the expert panels, as they had sufficient skills and knowledge to discuss the issues without prompting. This possibly raises concerns over the alignment of expert against practitioner data.

3.6.2.5 Facilitator experience

The Finnish (LTP) and Italian (NB and OM) facilitators attended the Athens panel and the Portugal (TC) facilitator attended the Boston panel. The Finnish facilitator also assisted with the Boston panel. A debriefing session was held for the facilitators after the discussion. All agreed to continue with the project, identified the need to be involved with the translation process for the documentation, and agreed to locate participant groups based on the information provided.

3.6.3 Summary of pilot studies

The use of four pilot focus groups improved the data collection procedure. The comparison between the acute health and long-term health groups in the UK found that the preferred outcomes were similar in the two areas, so future focus groups could combine PHAs from both sectors. As there were no structural changes to the data collection procedure, the two UK pilot groups were compiled and used as the UK data set (3.7). The data from the two expert focus groups were included in the analysis as a comparison with the four EU groups (3.7).
3.7 EU focus groups results

The role of the PHA and the experience and function of the role are different across the EU (Hignett et al., 2007). The qualitative approach used in this study, allowed different countries and levels of PHA to be involved in the definition of the important outcomes. The aim of these focus groups was to record the important outcome measures to the participants, and create a prioritised order from the combined data.

Initially a brief overview of the structure, process and demographics of the participants will be reported. The findings of the focus groups are then presented in the structure from section 3.6.1, i.e. organisation, staff, patient, task and other outcomes of importance.

The outcomes recorded from the focus group participants during the stages of generation and clarification, (Sheet 1 and the transcript analyses) were analysed to develop a fully inclusive list of outcome themes. Secondly, the voting process is described to refine the definitions and rank the selected outcomes, to develop a final list of outcomes for the next stage of the project

3.7.1 Introduction

The EU focus groups were facilitated by members of the EPPHE on a voluntary basis. Each facilitator chose their own venue and provided suitable arrangements for the group. The facilitator made contact with the participants and completed all communication relating to the focus group, using the translated documentation. Table 3.16 shows the facilitators, locations and participants in the groups
Table 3.16 Facilitators and locations for focus groups

<table>
<thead>
<tr>
<th>Country</th>
<th>Facilitator</th>
<th>Location</th>
<th>Observers</th>
<th>Numbers attending.</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>Mike Fray</td>
<td>Loughborough University</td>
<td>SH, AJ, AT</td>
<td>14</td>
</tr>
<tr>
<td>Finland</td>
<td>Leena Tamminen-Peter</td>
<td>Finnish Institute of Occupational Health, Helsinki</td>
<td>MF, SH</td>
<td>7</td>
</tr>
<tr>
<td>Portugal</td>
<td>Teresa Cotrim</td>
<td>University Hospital, Lisbon</td>
<td>MF, SH</td>
<td>7</td>
</tr>
<tr>
<td>Italy</td>
<td>Olga Menoni</td>
<td>EPM, University of Milan</td>
<td>MF, NB</td>
<td>8</td>
</tr>
</tbody>
</table>

3.7.2 Participant demographics

The composition of each group was selected by availability to attend and willingness to travel for the meeting, as no financial support could be provided. A short questionnaire recording experience was completed by all participants (Appendix C). The information for the UK group was collected retrospectively via personal communication with the researcher.

Table 3.17 Experience of the participants.

<table>
<thead>
<tr>
<th>Classification</th>
<th>UK</th>
<th>Finland</th>
<th>Portugal</th>
<th>Italy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profession</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurse</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Physiotherapist</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Occup. Therapist</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Occup. Physiotherapist</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occup. Physician</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Training</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Postgraduate course</td>
<td>10</td>
<td>2</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>PH training qualification</td>
<td>8</td>
<td>1</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Short courses</td>
<td>12</td>
<td>5</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>No specialist training</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Experience (Years)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3-5</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5+</td>
<td>12</td>
<td>4</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Is PH part of your job</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Small part</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major part</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>10</td>
<td></td>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>
The professions and different qualifications of the participants are recorded in Table 3.17. Most were health care professionals. The Finland group requested that occupational physiotherapist be considered as a different category, because they have a different qualification route to physiotherapists. Two of the Portugal group were not healthcare trained. One was an ergonomist and one was an occupational health and safety (OHS) technician. The Italy group had the largest range of qualifications with one nurse; two safety officers, one work inspector, and four occupational physicians. The UK group had a large number of non-qualified healthcare practitioners (7) mostly within the social care practitioners. These were either professional trainers specialising in patient handling, or social services carers who had developed in the PHA role.

The professional groups recorded in Table 3.17, indicated the kind of training given for patient handling or ergonomics skills. More participants in Italy and UK recorded the completion of postgraduate programmes and PH training qualifications, but almost half of the Finland and Portugal group also confirmed this higher level of training. Differences were identified in the availability of higher-level postgraduate programmes in the UK, and the requirements of occupational physicians to attend postgraduate programmes.

Only five participants from the sample had less than two years experience in their current job role and 75% (27/36) had over 5 years experience. The participants were mostly involved in the management and prevention of patient handling injuries. Only 8% (3/33) reported patient handling as a small part of their usual job role, with 92% reporting this as either a major part or their entire job role.

In summary, the participants in the four EU focus groups fulfilled the requirements of the study, and showed that they were educated to provide advice on patient handling and ergonomics. They were involved in the process of managing patient handling risks, and were experienced in that role.
3.7.3. Focus group procedure

All the data were collected by the procedure outlined in Section 3.3. For clarity, the presentation of information from the focus groups will follow the conventions in Figure 3.5. The findings from all focus groups can be found in Appendix E, where the content of each discussion is related to the outcomes registered in the analysis of the generation of ideas.

<table>
<thead>
<tr>
<th>Focus groups</th>
<th>Terminology</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK Acute health</td>
<td>UKAH</td>
</tr>
<tr>
<td>UK Long term health</td>
<td>UKLT</td>
</tr>
<tr>
<td>UK Combined</td>
<td>UK</td>
</tr>
<tr>
<td>Expert Athens</td>
<td>ExpA</td>
</tr>
<tr>
<td>Expert Boston</td>
<td>ExpB</td>
</tr>
<tr>
<td>Expert Combined</td>
<td>Exp</td>
</tr>
<tr>
<td>Finland</td>
<td>Fi</td>
</tr>
<tr>
<td>Portugal</td>
<td>Po</td>
</tr>
<tr>
<td>Italy</td>
<td>It</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Participants</th>
<th>Group name and place number. (E.g. Fi, 7)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Quotes</th>
<th>Comments from transcriptions</th>
<th>Group name and page number from NVivo reports (e.g. It, p27)</th>
</tr>
</thead>
</table>

Figure 3.5 Terminology for describing focus group data

3.7.3.1 Generation of ideas (Sheet 1)

The first opportunity for the participants to record their preferred outcomes was during the generation of ideas phase on Sheet 1. During the focus group, the EU facilitator and MF reviewed all Sheet 1 data to create the discussion structure. The completed sheet 1s were analysed again for content and theme after the focus group to check for errors or omissions. The information presented in this section compares the included list of outcomes for the four EU groups including the compiled Expert group data. The thematic analysis compares and links the individual comments to create an overview of the outcomes recorded on Sheet 1. During this first analysis no exclusion criteria were used, and all documented comments were considered.
The structure of the focus groups and the development of the scenario assisted the participants to consider the outcome measures in the written documentation and the discussion. The homogeneity of the participants also facilitated discussion, as many of the participants were contemporaries with shared interests, locations and job roles. There was a wide variety of outcomes recorded by all the groups. The UK groups had the lowest number of outcomes per participant (4.29), and the highest were in the Portugal (5.71) and Italy (6.5) groups. Some repetition was recorded in the outcomes from the larger groups. The outcomes from Sheet 1 were analysed for content and themes to give definitions of the outcomes. The data is presented in the four categories defined on the data collection sheets (Table 3.18).

<table>
<thead>
<tr>
<th>Participants</th>
<th>UK</th>
<th>Fi</th>
<th>Po</th>
<th>It</th>
<th>Exp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisation</td>
<td>14</td>
<td>13</td>
<td>12</td>
<td>11</td>
<td>18</td>
</tr>
<tr>
<td>Staff</td>
<td>20</td>
<td>9</td>
<td>9</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td>Patient</td>
<td>12</td>
<td>8</td>
<td>9</td>
<td>13</td>
<td>11</td>
</tr>
<tr>
<td>Task performance</td>
<td>8</td>
<td>9</td>
<td>6</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>Others</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>58</td>
<td>42</td>
<td>40</td>
<td>51</td>
<td>56</td>
</tr>
</tbody>
</table>

Both the UK and Italy groups recorded more staff outcomes than organisational outcomes. The ratios of patient outcomes were similar across the four groups. The UK group recorded less task performance data than the other three groups. Both Finland and Italy recorded almost 25% of their outcomes in this section. The overview of outcomes recorded in each section shows some of the variations between the countries. The difference in focus may be due to cultural, organisational or individual differences but this was not part of this study.

3.7.3.2 Clarification of ideas: Analysis of Transcribed Focus Groups

Each focus group was analysed under the same conditions to maintain the accuracy of the content. The UK and expert groups were transcribed by professional service and the transcript checked by the researcher twice. The
foreign language groups were sent for separate transcription and translation with external professional services. The audiotapes recorded the whispering interpreter alongside the foreign language discussion and did not allow for separate transcription and translation. The transcription services provided a foreign language transcript, and a single translation using both the foreign language version and the whispering interpreter information. The researcher clarified the transcription twice in line with the real time interpreter, to mirror the analysis of the UK tapes.

The clarified transcripts were coded using the NVivo7 (QSR International 2006). The transcripts were coded individually for all aspects of outcomes and interventions. The coding structure used the organisation, staff, patient and task categories. The analysis of the generation (Sheet 1) and clarification (Sheet 2 and discussion) stages was used to define the most important outcome themes for the participants. These important themes were then taken forward to the voting stage (Sheet 3).

3.7.4 Organisational Outcomes (Figure 3.6)

3.7.4.1 Generation of ideas (Sheet 1)

The most frequently recorded and clearly described outcomes were incident/accident figures, and the resulting sickness absence or losses from musculoskeletal health changes. This is not surprising given the focus of the manual handling regulations from the EU directive, as an extension of occupational health and safety regulation. The outcome measures identified for the measurement of MSDs were comprehensive, including staff turnover, recruitment costs, loss of experience and the relocation of staff to other areas. The sickness outcomes were clearly linked to the measures of financial impact on the organisation. Only the UK and Expert groups identified the compensation culture and litigation as possible financial outcomes. There was a lack of detail in the costs section from the Finland, Portugal and Italy groups, which could be due to the role of the participants in their hospital system, e.g. level of management. Reference was made to MSD and accidents in the staff section, but the focus of those definitions was on the personal impact of the accident or injury.
All groups identified the ratio of staff numbers to dependent patients in delivering appropriate care as an outcome. The relationship of staff to numbers of dependent patients was a topic for discussion in Portugal and Italy in particular (See 3.7.4.2).

The management of risks and the delivery of safe systems as an outcome were clearly identified e.g. improvements in risk management and risk assessment systems. There was awareness that organisational behaviour and systems with respect to policies, roles and safety culture were measurable outcomes. Finland included an interesting outcome of ‘management commitment’ by almost all participants in that group. Discussion with the facilitator (LTP) clarified that this relates very closely to organisational behaviour and the showing of a strong level of management commitment to control the PH risks.

Behaviour was also identified at an individual level through the measure of compliance, relating to participants in terms of the provision of training and recording of training outcomes. External reputation of the organisation was also recognised as an outcome in three groups. Finland, Portugal and the Expert group all recorded ‘image’ as an outcome, with Australia and Germany participants recording accreditation as a system that was already in place. The UK and Portugal recorded patient or staff satisfaction as organisational issues, though they occurred again in later sections of the study.
<table>
<thead>
<tr>
<th>Theme</th>
<th>UK</th>
<th>Finland</th>
<th>Portugal</th>
<th>Italy</th>
<th>Expert</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Absence or staff health</strong></td>
<td>Sickness absence</td>
<td>Accident figures</td>
<td>Accident numbers</td>
<td>Numbers of accidents</td>
<td>Sickness leave</td>
</tr>
<tr>
<td></td>
<td>Replacement staff costs</td>
<td></td>
<td></td>
<td></td>
<td>Increased worker fitness</td>
</tr>
<tr>
<td></td>
<td>• Turnover</td>
<td></td>
<td></td>
<td></td>
<td>Health status</td>
</tr>
<tr>
<td></td>
<td>• Loss of experience</td>
<td></td>
<td></td>
<td></td>
<td>Decreased MSD rate</td>
</tr>
<tr>
<td></td>
<td>Return to work</td>
<td></td>
<td></td>
<td></td>
<td>Retirement/ Leaving post</td>
</tr>
<tr>
<td></td>
<td>Recruitment costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sickness Leave</td>
<td>Increased productivity</td>
<td>Return to work</td>
<td>Turnover of staff</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Decrease sickness</td>
<td>• Decreased turnover</td>
<td>• Moving or leaving</td>
<td>• Decreasing hours</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Decreased turnover</td>
<td>• Improved well being</td>
<td>• Job displacement</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Alternative work</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Injury numbers</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Absenteeism</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Severity</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Length of illness</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Financial costs</strong></td>
<td>Financial</td>
<td>Costs</td>
<td>Costs</td>
<td>Costs/expenses</td>
<td>Decreased claims/compensation</td>
</tr>
<tr>
<td></td>
<td>Decreased litigation</td>
<td></td>
<td></td>
<td></td>
<td>Decreased patient claims</td>
</tr>
<tr>
<td></td>
<td>• Insurance</td>
<td></td>
<td></td>
<td></td>
<td>Cost of absence and Training</td>
</tr>
<tr>
<td></td>
<td>• Compensation</td>
<td></td>
<td></td>
<td></td>
<td>Productivity</td>
</tr>
<tr>
<td><strong>Staff ratios for care delivery</strong></td>
<td>Improved environment to deliver care</td>
<td>Staffing numbers</td>
<td>Planning services on patient dependencies</td>
<td>Team work</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Staff numbers</td>
<td>• Less time</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Less staff</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Ratio of staff to patients</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Task analysis</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Amount of work</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Length of shift</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Shift times</td>
<td></td>
</tr>
<tr>
<td><strong>Training skills and compliance</strong></td>
<td>Compliance</td>
<td>Number of people trained</td>
<td>Behaviour</td>
<td>Training numbers</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Lack of training</td>
<td>• Compliance with safe methods</td>
<td>Expert local group (on site)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Quality of training</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Compliance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improved co-operation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Risk management tools</strong></td>
<td>Number of risk assessments</td>
<td>Risk assessment improved</td>
<td>Risk management system</td>
<td>Safety culture</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Risk assessment improved</td>
<td>• Policy</td>
<td>Policy</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Roles and responsibility</td>
<td>• Roles and responsibility</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Participation in risk assessment</td>
<td>• Evaluating risks</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Evaluating risks</td>
<td>• Evaluating risks</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Provision of equipment</strong></td>
<td>Patient complaints</td>
<td>Staff satisfaction</td>
<td>Optimisation of equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Staff morale</td>
<td>“Image”</td>
<td>• Number of aids</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• MAPO</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Work environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Workspace</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Furniture</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Satisfaction and image</strong></td>
<td>Patient complaints</td>
<td>Staff satisfaction</td>
<td>Image of organisation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Staff morale</td>
<td>Patient satisfaction</td>
<td>Accreditation/audit</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Image”</td>
<td>Image in public</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td>Communication</td>
<td>Commitment</td>
<td>Humanisation of care</td>
<td>Quality of care</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Delayed discharge</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 3.6 Matrix of Organisational Outcomes**
3.7.4.2 Transcription analysis (Clarification)

The discussions surrounding organisational issues created more recorded points than the other sections. Some differences were noted in the focus of the discussion, in that some groups discussed the difficulties of implementation (It, Fi) where some held closely to the discussion of outcomes (ExpA, ExpB, UKAH and UKLT).

Safety culture and organisational commitment were described as requiring a management structure to support the process. The involvement of management at all levels (It p6, Po p1, 2, 17, ExpB p2, Fi p3, UKAH p14) was an important consideration. This tied in with the ‘commitment’ term that was specifically included in the Finland group outcomes (Fi p3). The involvement of individuals, management and the financial commitment were all considered as contributions to safety culture. Organisational behaviour was included in the discussion of safety culture and descriptions of compliance with policies and procedures (UKAH p8), and the links with complaints and claims (UKAH p9), were discussed, where individual and organisational behaviour are difficult to separate.

The financial outcomes were universally discussed. In some groups the explanation of each countries sickness benefit structure was a theme explored. There was some understanding that the sickness benefit structures affected the reporting and recording of sickness absence (It p4, Belgium, Germany, Australia, ExpB p2). Costs that were identified as outcomes from MSD in the workplace were; occupational health costs (Fi p6), claims and compensation (ExpB p3, Fi p6), replacement of staff costs (ExpB, Fi p6, UKLT p6, UKAH p4), in addition to regular costs for lost time. The relationship between costs and clinical outcomes was described by delayed discharge or bed-blocking as outcomes of poor PH management (UKAH p6). The use of young inexperienced workers raised concern in Portugal, as evidence was discussed that they leave the profession early (ExpB p4). Both Expert panels made specific judgement on the strength of cost benefit analysis to prove the benefits of PH interventions (ExpA p8, ExpB p3).
Accident numbers and reporting were considered as an organisational outcome. It was valued to allow MSD causation to be investigated (UKAH p3). It was linked with health surveillance as a health outcome (It p4, Po p3), but the precise relationship between incidents and accidents, and the time relationship between cause and effect of injury was thought problematic (Po p5). Direct links were drawn between accidents and the numbers of MSD recorded. Many of the groups discussed MSD rate as an organisational outcome, rather than a staff measure in line with the documented outcomes from Sheet 1. The use of MSD as an outcome measure was considered as of great importance. Many countries reported poor systems of data collection; the UK (UKAH p2, UKLT p2) Belgium, Germany, Portugal (ExpA p2), citing government systems, privacy rules and weak organisational management as causes. Australia and USA (ExpB p2) suggested that government systems related to workers compensation improved the access to MSD numbers and claims. A complication with MSD rate as an outcome measure was the recognised two to four year delay for reductions to appear in the data (ExpA p, Fi p10). It was suggested that a more appropriate measure was the ability to work rather than the inability to work (ExpA p5, Fi p1).

Group ExpA created a definition for the measurement of ‘quality of care’ (ExpA p9, 10) by measures of incontinence accidents, pressure sore prevalence, immobilisation of patients, timely discharge and patient satisfaction. The measure of ‘quality of care’ may be different in each type of unit as they have different aims and objectives, and the use of targets for quality of care measures may have a relationship with workload and staff numbers.

The morale of the organisation was discussed as an important outcome, but included many factors and interactions. It was suggested that there is a link between positive communication and feedback (UKLT p10-11); staff reporting feeling cared for (UKAH p5), involvement in and support of training, and in reasonable workload (Fi p1) and the level of morale. Morale as a measure also had suggested links with decreased MSD and job satisfaction (ExpA p7), and recruitment and retention of staff, which in turn has an effect on the external image of the organisation (Fi p1).
3.7.5 Staff Outcomes (Figure 3.7)

3.7.5.1 Generation of ideas (Sheet 1)

The focus in staff outcomes clearly centred on the recording of changes to the health status of care workers, including outcomes of the injury to the individual, severity and how the injury affected the person’s ability to work. The role of occupational health provision was well represented, including referrals to physician, treatment services, and physiotherapy. There was less focus on specific measures of musculoskeletal risks than would have been expected, though volume of work, postures, loads and physiological observations were all recorded. The UK recorded few physical exposure measures, perhaps suggesting that the focus of the UK group was more on the measures of effects rather than the reduction of causal exposures.

There were large numbers of outcomes describing the effects of training and individual behaviour. The identification of skills and compliance with safe systems, in addition to the recording of training, covered both the delivery of training and the recording of attendance numbers through the assessment of knowledge, skills, compliance and confidence. The method and frequency of equipment use was recorded in four groups. There is an interesting question here about the use of equipment as an intervention or as an outcome; it raises the question of knowledge levels and use of risk assessment.

Psychological well-being was included in three of the groups but there was little detail to suggest how it would be calculated. The inclusion of well-being as an outcome from a primarily physical intervention also raises interesting questions. For example, how does the level of psychological well-being mirror the physical demands of a job; and is there a link between the time, emotional and physical stressors found in the care environment.

3.7.5.2 Transcription analysis (Clarification)

Three themes comprised the discussions in the staff outcomes section of the focus groups; MSD measures, the psychological assessment of work, and competence and compliance.
The use of measures of MSD prevalence was widely recorded as an aim for the PHA (ExpB p6, It p8, Fi p10). Some suggested that insurance data could be used in this calculation (ExpA p17, Po p7). Only ExpA (p14) suggested the use of the Nordic questionnaire as a suitable data collection tool. Other measures of the effects of MSD were in recording treatment numbers in occupational health or physiotherapy services (UKAH p16, UKLT p15, 19) and the use of the return to work procedures as a record of problems (UKAH p18, Po p20).

Debate against the use of MSD prevalence was suggested by the use of measures of MS health rather than injury, which has similarities to the concerns in section 3.7.4.2 outlined previously (UKLT p13, 15, 18, Po p18). The relationship with an aging workforce (Fi p10) was also indicated as having a confounding effect on the measure, but experience could also be considered. The use of occupational health information may be unsatisfactory, as staff perception of that role differs between countries (UKLT p19). An interesting extension of the role of the PHA and training was the identification that staff unfit to complete the training exercises in patient handling are unfit for work (UKLT p17).

The psychological aspects of work suggested measures for fatigue and subjective evaluations of the work (UKAH p18, UKLT p13, ExpB p8). More consideration was described surrounding the subjective measure of workload, and the concepts that could be included in the calculation; staff numbers (UKAH p19), patient dependencies (UKAH p19), and measures of physical workload (ExpB p9, 11, Fi p12, UKLT p13). The physiotherapist rich group in Finland drew attention to the consideration of the relationship between staff fitness and the effects of workload (Fi p12).

Most groups considered the recording and measurement of staff behaviour in the forms of competence and compliance (UKAH p24, 25, Exp p18, It p8, 14). The descriptions suggested the assessment of performance against levels of skill, knowledge, use of equipment, and in particular against the documented patient handling risk assessment by observation (UKLT p20, Po p6, Fi p13). The ExpA group identified the role of supervision and observation of
competence as important to be completed by a local person as part of the management structure (ExpA p18), and to be supported by positive feedback (ExpA p19). Agreement with the local supervisor role was found (UKAH p42). It was noted that the measure of compliance could not be replaced by the provision of equipment, as having equipment does not reliably show changes in behaviour (Fi p15). The understanding across the groups was that there was relationship between safe behaviour, the reduction of MSD prevalence and ‘quality of care’.
<table>
<thead>
<tr>
<th>Theme</th>
<th>UK</th>
<th>Finland</th>
<th>Portugal</th>
<th>Italy</th>
<th>Expert</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incidents and accidents</td>
<td>Incidents and accidents</td>
<td></td>
<td></td>
<td>Number of accidents</td>
<td>No Incidents / Accidents</td>
</tr>
<tr>
<td>MSD measures</td>
<td>Injuries and absence Discomfort</td>
<td>Treatment services for staff</td>
<td>Stress Index</td>
<td>Increased physical capacity</td>
<td>Amount of diseases and injuries</td>
</tr>
<tr>
<td></td>
<td>Fatigue</td>
<td>Fatigue</td>
<td>Musculoskeletal symptoms</td>
<td>Strength</td>
<td>Low back injuries</td>
</tr>
<tr>
<td></td>
<td>Occupational health data</td>
<td></td>
<td>Personal effect</td>
<td>Endurance</td>
<td>Changes in health</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Workability Index</td>
<td>Work capacity</td>
<td>Sick leave</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Physical condition</td>
<td>Job rotation</td>
<td>Referral to Occupational Physician</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Health surveillance</td>
<td>Staff not fit for jobs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Risk exposure</td>
<td>Substitution of staff to replace illness</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Work related ill health</td>
<td></td>
</tr>
<tr>
<td>Exposure measures</td>
<td>Decreased effort Movement</td>
<td>Physical strain</td>
<td>Physical measures</td>
<td>Postures</td>
<td>Risk index from patient handling (MAPO)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Heart rate, EMG</td>
<td>• Posts</td>
<td>Force</td>
<td>Amount of manual handling exposure (MAPO)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Postures for working</td>
<td>• Loads</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Discomfort</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compliance competence and use of</td>
<td>Training figures</td>
<td>Supervision</td>
<td>Supervision of handling</td>
<td>Improved handling skills</td>
<td>Continued training (current)</td>
</tr>
<tr>
<td>equipment</td>
<td>Knowledge and skill level</td>
<td>Safety</td>
<td>Improved handling skills</td>
<td>Improved skill</td>
<td>Use of aids</td>
</tr>
<tr>
<td></td>
<td>Handling culture</td>
<td>Compliance</td>
<td>Training</td>
<td>Improved knowledge</td>
<td>Interviews with staff involved</td>
</tr>
<tr>
<td></td>
<td>Improved communication</td>
<td>• Are people using safe methods</td>
<td>Less risky postures</td>
<td>Adequate equipment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improved confidence</td>
<td>Use of equipment</td>
<td>Improved skill</td>
<td>Using equipment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Supervision</td>
<td></td>
<td>Adequate equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychological well-being</td>
<td>Staff feel valued</td>
<td>Psychological stress</td>
<td>Job satisfaction</td>
<td>Well-being</td>
<td>Satisfaction</td>
</tr>
<tr>
<td></td>
<td>Job satisfaction</td>
<td>• Well-being</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>Policy</td>
<td></td>
<td>Availability of physiotherapy for staff</td>
<td>Interdisciplinary?</td>
<td>Workplace surveys</td>
</tr>
<tr>
<td></td>
<td>Provision of equipment</td>
<td></td>
<td>• Skills mix</td>
<td></td>
<td>Decreased complaints</td>
</tr>
<tr>
<td></td>
<td>• Lack of equipment</td>
<td></td>
<td>• Risk assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Communicate risks</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Training</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 3.7 Matrix for Staff Outcomes**
3.7.6 Patient Outcomes (Figure 3.8)

3.7.6.1 Generation of ideas (Sheet 1)
Previous research has shown that interventions in patient handling do not regularly measure patient outcomes (Fray and Hignett, 2006). All these groups strongly identified patient outcomes as being important. The outcomes were presented under four themes: patient injuries, patient perception, patient condition and quality of care.

The first group of outcomes suggested that handling may be responsible for deleterious effects on the patient being moved, for example lacerations, bruising, shear/friction damage to tissues, and the prevalence of pressure sores. The investigation of causes of patient injuries is complex and multifactorial, but there is some evidence to support the potential for this measure (Haigh, 1993; Waldenstrom and Gottvall, 1991; and Harrison, 2004 and 2009). All groups included the number of falls, which suggests that the management of a patient’s mobility is a key area of success, and falls were recorded as a failure of this process.

The perception of the patient was also widely valued. Comfort and patient satisfaction were recorded in all EU groups. These two leading responses were supported with issues relating to fear, anxiety and the reporting of complaints.

Some positive outcomes described the effect on the patient. Outcomes in this theme suggested that if timely, effective, supportive handling was used then improvements could be seen, in terms of decreased length of stay, improved activity and increased independence of the patient.

The challenging theme was related to ‘quality of care’, which included many factors for its measurement and calculation.

3.7.6.2 Transcription analysis (Clarification)
In a similar way to the documented record, the largest contributor to the data was the problems that poor handling may deliver to the patient. Measures of possible damage to the patient were; injuries and accidents (UKAH p27, It
p16, Fi p17), tissue viability or the prevalence of pressure ulcers (UKAH p29, ExpA p13, Exp p12), cross infection (UKAH p29), bruising (UKLT p27), lacerations (UKLT p27), falls (UKLT p27, ExpB p12, It p16, Po p13, Fi p17). In comparison the PHAs perceived that positive patient handling could contribute to the treatment and rehabilitation of patients. Outcomes that measure the improvement in function and changes in the dependency levels were reported (UKAH p29, UKLT p28, ExpB p14, Fi p6).

The perception of the quality of the transfers and the delivery of care in general also were considered by the groups as a method to measure patient outcomes. Organisationally the recording of patient complaints (UKAH p26, Po p13) was suggested, against the more subjective personal assessments of comfort, fear or anxiety (Exp p13). These could also be added to the measure of patient satisfaction that implied a greater understanding of the actions of patient handling (It p16, Po p13). The clearest definition of this was presented in ExpA (p11), where it was suggested the assessment of patient handling performance by the patient might reveal that staff who handle patients poorly manually also deliver poor quality care with equipment.

The interaction across beneficiary sections of the measure of ‘quality of care’ was recognised in discussions in the patient outcomes section. The organisation requires a measure of quality to be judged with and compared against other providers. Nursing and care staff need a measure of care in the same way that the PHA does to show a high level of patient care. The complexity of this multi-factorial concept ultimately lies in the assessment and judgement of the patient and it needs to be clarified how these different factors can be amalgamated to make a realistic measure of patient handling quality of care (Section 3.8.6).
<table>
<thead>
<tr>
<th>Theme</th>
<th>UK</th>
<th>Finland</th>
<th>Portugal</th>
<th>Italy</th>
<th>Expert</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patient injuries</strong></td>
<td>Injuries</td>
<td>Falls</td>
<td>Falls</td>
<td>Pressure sore/ulcer</td>
<td>Injury/damage</td>
</tr>
<tr>
<td></td>
<td>Shear/friction</td>
<td>Safety</td>
<td>Pressure care</td>
<td>Problems caused by inappropriate handling</td>
<td>• Skin condition</td>
</tr>
<tr>
<td></td>
<td>Bruising</td>
<td></td>
<td>Safety</td>
<td>• Injuries</td>
<td>• Tears</td>
</tr>
<tr>
<td></td>
<td>Laceration</td>
<td></td>
<td></td>
<td>• Statistical data</td>
<td>• Ulcers</td>
</tr>
<tr>
<td></td>
<td>Falls</td>
<td></td>
<td></td>
<td>• Falls</td>
<td>MSD’s</td>
</tr>
<tr>
<td></td>
<td>Infection control</td>
<td></td>
<td></td>
<td>Number of manual lifts</td>
<td>Falls/accidents</td>
</tr>
<tr>
<td><strong>Patient perception</strong></td>
<td>Comfort</td>
<td>Patient satisfaction</td>
<td>Comfort</td>
<td>Privacy</td>
<td>Safety</td>
</tr>
<tr>
<td></td>
<td>Patient satisfaction</td>
<td></td>
<td>Decreased pain</td>
<td>Patient satisfaction</td>
<td>Perceived satisfaction</td>
</tr>
<tr>
<td></td>
<td>Decreased complaints</td>
<td></td>
<td>Level of satisfaction</td>
<td>Complaints</td>
<td>Well being</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Complaints</td>
<td>Patient accepts/refuses hoist</td>
<td>Fear/safety/anxiety</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Patient accepts/refuses hoist</td>
<td></td>
<td>Understanding</td>
</tr>
<tr>
<td><strong>Patient condition</strong></td>
<td>Patient condition</td>
<td>More activity</td>
<td>Level of participation</td>
<td>Health plan (Care-plan)</td>
<td>Mobility</td>
</tr>
<tr>
<td></td>
<td>Length of stay</td>
<td>Increased independence</td>
<td>Level of dependency</td>
<td>Measure patients abilities</td>
<td>Night disturbances</td>
</tr>
<tr>
<td></td>
<td>Discharge</td>
<td>Increased control</td>
<td>Time spent in hospital</td>
<td>Decreased length of stay</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Re-admission</td>
<td>Functional diagnosis tools</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Recovery time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improved independence</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Quality of care</strong></td>
<td>Standardisation of care</td>
<td>Meeting patient objectives</td>
<td>Quality of care</td>
<td>Care and actions delivered on time</td>
<td>Quality of care</td>
</tr>
<tr>
<td></td>
<td>Confidence in the care</td>
<td>Quality of care</td>
<td></td>
<td>Clinical assessment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quality of care</td>
<td></td>
<td></td>
<td>Legal numbers of staff</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Audit/feedback</td>
<td></td>
<td></td>
<td>• Decreased quality</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Attitude of staff</td>
<td></td>
<td></td>
<td>Uniformity of actions</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3.8 Matrix for Patient Outcomes
<table>
<thead>
<tr>
<th>Theme</th>
<th>UK</th>
<th>Finland</th>
<th>Portugal</th>
<th>Italy</th>
<th>Expert</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compliance with safe methods</td>
<td>Appropriate use of equipment</td>
<td>Agreed method for assisting the patient</td>
<td>Use of equipment</td>
<td>Uniformity of treatment</td>
<td>Compliance with procedures</td>
</tr>
<tr>
<td></td>
<td>Competence/skills</td>
<td>Quality of movement</td>
<td>• Small aids</td>
<td>Work postures adopted</td>
<td>Use of equipment</td>
</tr>
<tr>
<td></td>
<td>Efficiency</td>
<td>• Smooth</td>
<td>• Hoists and slings</td>
<td>Use of aids</td>
<td>Competence</td>
</tr>
<tr>
<td></td>
<td>Time taken</td>
<td>• Co-ordinated</td>
<td></td>
<td>Manual handling actions</td>
<td>Assessment systems</td>
</tr>
<tr>
<td></td>
<td>Movement quality</td>
<td>• Skills</td>
<td></td>
<td>Training</td>
<td>Professionalism systems</td>
</tr>
<tr>
<td></td>
<td>Compliance with methods</td>
<td>Use of equipment</td>
<td></td>
<td>Correct methods for manual handling</td>
<td>Efficiency</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment available</td>
<td>Equipment available</td>
<td>Ergonomie of rooms</td>
<td>Adequate furniture</td>
<td>Bathroom/WC appropriate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Work areas</td>
<td>Space</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Space</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Documentation</td>
<td>Documentation/Plans</td>
<td>Documentation</td>
<td>Clear management</td>
<td>Care-plans</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Good management system</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Support in workplace</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>Use of ergonomics tools</td>
<td>Rehabilitation approach</td>
<td>Decrease time taken</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Safety</td>
<td>• Length of stay</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Speed</td>
<td>Patient safety</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Staff time on wards</td>
<td>Falls and Accidents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Equipment increases time</td>
<td>Professional skills</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Work motivation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Work skills</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Supervisory levels</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Environments</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Custom and practice</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Figure 3.9 Matrix for Task and Other Outcomes |
3.7.7 Task and ‘Other’ Outcomes (Figure 3.9)

3.7.7.1 Generation of ideas (Sheet 1)
The literature review (Table 2b.11) revealed some recorded outcomes that measure qualities or quantities related to the completion of specific patient handling tasks. These were mainly related to time (22 studies) and the number of people required (5 studies). There was a lack of conformity in the outcomes recorded in this section, as some examples measured the intervention rather than an outcome. The importance of the provision of ergonomic environments and suitable equipment, and the need to record and audit clear risk assessment and care-plans were recorded in many sections.

The most popular theme was the relationship between task performance and the concepts of competence and compliance. Many different outcomes were assigned to this theme including assessments of competence, movement quality, use of equipment, and use of correct methods. The measures of time and staff numbers were only mentioned in three cases, time taken and speed (UK) and efficiency (Italy). This suggests that speed is not as important as safety, or the effects recorded on staff, patient etc.

The ‘other’ category was sparsely used and created a wide spread of unrelated items. Most of the outcomes recorded in this section could be attributed to organisational, staff or patient categories, and some met the criterion of being measures of interventions and not outcomes (Table 3.19).

3.7.7.2 Transcription analysis (Clarification)
Due to the inclusion of the task performance outcomes being at the end of the discussion, the contributions were limited, and the focus groups added little to the documented lists of outcomes. Most of the closing discussions concentrated on the barriers to implementation that each of the locations experience, which was not part of this study. The language surrounding the task section caused difficulties especially in the translated groups, as patient handling tasks were not recognised.
Table 3.19  Re-allocation of ‘other’ outcomes

<table>
<thead>
<tr>
<th>Organisational</th>
<th>Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety culture</td>
<td>Use of ergonomics tools</td>
</tr>
<tr>
<td>Risk awareness</td>
<td>Safety</td>
</tr>
<tr>
<td>Cost effectiveness</td>
<td>Professional skills</td>
</tr>
<tr>
<td></td>
<td>Work motivation</td>
</tr>
<tr>
<td></td>
<td>Work skills</td>
</tr>
<tr>
<td></td>
<td>Psychosocial factors</td>
</tr>
<tr>
<td></td>
<td>• Movement</td>
</tr>
<tr>
<td></td>
<td>• Avoidance of hazards</td>
</tr>
<tr>
<td></td>
<td>Fitness</td>
</tr>
<tr>
<td></td>
<td>• Relaxation</td>
</tr>
<tr>
<td></td>
<td>• Lifestyle</td>
</tr>
<tr>
<td></td>
<td>Specific actions</td>
</tr>
<tr>
<td></td>
<td>• Cleaning</td>
</tr>
<tr>
<td></td>
<td>• Toilets</td>
</tr>
<tr>
<td></td>
<td>Psychological well-being of staff</td>
</tr>
<tr>
<td></td>
<td>Health surveillance</td>
</tr>
<tr>
<td></td>
<td>Exposure to tasks</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Patient</th>
<th>Intervention measures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Supervisory levels</td>
</tr>
<tr>
<td></td>
<td>Environments</td>
</tr>
<tr>
<td></td>
<td>Job rotation</td>
</tr>
<tr>
<td></td>
<td>Accessible equipment</td>
</tr>
<tr>
<td></td>
<td>• Storage</td>
</tr>
<tr>
<td></td>
<td>Eliminate tasks</td>
</tr>
<tr>
<td></td>
<td>Space requirements</td>
</tr>
<tr>
<td></td>
<td>Remaining others</td>
</tr>
<tr>
<td></td>
<td>Custom and practice</td>
</tr>
<tr>
<td></td>
<td>Better relationship between staff and patients</td>
</tr>
<tr>
<td></td>
<td>Specific actions</td>
</tr>
<tr>
<td></td>
<td>• Cleaning</td>
</tr>
<tr>
<td></td>
<td>• Toilets</td>
</tr>
</tbody>
</table>

The inclusion of other issues in the closing discussions closely related to the information in Table 3.19 above.

3.8 Important outcomes

The recording of all the important outcomes from four EU, and two Expert sources, through focus group methodologies has allowed a wide range of outcomes to be considered. The analysis has refined the outcomes recorded and aligned them into a series of themes. The original categories of organisation, staff, patient and task have been maintained through the analysis though a number of outcomes, and themes were found to cross those boundaries. During this process some important issues were identified to assist with the interpretation of the findings.
3.8.1 Interventions and outcomes

It was unclear how well the participants of the focus groups understood the relationship between interventions and outcomes. All the research (Chapter 2) records the clear difference between the provision of behavioural, organisational or engineering interventions in the workplace, and measuring the effect of the intervention via a series of recognised outcome measures. Figures 3.5-3.9 show that there are large areas of overlap between the definitions of who benefits from the outcomes defined in this study. Many outcomes were entered against different beneficiaries. Examples are found in descriptions of safe behaviours that could be recorded as a staff, organisational or task performance outcome under ‘compliance’. Organisational behaviour also meets the double entry category, as some participants describe the documented systems as behaviour, and some describe the actions of the staff as the behaviour to range across many beneficiary areas.

There was much confusion in the recorded list of outcomes between the role of intervention and outcome. Some of the outcomes were recorded incorrectly and described the qualities or quantities of an intervention. Some however lacked any clarity and can be considered as both intervention and outcome measures. For example, the provision of training and attendance numbers is clearly a measure of an intervention, whereas an assessment of competence, skills, knowledge or handling methods would be an outcome of the training given. The provision of equipment, or improvements in the environment are engineering based interventions, but the use of equipment could be perceived as compliance with a safe system and is recognised as an individual behavioural outcome. Much of the confusion surrounding the interpretation is related to the cascade effect (3.8.2), and the inter-relationship between the interventions and outcomes, which in many cases form part of a multi-faceted management intervention that gives multi-faceted outcomes. This is complimented in many EU countries by the experience of the PHA, as their role is primarily that of an internal or external advisor. This suggests that they are requested to visit a ward and conduct an analysis of the identified risks and make recommendations for change. Therefore from their advisor perspective, the purchase of equipment or the completion of a training programme is the
result of their intervention, and is measured as an outcome. The development of this measurement tool suggests that all outcomes that are measures of interventions i.e. training details and equipment available, should be removed from Figure 3.4.

3.8.2 Cascade relationships between interventions and outcomes

The cascade relationship is where the change in one outcome can be replicated in another from the same intervention. This inter-relationship of outcomes and interventions was already discussed by Nelson (2006), suggesting that multifactorial interventions give improved outcomes and that all aspects of the management system need to be fulfilled to get a positive response. The general consensus of the participants in the focus groups agreed that the outcomes were linked and comprehensive multifaceted changes to a system would be appropriate. Areas that had the most potential to cascade to extra outcomes were related to management commitment. There was the perception that high commitment could improve staff behaviour via supervision or increased access to training, and would lead to a better working environment due to better equipment and facilities. This would then lead to better quality of care and better patient perception outcomes. These types of interactions occur repeatedly and need to be accepted as the complexity of the management of patient handling risk.

In some circumstances the relationship between outcomes and interventions is based purely on assumption, and consequently weakens the selection and inclusion of outcomes. An example of this is the provision of training. The reliance on training for patient handling risk management has been well discussed, and for the most part shown to be of little effect (Martimo et al., 2008, Hignett et al., 2003, and Haslam et al., 2007). The use of training numbers as an organisational measure does not measure any difference in performance but there is an assumption that training = skills and knowledge = better compliance = decrease MSD risk and organisational risk. This is also found in some of the higher-level outcome measurement tools, e.g. MAPO.
3.8.3 Organisational behaviour

One outcome theme that covers the area of interventions and outcomes is that describing organisational behaviour. Literature describing the management of health and safety risks including practices in the healthcare environment suggests that key issues should be addressed (HMSO (HSG 65), 1997); Policy, Organisation, Arrangements, Measure performance, Review/Audit. Consequently the provision of policies, procedures, and organisational systems such as supervision, risk assessment and audit are understood to be interventions. But their existence and the commitment of the organisation to follow them, in particular evidence of individuals and departments complying with the system, is an outcome. The theme of organisational behaviour links three different themes that were identified in the Table 3.20. Risk management systems describe the delivery of risk assessment and controls, policies, procedures etc. Management commitment describes the financial and manpower systems in place to ensure compliance with safe systems. Safety culture defines measurable behaviour in an organisation to show that safe behaviour is being adopted. These measures are all indicators of safety culture/climate and should be combined. This combined outcome theme of safety culture is important. The complexity and multi-faceted quality of the definition suggest a complex set of measurements to quantify the theme (see Chapter 4).

3.8.4 Different outcomes in different categories

The structure of the data collection sheets and focus group content was separated into the beneficiary categories, but some outcomes were recorded in more than one section. The numbers of incidents and accidents were recorded in Organisational, Staff and Patient categories. The focus of the outcome is different for each of the inclusions.

- The recording of accidents and incidents in many organisations is a cultural measure and signifies safety performance, and is a positive organisational measure.
- The recording of staff injuries from accidents and injuries was also recorded as an important criterion. When examining the range of
outcomes included the MS health measure and the sickness absence figures will record the staff incidents and injuries.

- Incidents and accidents that involve patients are also a valid outcome measure and have links with the patient injury category.

Given that both the effects of staff and patient injury or damage will be recorded elsewhere, the incident and accident outcome becomes an organisational performance measure.

### 3.8.5 Musculoskeletal health and absence

There were many outcomes and inclusions for the measurement of injuries and their effects. The differentiation in the range of included outcomes was about the beneficiary category being organisational or staff. In the first instance there were outcomes that signified a loss of a worker, or any part of their productivity to the organisation. Outcomes in this section included lost days, reduced productivity, replacement staff or recruitment of staff as replacements, including the possibility of losing staff to alternative work sites or roles. The staff category included outcomes and measures defining the effect of the injury on the individual, the number of injuries, specific measures of a person’s ability to work, and whether the individual had required attention from medical services i.e. occupational health, physicians, or physiotherapy. To define the two similar outcome themes they were named sickness absence for the organisational theme, and musculoskeletal (MS) health measures for the staff theme.

### 3.8.6 Quality of Care

There were many different outcomes recorded that suggested measurement of care quality and the definition of quality of care is a complex question. Initially there is the beneficiary question of whether the patient or the organisation should quantify this outcome. This analysis provided arguments for both aspects. Outcomes for patient injury or damage e.g. fractures, falls, pressure ulcers, and cross infection all suggest a poor ‘quality of care’, but patient perception values for satisfaction, anxiety and complaints add to the picture. Organisational measures of timely discharge, patient satisfaction or patient complaints may also be part of the measure.
Prevention or damage as a direct result of patient handling actions has not been clear in the literature and may be difficult to prove. Four of the groups simply recorded ‘quality of care’, indicating an understanding of the requirement but not how to measure it. More measurable outcomes were indicated by consistency/uniformity of care, confidence in the care, meeting patient objectives and timely delivery. One discussion that was raised in the focus group analysis was regarding the definition of the theme, and what could compose the measure. There was one debate that suggested that quality of care could be measured as quality of assistance. This was in agreement with a second point that linked quality of care with quality of assistance, which was measured by knowledge, skills and competence. The issue of quality of care and the general principles of successful management of healthcare are also of interest in this situation.

3.8.7 Compare EU vs. Expert
The final issue for this phase of the discussion surrounded the differences between the EU practitioner groups and the outcomes recorded by the Expert groups. The Expert groups recorded more detail on how the outcomes would be measured, and recorded several indices, scales and methods. There was a higher concentration on the costs of compensation claims in the measures for sickness absence; this was particularly evident in the ExpB that included representatives from Australia and the USA. It was also recorded that the Expert panels reported less intervention definitions in the sample, e.g. training was described by skills, competence and compliance, and equipment use was included rather than equipment provision. The list of outcomes recorded by the Expert groups did not show significant difference with the range of outcomes recorded with the EU groups, and will be carried forward to the voting analysis.

3.8.8 Summary of outcomes before voting
The generation of ideas recorded 210 different outcome identifiers. The content and thematic analysis grouped them into themes. The beneficiary descriptors that were used in the creation of the study have been maintained in most of the analysis, but as with the literature, organisation and staff outcomes have been more common. The combination of the data from Sheet 1 and the transcription
analysis has created a list of factors that the group regarded as important (Table 3.20). To assist clarity of the final scoring process, 20 definitions for each of the outcome themes were created from the analysis. The beneficiary has been linked with a list of terms that occurred in each section. The exception to this is the concept of safety culture, which in this discussion covers some aspects of all the beneficiaries.

Table 3.20 Definitions of the most important outcomes

<table>
<thead>
<tr>
<th>Theme (Outcome)</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisation</td>
<td></td>
</tr>
<tr>
<td>Accidents and incidents</td>
<td>The recording of incidents or accidents from patient handling in a central location as a performance measure</td>
</tr>
<tr>
<td>Absence or staff health</td>
<td>Measures that record the time away from work or lost productivity due to MSD</td>
</tr>
<tr>
<td>Financial</td>
<td>The financial impact of MSD in an organisation against the costs of any prevention programme</td>
</tr>
<tr>
<td>Training</td>
<td>Measurements that define the delivery of training, attendance numbers, duration, assessment criteria.</td>
</tr>
<tr>
<td>Risk Management Systems</td>
<td>Specific interventions in the work place to assist with the control of patient handling situations, e.g., policy, risk assessment systems etc</td>
</tr>
<tr>
<td>Satisfaction and image</td>
<td>Measures relating to how the organisation is perceived outside its organisation</td>
</tr>
<tr>
<td>Management Commitment</td>
<td>A measure of the support for the prevention programme, managerially, financially and organisationally</td>
</tr>
<tr>
<td>Staff</td>
<td></td>
</tr>
<tr>
<td>MSD Health Measures</td>
<td>The measurement of the level of MSD in the working population, injuries, chronic conditions, fitness for work</td>
</tr>
<tr>
<td>Incidents and accidents</td>
<td>Those staff that have been involved in accidents, incidents or near miss situations when patient handling</td>
</tr>
<tr>
<td>MSD Exposure measures</td>
<td>Physical workload factors that place the staff under strain, forces, postures, frequency of tasks, workload</td>
</tr>
<tr>
<td>Compliance, competence</td>
<td>Measures of the staff's individual behaviour to complete patient transfers, skill, compliance with safe methods and equipment use</td>
</tr>
<tr>
<td>Psychological well-being</td>
<td>Measurement of the staff's mental health status, measures of stress, strain, job satisfaction etc</td>
</tr>
<tr>
<td>Patients</td>
<td></td>
</tr>
<tr>
<td>Patient injuries</td>
<td>Records of accidents or injuries to patients when being assisted to move, bruises, lacerations, tissue damage etc</td>
</tr>
<tr>
<td>Patient perception</td>
<td>The subjective assessment of a patient when being moved in transfers or mobility situations, fear, comfort etc</td>
</tr>
<tr>
<td>Patient condition</td>
<td>Does the patient handling method affect the length of stay, treatment progression, level of independence</td>
</tr>
<tr>
<td>Quality of care</td>
<td>When a patient is being moved are all their requirements for dignity, respect, safety, empathy, being met</td>
</tr>
<tr>
<td>Task</td>
<td></td>
</tr>
<tr>
<td>Equipment available</td>
<td>Is all of the appropriate equipment being provided for the level of care required</td>
</tr>
<tr>
<td>Safety</td>
<td>Is the method of moving an patient meeting all the requirements for safety, security, suitability</td>
</tr>
<tr>
<td>Speed</td>
<td>Any measurement that identifies the time taken for patient handling, the rate or speed of movement</td>
</tr>
<tr>
<td>All</td>
<td>Safety Culture</td>
</tr>
<tr>
<td></td>
<td>Measurement of how the organisation behaves and how its management systems can be shown to control risk</td>
</tr>
</tbody>
</table>
In summary, a range of professions fulfils the PHA role across the EU. The fundamental requirements of what should be achieved by interventions have many similarities but significant breadth and depth. In general PHA have a clear focus on some outcomes that they wish to achieve by their interventions, but their knowledge of outcome measures is not so well defined. Patient outcomes were recognised as important to the groups and need to be included in intervention studies and reviews.

### 3.9 Priority Ordering (Voting)

Each participant completed Sheet 3 by recording their highest five ranked outcomes. The group facilitators and translators translated the written responses during the focus group. Every attempt was made to translate the meanings of the written statements to identify the specific outcomes and outcome measures. When the meaning of the outcome included in the rankings was unclear discussion between MF and the EU facilitator clarified the definition. Appendix F shows all ranked scores and specific outcomes that required clarification. These outcomes were analysed by a second researcher who had an understanding of the outcome measures in Sheet 1 analysis. A consensus was reached between the researchers and the EU facilitator.

The outcomes that were included in the ranked list are shown in Tables 3.21-3.24 against the beneficiaries. These tables show the narrowing of the range of outcomes from the initial included outcomes. In addition it can be seen that some of the outcomes showed preferences across the different groups and others were valued only in single locations. The numerical values of the ranking are now introduced to the analysis to further explore the importance of each of the included outcomes.

#### 3.9.1 Individual participants

All completed Sheet 3 data sets were included in the analysis. Some individual sets of data required secondary analysis to ensure accuracy.
• Finland 2 repeated measures for safety culture for two of the high rankings.
• Finland 3 recorded nurse motor skills as an outcome, which represented a compliance measure as per the use of the SOPMAS tool.
• Portugal 2 used a series of measures that defined interventions and not outcomes.
• Italy 2 and 8 both used MAPO definitions as outcome measures.
• Italy 5 repeated MSD outcomes for several of the high rankings as they were from an occupational health background.

3.9.2 Organisational Outcomes
Table 3.21 shows the strongest outcome theme in the organisational section was sickness absence, which was included by all five focus groups. This theme was supported by secondary measures of illness that included costs of staff replacement, staff turnover, and the need for alternative work placements. Financial costs were registered by three focus groups but not by Italy and Portugal. The costs of patient handling management systems have been discussed in the two earlier results sections and are clarified in the definition section (Table 3.28). All four EU groups recorded the completion of training as an outcome, but the Expert panels did not. The UK, Portugal and Expert groups prioritised a variety of risk management outcomes. These were surrounding the provision of risk assessment systems including responsible persons, policies, procedures and risk assessment systems. The concept of management commitment recorded by the Finland group, could also be related to management systems, as the effectiveness of the system will be weakened without it. However discussion in 3.7.4.2 showed this to be linked with safety culture.
Table 3.21 Organisational Outcomes (Sheet 3)

<table>
<thead>
<tr>
<th>Theme</th>
<th>Definitions/ measures</th>
<th>UK</th>
<th>Fi</th>
<th>Po</th>
<th>It</th>
<th>Exp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accidents</td>
<td>Accident figures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absence or staff health</td>
<td>Sickness absence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Replacement staff costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Staff turnover</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alternative work</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increased productivity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial costs</td>
<td>Financial costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Insurance / claims</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training skills and compliance</td>
<td>Number of people trained</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk management tools</td>
<td>Risk assessment improved</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Risk management system</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Evaluating risks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfaction and image</td>
<td>Image in public</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>Commitment (Management)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.9.3 Staff Outcomes

The staff outcomes recorded in the higher priority sheets show a much clearer picture (Table 3.22). Two single outcomes were reported from all focus groups; the measure of MSD and the skill and competence level of the workforce. The MSD rate values were supported by occupational health numbers, specific low back pain measures rather than MSD, and other human resource values to measure the lack of availability to work. The competence and skill section was also complimented by a range of secondary outcomes, that quantified compliance with safe methods. Compliance, the use of safe methods, the use of equipment and the consistency of assistance all added to the description.

There was recording of the psychological factors relating to physical work tasks through the recording of job satisfaction from all four EU groups, and ‘well-being’ was recorded by Expert and Italy groups. The final inclusion from three EU sources was the measure of accidents as a score of poor patient handling performance. This does have a direct link to the MSD numbers, but has traditionally been recorded as an instant record of error and poor practice in many areas of health and safety.
### Table 3.22 Staff Outcomes (Sheet 3)

<table>
<thead>
<tr>
<th>Theme</th>
<th>Definitions/ measures</th>
<th>UK</th>
<th>Fi</th>
<th>Po</th>
<th>It</th>
<th>Exp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incidents and accidents</td>
<td>Number of accidents</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSD measures</td>
<td>Referral to Occupational Physician</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Occupational health data</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Amount of MSD and MSI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low back injuries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Changes in health</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work capacity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Substitution of staff to replace</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposure measures</td>
<td>Decreased Effort and Workload</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physical measures - Posture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compliance competence and</td>
<td>Knowledge, skill, competence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>use of equipment</td>
<td>Compliance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Are people using safe methods</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Using equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Consistency of assistance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychological well-being</td>
<td>Job satisfaction-Morale</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Well-being</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 3.9.4 Patient outcomes

The focus group discussion (3.7.6.2) centralised the patient outcomes into four issues that were replicated in this section (Table 3.23). Quality of care was included in all focus groups, with patient satisfaction and improving a patient’s independence being reported by four groups. The quality of care outcome was linked in the previous discussion (3.7.6.2) with terms like quality of assistance, and consistency of care was included in the priority list. This draws the quality of care score further to the patient section for this final analysis, and in the development of a data collection tool will show the requirement that the patient is to participate in the rating of performance.
### Table 3.23 Patient Outcomes (Sheet 3)

<table>
<thead>
<tr>
<th>Theme</th>
<th>Definitions/ measures</th>
<th>UK</th>
<th>Fi</th>
<th>Po</th>
<th>It</th>
<th>Exp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient injuries</td>
<td>Injuries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pressure care</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Infection control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient perception</td>
<td>Comfort</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Patient satisfaction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient condition</td>
<td>Improved independence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality of care</td>
<td>Consistency of care</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quality of care</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 3.9.5 Task and other outcomes

Table 3.24 shows that the task performance and others section was little used. The only strong theme identified in this section was safety culture, which was included by three of the EU focus groups. In the detail of the scoring sheets, the theme of safety culture drew closer links with the topic of management commitment, and with the provision of management systems relating to policies, procedures, and most importantly the observation of organisational and individual behaviour. Given there was a strong staff outcome for individual behaviour in competence and compliance, safety culture was assigned to the organisational section in future analysis.

### Table 3.24 Task and Other Outcomes (Sheet 3)

<table>
<thead>
<tr>
<th>Theme</th>
<th>Definitions/ measures</th>
<th>UK</th>
<th>Fi</th>
<th>Po</th>
<th>It</th>
<th>Exp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment available</td>
<td>Equipment available ‘Ergonomie’ of rooms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>Safety</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Speed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Safety culture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 3.9.6 Scoring the preferred outcomes

The previous four tables show that the breadth of the initial list of outcomes was not reproduced by the highest rankings in Sheet 3. Table 3.25 identifies how the numbers of outcomes has reduced through the different sections of the analysis across the beneficiary groups.
Table 3.25 Range of outcomes included in ranking score sheets

<table>
<thead>
<tr>
<th>Beneficiary</th>
<th>Sheet 1</th>
<th>Sheet 3</th>
<th>Sheet 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No of outcomes recorded on</td>
<td>No included in Expert rankings</td>
<td>No Included in EU rankings</td>
</tr>
<tr>
<td>Organisational</td>
<td>65</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>Staff</td>
<td>57</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>Patient</td>
<td>40</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Task</td>
<td>30</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Others</td>
<td>18</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Totals</td>
<td>210</td>
<td>20</td>
<td>38</td>
</tr>
</tbody>
</table>

It is clear that many of the outcomes (80%) were not considered to be of high importance. The comparison between the Expert and EU groups shows that the proportions of items included in the ranking lists have much similarity. Only 6 of the 44 outcomes included in the ranking tables were in the expert group only. When the included outcomes (n=44, Table 3.25) are associated with the 20 definitions reported in Table 3.20 there is a further focussing of the importance of each of the different outcomes. Table 3.26 shows the scores against the 20 definitions.

The importance of the beneficiary groups in this description also shows differences between the rates of perceived importance. The importance in these scores shows a ratio of Organisational: Staff: Patient: Task as approximately 4:4:2:1. This ratio agrees with the process all through the different data collection phases, that organisational and staff outcomes are valued as of the highest importance.

Table 3.26 also shows that some of the outcomes received low values in the voting phase. The information, definitions and the scoring can now be combined to create the outcome definitions with the clearest description of the highest priority outcomes from this study. A series of transformations was used to focus the data.
Table 3.26 Total Scores From Ranking (Sheet 3).

<table>
<thead>
<tr>
<th>Beneficiary</th>
<th>Theme</th>
<th>Exp</th>
<th>EU</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisation</td>
<td>Accidents</td>
<td>0</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Absence or staff health</td>
<td>20</td>
<td>55</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Financial</td>
<td>10</td>
<td>12</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Training</td>
<td>0</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Risk Management Systems</td>
<td>13</td>
<td>45</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>Satisfaction and image</td>
<td>0</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Management Commitment</td>
<td>0</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff</td>
<td>MS Health Measures</td>
<td>14</td>
<td>71</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>Incidents and accidents</td>
<td>0</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Exposure measures</td>
<td>10</td>
<td>12</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Compliance, competence, equip use</td>
<td>22</td>
<td>55</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td>Psychological well-being</td>
<td>3</td>
<td>31</td>
<td>34</td>
</tr>
<tr>
<td>Patient</td>
<td>Patient injuries</td>
<td>4</td>
<td>11</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Patient perception</td>
<td>2</td>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Patient condition</td>
<td>0</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Quality of care</td>
<td>13</td>
<td>52</td>
<td>65</td>
</tr>
<tr>
<td>Task</td>
<td>Equipment available</td>
<td>0</td>
<td>44</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>Safety</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Speed</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>Safety Culture</td>
<td>0</td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Totals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>113</td>
<td>520</td>
<td>633</td>
</tr>
</tbody>
</table>

Outcomes that measured qualities of an intervention were removed:
- Equipment available
- Training numbers

Outcomes with a score less than five were removed:
- Safety
- Speed
- Satisfaction and image

The measures related to safety culture were all combined to a single measure:
- Risk management tools and improved systems,
- Management commitment
- Safety culture.

Outcomes recorded in two beneficiaries were combined:
- Accidents recorded in the organisational group
- Accidents recorded in the staff group.
The MSD measure in the organisational data was not combined with the MS health measure in the staff data, as one relates to absence and the other relates to the physical effects on the staff member.

Two transformations from the list above require further explanation. The separation of the two outcomes for MSD allowed the quantities of sickness absence, and the health effects for the staff, to be allocated to the different beneficiaries. The double inclusion reflects the importance of MSD across the systems for the PHA. The second transformation was the amalgamation of terms for the measure of safety culture. The MARCH (Smedley et al., 2005) and PHOQS (Hignett and Crumpton, 2005) tools have been used to measure ‘Safety Culture’ relative to patient handling processes. Between the two tools, they measure organisational systems information like policies and procedures, the provision of funding and personnel for specific roles, examine risk assessment, communication systems and collect evidence that the organisation is following the procedures adopted. Given that these tools have been peer reviewed as successful, the combination of the three safety culture outcomes is appropriate.

Table 3.27 shows the total scores for the EU groups and the rankings for each group based on the scores. This analysis aimed to create a single prioritised list of the most important outcomes. The number of participants for each of the focus groups was variable, so rankings for each of the focus group scores was used to remove the group size differences. The summed totals of the ranks, was then ranked to give the priority list in the blue column. In addition the expert group was also ranked as a comparison (Orange column).
Table 3.27 Scores from voting for 12 most preferred outcomes.

<table>
<thead>
<tr>
<th>Theme</th>
<th>It</th>
<th>Po</th>
<th>Fi</th>
<th>UK</th>
<th>Rank It</th>
<th>Rank Po</th>
<th>Rank Fi</th>
<th>Rank UK</th>
<th>Rank Sum</th>
<th>Rank rank</th>
<th>Expert</th>
<th>Rank Expert</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incidents and accidents</td>
<td>3</td>
<td>12</td>
<td>0</td>
<td>17</td>
<td>8</td>
<td>3</td>
<td>11</td>
<td>6</td>
<td>28</td>
<td>6</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Absence or staff health</td>
<td>13</td>
<td>4</td>
<td>17</td>
<td>21</td>
<td>3</td>
<td>8</td>
<td>2</td>
<td>4</td>
<td>17</td>
<td>4</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>Financial</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>7</td>
<td>12</td>
<td>12</td>
<td>7</td>
<td>10</td>
<td>41</td>
<td>12</td>
<td>10</td>
<td>6.5</td>
</tr>
<tr>
<td>Safety culture</td>
<td>20</td>
<td>23</td>
<td>20</td>
<td>22</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>1</td>
<td>13</td>
<td>4.5</td>
</tr>
<tr>
<td>MS health measures</td>
<td>25</td>
<td>8</td>
<td>4</td>
<td>34</td>
<td>1</td>
<td>5</td>
<td>8</td>
<td>1</td>
<td>15</td>
<td>2</td>
<td>14</td>
<td>3</td>
</tr>
<tr>
<td>MSD Exposure measures</td>
<td>0</td>
<td>3</td>
<td>9</td>
<td>0</td>
<td>12</td>
<td>9</td>
<td>5</td>
<td>12</td>
<td>38</td>
<td>10</td>
<td>10</td>
<td>6.5</td>
</tr>
<tr>
<td>Compliance, competence</td>
<td>10</td>
<td>18</td>
<td>10</td>
<td>17</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>16</td>
<td>3</td>
<td>22</td>
<td>1</td>
</tr>
<tr>
<td>Psychological well-being</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>21</td>
<td>10</td>
<td>7</td>
<td>9</td>
<td>4</td>
<td>30</td>
<td>7.5</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Patient injuries</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>8</td>
<td>12</td>
<td>11</td>
<td>9</td>
<td>40</td>
<td>11</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Patient perception</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>10</td>
<td>8</td>
<td>10</td>
<td>11</td>
<td>8</td>
<td>37</td>
<td>9</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Patient condition</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>6</td>
<td>7</td>
<td>6</td>
<td>11</td>
<td>30</td>
<td>7.5</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Quality of care</td>
<td>8</td>
<td>10</td>
<td>15</td>
<td>12</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>19</td>
<td>5</td>
<td>13</td>
<td>4.5</td>
</tr>
</tbody>
</table>

3.9.7 Statistical Analysis

The similarity between the four EU focus group rankings was explored. High rankings were seen for safety culture, compliance and MS health measures in all EU groups and the Expert groups. The lower ranked outcomes were finance and patient related measures. Analysis for association rather than difference was appropriate. Given the format of multiple rankings, there was a limited choice of tools.

Kendall’s Measure of Concordance (Seigel and Castellan, 1988), which has a proven link with the processes for Friedman’s ANOVA calculation, was completed. The calculation was performed using the correction factor for tied ranks, compared with the Chi² tables W=0.6287 (N=12, df 11, k=4, Chi² =27.6628), and showed significant concordance (P=0.005). This indicates very
close agreement between the four European groups. The test was repeated to include the four EU groups and the combined ranks for the Expert groups. The calculation was performed using the correction factor for tied ranks, compared with the Chi^2 tables W=0.9416 (N=12, df 11, k=5, Chi^2 =51.78) and showed greater significance in concordance (P=0.001).

As a cross check the combined ranks of the combined EU groups were compared to the combined ranks for the Expert groups. For this data W=0.7882 (N=12, df 11, k=2, Chi^2 =17.34), and the significance was reduced to P=0.1. Though the inclusion of the Expert data in the statistical analysis improves the overall concordance measure, there are differences between the priorities of the Expert groups and the EU practitioner groups. The decision was made to use only the EU priority list for future work. The tied rank found between the outcomes of psychological well-being and patient condition was re-calculated, by using the total votes cast for the two outcomes in the individual focus groups. This indicated that psychological well-being was preferred. The full ranked list for future inclusion is in Table 3.28.

3.9.8 Conclusion

Seven focus groups were conducted to create information on the outcomes that PHAs preferred, to show values from patient handling interventions in the workplace. Two hundred and ten different outcomes were identified. Thematic and content analysis reduced these outcomes to 20 themes with clear definitions. Priority was scored by all the participants, and accumulated and ranked scores were tabulated (Table 3.27), and showed 12 outcome themes to be of highest priority. There is a good level of agreement between the priority information found in the four EU focus groups, but reduced agreement with the Expert group priorities. A final list of the 12 strongest outcome themes has been identified (Table 3.28), and these will be taken forward for the creation of the assessment tool (Chapter 4).
Table 3.28 The 12 most preferred outcomes in priority order.

<table>
<thead>
<tr>
<th>Theme (Outcome)</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Safety culture</td>
<td>A measure of organisational behaviour and how its management systems control patient handling risk. This is an audit of procedures rather than behaviours e.g. policy, risk assessment, records of training etc., and should measure the support for the prevention programme both financially and organisationally</td>
</tr>
<tr>
<td>2 MS health measures</td>
<td>The measurement of the level of MSD in the working population, injuries, chronic conditions, fitness for work, staff turnover, work capacity etc.</td>
</tr>
<tr>
<td>3 Compliance, competence</td>
<td>Measures of the staff’s individual behaviour to complete patient transfers, competence, skill, compliance with safe methods and equipment use</td>
</tr>
<tr>
<td>4 Absence or staff health</td>
<td>Measures that record the time away from work or lost productivity due to MSD, days/shifts lost, staff on reduced work capacity, staff turnover</td>
</tr>
<tr>
<td>5 Quality of care</td>
<td>When a patient is being moved are all their requirements for dignity, respect, safety, empathy, being met</td>
</tr>
<tr>
<td>6 Incidents and accidents</td>
<td>The recording of incidents, accidents or near misses from patient handling where staff could have been injured in a central location as a performance measure</td>
</tr>
<tr>
<td>7 Psychological well-being</td>
<td>Measurement of the staff’s mental health status, measures of psychological stress, strain, job satisfaction etc.</td>
</tr>
<tr>
<td>8 Patient condition</td>
<td>Does the patient handling method affect the length of stay, treatment progression, level of independence</td>
</tr>
<tr>
<td>9 Patient perception</td>
<td>The subjective assessment of a patient when being moved in transfers or mobility situations, fear, comfort etc.</td>
</tr>
<tr>
<td>10 MSD exposure measures</td>
<td>Physical workload factors that place the staff under strain, forces, postures, frequency of tasks, workload measures</td>
</tr>
<tr>
<td>11 Patient injuries</td>
<td>Records of incidents, accidents or injuries to patients when being assisted to move, bruises, lacerations, tissue damage etc.</td>
</tr>
<tr>
<td>12 Financial</td>
<td>The financial impact of MSD in an organisation, lost staff time, lost productivity costs, compensation claims, litigation, all direct and indirect costs against the costs of any prevention programme</td>
</tr>
</tbody>
</table>
CHAPTER 4

Development of the Intervention Evaluation Tool (IET)
4.1 Introduction

Chapter 3 of this study created a prioritised list of outcomes that a PHA would like to measure as part of an assessment process to evaluate the benefits of patient outcomes. This Chapter describes the process to examine each of the 12 selected outcomes and develop a measurement tool for each separate outcome, and a combined process for evaluating PH interventions. The purpose of Intervention Evaluation Tool (IET) is to:

- Be an accurate measure of effects of any intervention strategy in terms of the management of patient handling risks, in any given situation.
- A tool for practitioners, to be used to evaluate their own progress in their organisations (Internal assessment).
- Allow comparison of different intervention strategies across different locations (Intra-agency comparison)
- Be robust in data collection and analysis, to allow the data to be used in multi-centre research programmes (EU comparison)

The tool is, in this study, an assessment for a single ward or unit. Future developments could convert the score systems to allow a whole hospital or health service to be covered. The procedure for data collection and analysis for the IET allows an individual PHA or team to collect organisation wide information and observations on the assessed location, e.g. ward or unit, and then an expert user (MF) to calculate the IET scores. Future development will include the development of a computer based scoring system, to improve access to the scoring and report writing functions.

4.2 Methodology

The focus group study provided a prioritised list of 12 outcome themes that were included in the IET structure. The initial consideration was how to measure the outcomes that had been defined by the EU study (Table 3.28), and then to consider how the 12 individual measures could be amalgamated to
provide a single IET total score. Each definition for the 12 outcomes was applied specifically to the field of PH and the resulting organisational effects. However, each of the definitions could also have been used in the much wider fields of MSD or occupational health. Due to the limitations of this project it was not possible to evaluate all the possible outcome measures (OM) and outcome measurement tools (OMT) for the wider context. This indicated that the IET would be comprised of OM and OMT that had previously been assigned to evaluating outcomes in peer-reviewed studies for patient handling issues. The search for the OMs and OMTs was completed on the literature database created for the literature analysis (Section 2b). In this analysis the OMTs included in the comparison section 2b.6 were also considered, as they had all been through the peer-review process, though some had not been used in a peer-review study.

The information discussed was developed into a full guidebook for users, and a set of data collection documents that is presented in Appendix H.

**4.2.1 Selection criteria**

The creation of the different sections of the IET required a practitioner-based view of the project. The selection process needed to create measures for each outcome that were valid and accurate for the types of situations in which it would be applied. The tool also needed to be usable and accessible for practitioners in patient handling, so the selection process considered the complexity of data collection and analysis during the selection process.

Appendix G includes a breakdown of all outcome measures that correspond to each of the 12 selected outcomes. The outcome measures are ordered by the academic QR score (Downs and Black, 1998) that each study received as part of the literature analysis.

The tools for the IET were then selected using the following criteria:
- The level of the QR ratings were considered and only QRs of >50% were accepted for inclusion
• Papers that used measurement tools that had previously been subject to peer reviewed validation studies were included.

• In areas where lower quality studies prevailed:
  o The most frequently observed outcome measures were considered.
  o Outcome measures that had been used to score a before and after intervention trial were considered.

• Selection depended upon the structure of the IET. The data had to be collectable and the analysis needed to be acceptable in the context of the IET in the healthcare setting.

• In situations where appropriate Robson Level 3 (Robson et al., 2007) outcome measures would be preferred.

The number of outcome measures included in the over 50% category for each of the 12 selected is in Table 4.1.

### Table 4.1 Numbers of outcome measures included for IET

<table>
<thead>
<tr>
<th>Preferred outcome</th>
<th>No outcomes included</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Safety Culture</td>
<td>6</td>
</tr>
<tr>
<td>2. MS health measures</td>
<td>46</td>
</tr>
<tr>
<td>3. Competence and Compliance</td>
<td>25</td>
</tr>
<tr>
<td>4. Absence or staff health</td>
<td>20</td>
</tr>
<tr>
<td>5. Quality of care</td>
<td>1</td>
</tr>
<tr>
<td>6. Accident numbers</td>
<td>2</td>
</tr>
<tr>
<td>7. Psychological well being</td>
<td>10</td>
</tr>
<tr>
<td>8. Patient condition</td>
<td>1</td>
</tr>
<tr>
<td>9. Patient perception</td>
<td>25</td>
</tr>
<tr>
<td>10. MSD exposure measures</td>
<td>163</td>
</tr>
<tr>
<td>11. Patient injuries</td>
<td>0</td>
</tr>
<tr>
<td>12. Financial</td>
<td>10</td>
</tr>
</tbody>
</table>

Certain factors have been identified when analysing the outcomes against the different categories. Robson level 3 outcomes are mostly organisational style outcomes, and Robson level 2 data are mostly staff and patient outcomes.
Level 1 data are measures of the intervention and are not included in this analysis. Table 4.2 shows the highest QR ratings for each of the 12 preferred outcomes. i.e. the highest level academic papers in each section. The academic score does not necessarily relate to the outcome measured, but to the quality with which the study was conducted. It is clear that only some of the included outcomes can deliver level 3 measures. There is no justified methodology to accept these differences into the score system at present.

### Table 4.2 Highest QR for each of the 12 preferred outcomes

<table>
<thead>
<tr>
<th>Preferred outcome</th>
<th>Level 2</th>
<th>Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Safety Culture</td>
<td>Knibbe and Knibbe (2006a) 74%</td>
<td>Chokar et al. (2005) 93%</td>
</tr>
<tr>
<td></td>
<td>Nelson et al. (2006) 70%</td>
<td>Warming et al. (2008) 89%</td>
</tr>
<tr>
<td>2 MSD measures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Competence Compliance</td>
<td>Kjellberg et al. (2004) 89%</td>
<td>Chhokar et al., 2005</td>
</tr>
<tr>
<td></td>
<td>Wachs and Parker (1987) 86%</td>
<td>Cohen et al. (2004) 82%</td>
</tr>
<tr>
<td></td>
<td>Daynard et al. (2001) 81%</td>
<td>Craib et al. (2007) 81%</td>
</tr>
<tr>
<td>4 Absence or staff health</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Quality of care</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Accident numbers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Psychological well being</td>
<td>Kindblom-Rising et al.(2007) 85%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Smedley et al. (2003) 70%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nelson et al. (2006) 70%</td>
<td></td>
</tr>
<tr>
<td>8 Patient condition</td>
<td>Waldenstrom and Gottvall (1991) 93%</td>
<td></td>
</tr>
<tr>
<td>9 Patient perception</td>
<td>Conneeley (1992) 92%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kjellberg et al (2004) 89%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Garg et al. (1991) 80%</td>
<td></td>
</tr>
<tr>
<td>10 MSD exposure measures</td>
<td>Engkvist et al. (2001) 100%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hignett (1996a) 96%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Waldenstrom and Gottvall (1991) 93%</td>
<td></td>
</tr>
<tr>
<td>11 Patient injuries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Financial</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 4.3 Selected methods for IET

The studies collated in Table 4.1 (Appendix G) were examined for the outcome measure based on the criteria above. Each included outcome was investigated.
individually for the best method of measurement. As some of the OM and OMT in the available studies measured more than one outcome, the tools selected for each outcome were compared to minimise overlap and simplify the data collection process, particularly relating to the staff, patient and organisational groups of outcomes.

The following 12 sections describe; the selection process for each of the outcomes included, the reasons for inclusion/exclusion, the method of data collection for each outcome, the method for calculating each of the section scores, and the range of scores expected as part of the data collection.

4.3.1 Safety culture
4.3.1.1 Selection
Only six studies were identified in the database as potential measures for safety culture. Smedley et al., (2005) suggested the MARCH tool for evaluating management commitment, and this was also considered. But for the most part MARCH is an organisational assessment and is difficult to apply in small locations. Table 4.3 shows the most suitable measures.

<table>
<thead>
<tr>
<th>No</th>
<th>Paper ID</th>
<th>Outcome Measure</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>153</td>
<td>1997 Menckel</td>
<td>Number reports completed</td>
<td>Evaluation interviews</td>
</tr>
<tr>
<td>155</td>
<td>1997 McGuire</td>
<td>Manager knowledge and attitude</td>
<td>Qualitative interviews. – attitudes about interventions</td>
</tr>
<tr>
<td>210</td>
<td>2006 Nelson</td>
<td>Perceived support of organisation (Culture)</td>
<td>Level of support for program</td>
</tr>
<tr>
<td>230</td>
<td>2007 Hignett</td>
<td>Safety Culture PHOQS</td>
<td>PHOQS</td>
</tr>
<tr>
<td>241</td>
<td>2006 Knibbe</td>
<td>Prevention strategies/Compliance/Policy mirror</td>
<td>Policy mirror</td>
</tr>
</tbody>
</table>

Menckel et al. (1997), McGuire et al. (1997) and Nelson et al. (2006) measured only small selections of the overall problem, so were unsuitable. Only the Policy Mirror (Knibbe and Knibbe, 2006a) and the PHOQS tool (Hignett and Crumpton, 2005) gave an overview of the safety culture in an organisation. The Policy Mirror is self-reported, and PHOQS is an interview-based audit including
a document check and the presentation of evidence. PHOQS has been published as a development study, and subject to peer review and evaluated in an intervention study (Hignett and Crumpton, 2007). The factor of management commitment was raised as important in the focus group study (Section 3.7.4), and discussed in Nelson et al. (2006) and the MARCH tool (Smedley et al., 2005) is worthy of inclusion as an addition to the chosen question set. Nelson et al. (2006) asked specialists in the area about the level of support for the programme. This has been added to the question set and will be distributed as part of the staff and management data sheets.

4.3.1.2 Data collection
The data for safety culture was collected mostly from an interview with the ward/unit manager, the management commitment was asked of managers, advisors and staff. This tool is based on the Patient Handling Observational Question Set (PHOQS) tool devised and evaluated by Hignett and Crumpton (2005). The scores were only allowed if documentary evidence was seen by the Observer. This was particularly relevant when discussing the communication based questions. An additional question, the subjective appraisal of management commitment (5 point Likert value) was collected from managers, advisors, and staff and incorporated as a multiplier to the PHOQS score.

4.3.1.3 Calculation
The PHOQS score was calculated from 30 points. The management commitment score was calculated as two scores, the average score from staff, and the average score from management and advisors

\[ \text{Section 1 Score} = \text{PHOQS score} \times \text{Commitment average score} \]

\[ = \frac{\text{Modified PHOQS score}}{120} \times \text{as}\% \]

The total from 120 was calculated as a percentage and included in the IET total score.
4.3.1.4 Range of scores
The IET section score is a simple percentage from the total score (0-120). The PHOQS score can be maximised if a very comprehensive management system is in place, with day-to-day evidence of following best practice. It is unlikely that a full percentage score for commitment will be achieved across the staff and management. It might be considered in future reviews that the management commitment score be additive rather than used as a multiplier. The full range of scores will be carried into the IET.

4.3.2 Musculoskeletal Health Measures
4.3.2.1 Selection
The quality required for measuring MS health in the workforce required a self-reported assessment of recent MS health status. The outcome measures for the recording of MS health in the included studies revealed a clear picture. Forty-six outcomes were included in this part of the study; 26 studies recorded injury rates, and 18 recorded the prevalence of pain and discomfort for the given populations. The most frequently referenced tools for data collection were derivations of the Nordic questionnaire (Kuorinka et al., 1987).

4.3.2.2 Data collection
To aid the data collection the short version of the Nordic Questionnaire (Dickinson et al., 1991) was used. This records whether the staff reported any MSD problems over the last 12 months. Each reported problem scored as a negative response. The questionnaire is delivered as part of the staff questionnaire.

The aim is to collect completed forms from 50% of the WTE numbers on the unit. The Observer must record the number of staff absent with MSD at the time of the survey, and include numbers in the calculation as a maximum negative.
4.3.2.3 Calculation
The worst score for any body part (line) is recorded as the submission for each participant. The score for MS Health for each participant is 0-6.

Section 2 Score = Average Nordic Questionnaire Score (as %)

4.3.2.4 Range of scores
If a unit recorded all staff as having MS problems during the survey, it would be a very high level of MSD problems and would be difficult to justify. In a similar way the recording of no problems for any staff would also be unexpected. This indicates that extremes of the range can be removed to give better detail in the final score. Therefore the scoring for the section was based on:

Average scores of \(<1 = 100\% = \text{very good management of MS health, and}
\)

average scores of \(>5 = 0\% = \text{very high levels of MS problems.}

The Expert focus groups (Section 3.7.4 and 3.7.5) discussed the difficulties with using MSD figures, and it may be necessary in future developments to include standardisation for age, experience and workload factors.

4.3.3. Competence and Compliance
4.3.3.1 Selection
The outcomes for competence and compliance were numerous, and 25 studies were included. A selection of the more appropriate measures is included in Table 4.4.

Some methodological factors resulted in exclusion from selection. Any methods based on video analysis were removed due to time and equipment needed. All self reported compliance tools were removed due to the potential reduction in reliability. This left the smaller range of observational tools that ranged from compliance checklists, and use of equipment registers to error recording.
### Table 4.4 Competence and compliance – Selected outcome measures

<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Quality</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 1993</td>
<td>Switzer</td>
<td>Observations of practice</td>
</tr>
<tr>
<td>42 2001</td>
<td>Daynard</td>
<td>Compliance with methods taught</td>
</tr>
<tr>
<td>63 1987</td>
<td>Troup</td>
<td>Task performance by the staff</td>
</tr>
<tr>
<td>64 1996</td>
<td>Foster</td>
<td>Self reported changes in practice</td>
</tr>
<tr>
<td>68 1995</td>
<td>Garb</td>
<td>Awareness and knowledge of the staff</td>
</tr>
<tr>
<td>69 1993</td>
<td>Feldstein</td>
<td>Back pain</td>
</tr>
<tr>
<td>162 1987</td>
<td>Wachs</td>
<td>Compliance with standards</td>
</tr>
<tr>
<td>180 1993</td>
<td>Hellsing</td>
<td>Observed compliance with teaching</td>
</tr>
<tr>
<td>209 1988</td>
<td>Owen</td>
<td>Use of equipment for tasks</td>
</tr>
<tr>
<td>210 2006</td>
<td>Nelson</td>
<td>Self reported unsafe acts (compliance)</td>
</tr>
<tr>
<td>211 2003</td>
<td>Smedley</td>
<td>Number of unassisted transfers(compliance)</td>
</tr>
<tr>
<td>230 2007</td>
<td>Hignett</td>
<td>Skill understanding/Verbal protocol</td>
</tr>
<tr>
<td>247 2006</td>
<td>Hye-Knudson</td>
<td>Compliance / skill (Warming tool)</td>
</tr>
<tr>
<td>255 2002</td>
<td>Johnsson</td>
<td>Method assessment (Compliance)</td>
</tr>
<tr>
<td>256 2006</td>
<td>Engkvist</td>
<td>Use of Equipment</td>
</tr>
<tr>
<td>277 2007</td>
<td>Reid</td>
<td>Survey response</td>
</tr>
<tr>
<td>328 1997</td>
<td>Engels</td>
<td>Errors</td>
</tr>
<tr>
<td>227 2004</td>
<td>Kjellberg</td>
<td>Work technique (clear method)</td>
</tr>
</tbody>
</table>

The most familiar of the observational tools is DiNO (Johnsson et al., 2004) reported in section 2b.6. This method used an observational checklist of work technique to measure physical compliance. DiNO is a validated tool and has been used in Greece (Lomi and Lomi, 2006), the UK (Griffiths, 2009) and Portugal (Barroso et al., 2007). The checklist is however only an assessment of competence, and has no specific assessment of whether the person is completing the recommended activity.

The definition of the outcome (Table 3.20) included a measure of compliance. Two questions were added to the full DiNO score that required the observer to see the patient handling plan, and judge how well the protocol was followed with
a graded response. The two additional scores acted as reducing multipliers to the competence score, which is reduced by 50% if a) there was no protocol or b) the protocol was not followed.

4.3.3.2 Data collection
The observed transfers are selected on a convenience basis. Observations are taken for 25% of the patients in the unit over a 24-hour period (32 Patients = 8 observations). A minimum of five transfers must be observed in any assessment. A working knowledge of DiNO must be noted in the observer.

4.3.3.3 Calculation

Section 3 Score = Average Adapted DINO Scores = as%

4.3.3.4 Range of scores
Even with a very poor patient transfer some movement principles or equipment will be used so full compliance scores are unlikely. Greater use of the range of values will be found if the range of positive scoring is reduced to 4-16. This range would score an average competence transfer (DiNO = 8/16) with no handling plan (x50%) as the lowest level in the range (0%) for the section.

4.3.4 Absence or staff health
Given the focus on MSD and absence in the role of PHA, only 20 studies met the selection criteria for the values of staff absence.

4.3.4.1 Selection
The North American countries have clearer absence reporting structures. The US uses the OSHA reporting system (OSHA 2009, BLS 2009). British Columbia also has many studies using its central reporting systems. If only formal, government or organisation, reporting systems were used in this study there would be a large possibility of excluding information from many EU countries where the data is less well controlled.
The staff related MS health figures were self-reported through the Nordic Questionnaire. So as a comparison the absence data needed to be collected from official records for the organisation. Sickness absence data collected in the organisation with a standardised form was utilised. All self-reported systems, and any systems that required further information from the staff were removed. Only the OSHA data collection and scoring system gave work hours standardisation, so the method in Charney (1997), Charney et al. (2006) and Collins et al. (2004) was selected.

**Table 4.5 Absence or staff health – Selected outcome measures**

<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Quality</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>48 1999</td>
<td>Fanello</td>
<td>Semi structured questionnaire for absence</td>
</tr>
<tr>
<td>66 1997</td>
<td>Best</td>
<td>Sickness absence</td>
</tr>
<tr>
<td>82 1999</td>
<td>Evanoff</td>
<td>Lost time injuries</td>
</tr>
<tr>
<td>87 1997</td>
<td>Charney</td>
<td>Lost time from injuries,</td>
</tr>
<tr>
<td>140 1998</td>
<td>Pohjonen</td>
<td>Work ability index</td>
</tr>
<tr>
<td>149 1991</td>
<td>Nyjanen</td>
<td>Lost Time Claims</td>
</tr>
<tr>
<td>163 1987</td>
<td>Wood</td>
<td>Lost time</td>
</tr>
<tr>
<td>210 2006</td>
<td>Nelson</td>
<td>Lost days and modified days</td>
</tr>
<tr>
<td>213 2005</td>
<td>Fujishiro</td>
<td>Days lost</td>
</tr>
<tr>
<td>241 2006</td>
<td>Knibbe</td>
<td>Sick leave</td>
</tr>
<tr>
<td>243 2006</td>
<td>Knibbe</td>
<td>Absence</td>
</tr>
<tr>
<td>256 2006</td>
<td>Engkvist</td>
<td>Time lost</td>
</tr>
<tr>
<td>265 2005</td>
<td>Engst</td>
<td>Injury Costs</td>
</tr>
<tr>
<td>296 2004</td>
<td>Collins</td>
<td>Lost work days</td>
</tr>
<tr>
<td>248 2006</td>
<td>Charney</td>
<td>Time lost</td>
</tr>
<tr>
<td>263 2005</td>
<td>Chhokar</td>
<td>Time lost injury rate</td>
</tr>
<tr>
<td>260 2004</td>
<td>Cohen</td>
<td>Lost days.</td>
</tr>
<tr>
<td>277 2007</td>
<td>Craib</td>
<td>Lost time injuries</td>
</tr>
</tbody>
</table>

**4.3.4.2 Data collection**

Organisationally collected sickness absence figures were required for the calculation. These could be provided via the manager interview or from a
different location if required, e.g. human resources, occupational health or pay services. Total staff numbers and hours were also required for the calculation.

### 4.3.4.3 Calculation

The calculation of incidence rates for US government projects, reports each case of injury and illness. Due to the smaller sample size and the definition of reported sickness absence the calculation was changed to include lost time in the ward area. This was multiplied by the OSHA factor, which is the possible hours for 100 staff, against the total hours worked in the unit in question (BLS 2009).

\[
\text{Section 4 score} = \frac{\text{Time lost} \times \text{OSHA Work Hours Factor}}{\text{Total productive hours}}
\]

The OSHA calculation is based on company workforce numbers, so a grading factor was introduced in the range calculation.

### 4.3.4.4 Range of scores

The OSHA calculation creates large scores for comparison. The IET is for a single ward or unit, so to examine the range of scores in a unit with 30 staff, and 13 full time shifts per day, the following examples have been developed to show the levels of high and low scoring.

**Example 1 High absence**

30 staff 10 staff absent with MSD, 5 staff on reduced capacity following injury

Lost time per year = 18900 hours

Section 4 score = \(18900 \times \frac{168000}{27040} = 117426\)
Example 2 Low absence
30 staff 1 staff absent with MSD, 1 staff on reduced capacity following injury

Lost time per year = 2100 hours
Section 4 score = 2100 x 168000/ 27040 = 13047

The score for the IET can therefore be based on the range of 0-100 000 and converted to a percentage score.

4.3.5 Quality of care
4.3.5.1 Selection
Only the 2008 paper from Nelson et al., met the criteria for quality of care. This paper utilises the Residents Assessment Instrument (RAI) sponsored by Medicare and Medicaid Services in the USA. It develops scores for cognitive, mood and behaviour, physical function, incontinence and health, using a large battery of data collection instruments. The RAI was too complex for this study. Nelson et al. (2008) considered the acquired pressure ulcer score as a key indicator, and in this tool for patient injury was to be included in Section 11 Patient Injuries. Meeting patient’s requirements was the quality measured.

4.3.5.2 Data collection
The data and definition created from the focus group study suggested that the questions for inclusion (Section 3.7) would represent security, comfort, communication, consent and dignity. The questions were targeted at the patient’s response to patient transfers across their hospital stay, rather than the feedback from a specific task, as in Section 9, Patient Perception.

4.3.5.3 Calculation
The calculation is a simple average score calculated as a percentage.

4.3.5.4 Range of scores
No limits were added to the range of available scores, as it was not known how the responses might occur. Further narrowing of the acceptable range may be required in future development.
4.3.6 Accident numbers

4.3.6.1 Selection

Table 4.6 shows the two studies that were considered under the accidents and incidents category. The methodology from neither gave a suitable method, but the inclusion of verbal/subjective responses from the staff improved the quality of the data recorded, rather than relying singly on official incident reporting.

Table 4.6 Accident numbers – Selected outcome measures

<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Quality</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>153</td>
<td>Menckel</td>
<td>Accident reports and feedback</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Verbal and documented reporting</td>
</tr>
<tr>
<td>188</td>
<td>Engst</td>
<td>PH incidents</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Number of resident handling incidents reported</td>
</tr>
</tbody>
</table>

4.3.6.2 Data collection

The inclusion of incident numbers that have patient handling factors is unclear and complex. The scoring system included scores for non-reporting by the unit manager and self-reports of unsafe practice by the staff. The score was low for units with a lot of accidents, and those with poor practice, or poor reporting. There is a check question in the IET Data 4 to detect if too many people report completing an incident form compared to those recorded. In this case the data is erroneous and should be removed from the survey.

4.3.6.3 Calculation

Section 6 score = \( \frac{\text{Reported PH incidents} + \text{Potential PH incidents}}{\text{Number WTE on unit}} \)

The number for the IET total is an inverse value as a percentage.

4.3.6.4 Range of scores

If the ratio value exceeds one report per member of staff, a score of 0% will be recorded.
4.3.7 Psychological well-being

4.3.7.1 Selection

Eighteen studies were accepted from the full selection. Studies were excluded if they included full job satisfaction measures, as they are complex and have benefit as research tools only. Self-reported perception of injury risk measures and measures of comfort were removed, as they are weak without some psychosocial data. Measures of psychological stressors were a more suitable measure and easier to collect. Evanoff et al. (1999) used a three section assessment tool, based on Bigos et al. (1991) and this was the most suitable.

Table 4.7 Psychological well-being – Selected outcome measures

<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Year</th>
<th>Author</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>82</td>
<td>1999</td>
<td>Evanoff</td>
<td>Psycho social stressors</td>
</tr>
<tr>
<td>210</td>
<td>2006</td>
<td>Nelson</td>
<td>Job satisfaction</td>
</tr>
<tr>
<td>210</td>
<td>2006</td>
<td>Nelson</td>
<td>Perceived effectiveness of intervention</td>
</tr>
<tr>
<td>211</td>
<td>2003</td>
<td>Smedley</td>
<td>Psychosocial stress</td>
</tr>
<tr>
<td>237</td>
<td>2005</td>
<td>Santaguida</td>
<td>Ranking of preference</td>
</tr>
<tr>
<td>240</td>
<td>2006</td>
<td>Millar</td>
<td>Comfort</td>
</tr>
<tr>
<td>306</td>
<td>2007</td>
<td>Kindblom-Rising</td>
<td>Perception after training</td>
</tr>
<tr>
<td>188</td>
<td>2004</td>
<td>Engst</td>
<td>Perception of MSD risk</td>
</tr>
</tbody>
</table>

4.3.7.2 Data collection

Data collection was via a single page staff questionnaire. The link between psycho-social factors and the prevalence of MSD is well documented, and one criticism of MSD risk factor studies is the omission of such factors. The scoring system for this section was defined by Bigos et al., (1991), and used questions to give a score for: job satisfaction, worker satisfaction and psycho-social factors. The final section was scored in reverse as a check score in the data sheet. The calculation recovered the polarity.
4.3.7.3 Calculation
The calculation for the Section 7 overall score, scores each of the three sections equally from the original model, and then scores an average for the section total.

a) Job Satisfaction = Total score / 9 / No participants
b) Work Satisfaction = Total score / 21 / No participants
c) Psycho-social factors = (9 – Total score) / 9 / No participants

Total inclusion score for IET = a) + b) + c) = as %

4.3.7.4 Range of scores
With so many of the questions being three part responses, the full range of scores was possible so no limitations were added to the total IET score

4.3.8 Patient condition
Table 2b.11 in the literature analysis identified six studies with patient result outcomes, but only Waldenstrom and Gottvall (1991) scored over 50% on the QR score. This study measured clinical obstetric outcomes, so was not a suitable measure.

4.3.8.1 Selection
The EU study indicated that Patient Handling Specialists considered that high quality patient handling could improve the treatment and effectiveness of a care package. Quantifying that effect has been a challenge. This series of questions aims to identify any negative effects of poor patient handling systems. Each identified case of a negative effect reduces the score in the section. The consideration that the prevalence of pressure sores may also be a deterioration in the patient condition is included in Section 11.
4.3.8.2 Data collection
The possible reduction in the level of care is recovered from a questionnaire given to staff and management, as it was unclear that patients would have enough understanding of what should happen to them in a care situation. Other studies collecting condition change need either expert assessors or expert patients.

4.3.8.3 Calculation
Section 8 score was calculated a simple score presented as a %.

\[
= \frac{\text{Total score from survey}}{16 \times \text{No of forms}} \text{ as } \%
\]

4.3.8.4 Range of scores
As this section was a newly defined score, no restrictions were placed on the calculation.

4.3.9 Patient perception
4.3.9.1 Selection
Twenty five outcomes met the inclusion criteria, though many studies provided multiple measures; a sample is given in Table 4.8. Studies that measured family considerations, qualitative records from interviews, subjective assessments of the intervention, or equipment assessments were excluded. This indicated that the measure for patient perception was a judgement of the quality of a single transfer that has just been completed.

In most of the remaining studies the measurement was on a 5- or 7-point Likert scale or a 10-point visual analogue scale. The highest scoring study was by Kjellberg et al. (2004) that used a bi-polar score (-4 to +4) for safety and comfort, with descriptors on the scale. This method was selected and compared with a staff measure of quality of transfer, to evaluate if the transfer was unsafe or uncomfortable due to the quality of the act or unsafe due to the method choice.
Table 4.8 Patient perception – Selected outcome measures

<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Quality</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1996</td>
<td>Gingher</td>
</tr>
<tr>
<td>49</td>
<td>1999</td>
<td>Owen</td>
</tr>
<tr>
<td>66</td>
<td>1997</td>
<td>Best</td>
</tr>
<tr>
<td>72</td>
<td>1999</td>
<td>Owen</td>
</tr>
<tr>
<td>73</td>
<td>1994</td>
<td>Garg</td>
</tr>
<tr>
<td>74</td>
<td>1993</td>
<td>Benevolo</td>
</tr>
<tr>
<td>158</td>
<td>1996</td>
<td>McGuire</td>
</tr>
<tr>
<td>159</td>
<td>2000</td>
<td>Zhuang</td>
</tr>
<tr>
<td>168</td>
<td>1997</td>
<td>Le Bon</td>
</tr>
<tr>
<td>183</td>
<td>1991</td>
<td>Garg</td>
</tr>
<tr>
<td>200</td>
<td>1998</td>
<td>Conneeley</td>
</tr>
<tr>
<td>236</td>
<td>2005</td>
<td>Ruszala</td>
</tr>
<tr>
<td>237</td>
<td>2005</td>
<td>Santaguida</td>
</tr>
<tr>
<td>255</td>
<td>2002</td>
<td>Johnnsson</td>
</tr>
<tr>
<td>271</td>
<td>2006</td>
<td>Baptiste</td>
</tr>
<tr>
<td>227</td>
<td>2004</td>
<td>Kjellberg</td>
</tr>
</tbody>
</table>

4.3.9.2 Data collection
The general views of staff and management, relating to the quality of the services provided, were accounted for in other sections. This section related to the safety and comfort of the patients that were assisted in movement. After the transfer was completed, large font copies of the Likert scales were presented to the patient and the questions asked verbally.

The staff question ascertains whether the choice of transfer was the root cause for any poor perception. This was to be used as a cross check for the section score.

4.3.9.3 Calculation
A simple average score of the collected data is presented.
4.3.9.4 Range of scores
The bi-polar scales presented in this section suggest that any negative score would be an unacceptable outcome. Therefore the range of included scores should be 0-4. Any average scores under zero score zero.

4.3.10 MSD exposure measure
The definition of MSD exposure measure (Section 3.7) is an expression of the volume of patient handling activities as an indicator of the MSD risk.

4.3.10.1 Selection
Table 4.9 shows the range of outcome types included (163) in this section. There were many tools and studies that score for postural risk, biomechanical loading, forces applied and the resultant physiological response and subjective measures of workload. Most of the studies have measured an individual caregiver for an individual task. This form of data collection was not going to be possible in the IET due to time and technological restrictions.

A small number of studies collected workload measures for a group of workers over a period of time. These measurement devices were investigated to identify the factors that needed to be considered for inclusion. The level of physical effort and demand on the workforce was the desired measure. The most suitable measurements were those related to log registrations as a measure of workload, (Knibbe and Friele, 1999; Cohen et al., 2004; and Warming et al., 2008).

It is the author’s opinion that the level of work demand in a given work area is dependent of the following factors: number of staff, number of patients, level of dependency of patients, weight of patients, complexity of care packages of patients, number of handling tasks completed each work period, and methods used to complete the tasks (with a safe system or not).

In line with previous research studies conducted in the industrial partners for the project, the method selected for Section 10 was based on one section of the
Care Thermometer (Arjo ab b). The philosophy of this process indicates success when equipment is provided, but this does exclude some increased workload situations, e.g. for heavier person hoist tasks. The question set included was developed from three studies: self reported workload measure (Knibbe and Friele, 1999), patient parameters and workload (Cohen et al., 2004) and the Arjo Resident Gallery (Arjo ab d).

**Table 4.9 MSD Exposure measures – Selected outcome measures**

<table>
<thead>
<tr>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSD risk factors</td>
</tr>
<tr>
<td>Qualitative studies</td>
</tr>
<tr>
<td>Postural loading</td>
</tr>
<tr>
<td>Biomechanical loading</td>
</tr>
<tr>
<td>Forces applied</td>
</tr>
<tr>
<td>Physiology response</td>
</tr>
<tr>
<td>Self reported workload measures</td>
</tr>
</tbody>
</table>

4.3.10.2 Data collection

24-hour recordings of actual tasks were not possible in the context of this tool, therefore an estimation of patient handling workload was collected based on the measurement of the following factors:

a) The patient condition rated on the Arjo Resident Gallery
b) The weight of the patient
c) The functional activities that require assistance from staff AND are being completed
d) The provision of suitable equipment to manage the risks of transfers
e) Other additional risks perceived by the staff on the unit

The Care Thermometer guidance for safe transfers is as follows:

Repositioning in bed – Hi/lo bed and sliding aids
Lateral transfers – Requires sliding aids
General transfers – Active or passive lifter where appropriate
Hygiene in sitting – Hi/lo hygiene chair
Shower in supine – Hi/lo shower trolley
Bathing – Hi/lo bath
Transfers to bath – Hi/lo seat or hi/lo trolley
Care on bed – Hi/lo bed
Compression stockings – Stocking applicator aid

The final section allowed the staff on the unit to identify further complications for the handling activities based on their experience. Additional risks will be scored for poor equipment, poor environment and lack of compliance of patient.

4.3.10.3 Calculation
The measurement is calculated as two separate ratios that can be used as comparisons between units. The first is to measure the average handling workload per patient, and the second for inclusion in the IET is the average handling workload per WTE staff member.

4.3.10.4 Range of scores
The range of ward types and the different levels of compliance with the manual handling directive across the EU could allow large variation across the scale, so no restrictions on the score system were suggested.

4.3.11 Patient injuries
There were no studies that evaluated patient injuries as outcomes of patient handling actions. The definition for the outcome (Table 3.20) was used to develop a new measure.

4.3.11.1 Selection
The only sources of data that could be included for this section were any record of patient accidents resulting from patient handling actions e.g. mobility, falls, improper positioning etc, and the acquired pressure ulcer data that has already been linked with quality of care (IET Section 5, 4.3.5).

4.3.11.2 Data collection
Only management information from official data collection was used. The recording of pressure ulcer prevalence with local and organisational evaluation is very common across the EU.
4.3.11.3 Calculation

Section 11 score:

\[
\text{Section 11 score} = \frac{\text{Number of reported incidents} + \text{Acquired pressure ulcer score}}{\text{Number of beds}}
\]

The IET score is presented as an inverse percentage score i.e. high accident scores are recognised as poor performance. For a 12-month period more than five accidents per bed was calculated as the 0% score for poor performance.

4.3.11.4 Range of scores

As with the previous section this was a new definition and measure, so the range of values was not understood before the trials were completed.

The measurement of the patient injury outcome is one for future discussion. There is much overlap between the section definitions of 8, 9, and 11. Discussion within the project group and the peer-review panels raised the question that the relationship may exist that \(8+9+11=\) quality of care (IET Section 5, 4.3.5).

**4.3.12 Financial**

In the priority list of outcomes the last included outcome was the financial evaluation of the intervention.

**4.3.12.1 Selection**

A small number of studies (10) were compliant with the inclusion criteria. The most suitable studies were included in Table 4.10.

<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Quality</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>82</td>
<td>1999 Evanoff</td>
<td>Compensation costs</td>
</tr>
<tr>
<td>87</td>
<td>1997 Charney</td>
<td>Compensation costs</td>
</tr>
<tr>
<td>199</td>
<td>1993 Charney</td>
<td>Financial impact</td>
</tr>
<tr>
<td>210</td>
<td>2006 Nelson</td>
<td>Cost benefit</td>
</tr>
</tbody>
</table>

**Table 4.10 Financial– Selected outcome measures**
The IET is not a replacement for a full financial evaluation, so complex cost benefit analysis procedures would be unnecessary for this application. A simple intervention costs versus organisational losses model was defined for this section.

4.3.12.2 Data collection
These organisational outcomes were recorded as part of the management interview. The financial values that need to be recorded were:

- Costs of days lost
- Costs of reduced capacity days
- Costs of MSD claims
- Costs of any treatment for the MSD (internal or external)
- Costs of the intervention extra to the organisational set up

The data will be standardised using the OSHA formula (Charney, 1997, Charney et al. 2006; and Collins et al., 2004). The calculation can then be used as a cost benefit model (e.g. Siddarthan, Nelson and Weisenborn, 2005), if required.

4.3.12.3 Calculation
The score for the IET section will be presented as a ratio of cost improvement per the investment costs for the intervention. Higher scores show higher success for the intervention.
Section 12 score = \[ \text{Losses before} - \text{Losses after} \]
\[\text{Cost of intervention}\]

4.3.12.4 Range of scores
As with the other created calculations there are no restrictions on the scores for this outcome. There may be other values that are worthy of consideration in future developments; figures may be normalised for each EU country depending upon salaries, recognised working hours, etc, and the normal prevalence of MSD in each country. It is suggested that any loss represents a 0% score and 100% improvement on the costs would represent a 100% score.

4.3.13 Summary
Table 4.11 shows a summary of the information required to create the IET score, and the source material for each section.

Table 4.11 Overview of IET development

<table>
<thead>
<tr>
<th>Preferred outcome</th>
<th>Method for collection</th>
<th>Source papers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Safety Culture</td>
<td>PHOQS Documentation review</td>
<td>Hignett and Crumpton, 2005</td>
</tr>
<tr>
<td>2 MSD measures</td>
<td>Nordic Questionnaire (or derivative)</td>
<td>Kourinka et al., 1987</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dickinson et al., 1991</td>
</tr>
<tr>
<td>3 Competence Compliance</td>
<td>Observational checklist. DiNO</td>
<td>Johnsson et al., 2004</td>
</tr>
<tr>
<td>4 Absence or staff health</td>
<td>OSHA Logs</td>
<td>Charney, 1997</td>
</tr>
<tr>
<td></td>
<td>Standardised data per population</td>
<td>Charney et al., 2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Collins et al., 2004</td>
</tr>
<tr>
<td>5 Quality of care</td>
<td>Meeting the clinical needs of the patient, patient evaluation.</td>
<td>Nelson et al., 2008</td>
</tr>
<tr>
<td>6 Accident numbers</td>
<td>Standardised incident numbers and non-reporting ratio</td>
<td>Menckel et al., 1997</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engst et al., 2004</td>
</tr>
<tr>
<td>7 Psychological well being</td>
<td>Job satisfaction</td>
<td>Evanoff et al., 1999 (Bigos Study)</td>
</tr>
<tr>
<td></td>
<td>Psychosocial stressors</td>
<td></td>
</tr>
<tr>
<td>8 Patient condition</td>
<td>Meeting the clinical needs of the patient, staff evaluation.</td>
<td>Care Thermometer (Arjo ab b)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nelson et al., 2008</td>
</tr>
<tr>
<td>9 Patient perception</td>
<td>Comfort</td>
<td>Kjellberg et al., 2004</td>
</tr>
<tr>
<td></td>
<td>Security/Fear</td>
<td></td>
</tr>
<tr>
<td>10 MSD exposure measures</td>
<td>Patient handling demand</td>
<td>Knibbe and Friele, 1999</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cohen et al., 2004</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Arjo Mobilty Gallery (Arjo ab d)</td>
</tr>
<tr>
<td>11 Patient injuries</td>
<td>Detrimental effects of poor case</td>
<td>New tool</td>
</tr>
</tbody>
</table>
4.4 Data collection for the IET

The IET creates section scores to measure the performance against the 12 priority outcomes, and a combination score evaluates the overall performance for patient handling management. The measurement for the 12 sections was examined and combined to create the simplest data collection format. The data collection format of the IET is outlined in Part B of Appendix H. Each section includes guidance notes for data collection, definitions of terminology, inclusion and exclusion criteria.

The IET required a level of skill in the Observer to complete certain sections, e.g. workload assessment and observation scores. Early field trials recruited experts in the patient handling field to assist with the data collection, training requirements will need to be considered for the wider recruitment of observers (Section 6.2 and 6.4).

4.4.1 IET Summary Sheet.
A front sheet is completed to collate the names and contact details for all the individuals collecting data and with details about the ward or unit being assessed.

4.4.2 IET Data 1. Organisational Review
The Observer collects information about, accidents, incidents, workload and the costs of MSD in the area being investigated. Data is gathered through the specialist advisors or managers in the organisation e.g. HR, H&S, ward manager, handling advisors.
4.4.3 IET Data 2. Safety Culture Audit
The Observer conducts a PH safety culture audit, which requires the area manager or senior healthcare person to show documentary evidence that a safe system of work is in place.

4.4.4 IET Data 3. Patient Handling Transfer Observation
The Observer completes a series of patient handling transfer observations, scores the task, and collects the staff and patient observations of the transfer. Twenty five percent of the patients requiring assistance will be observed, or a minimum of five transfers. If the patient is unable to complete the form, it will be removed from the survey.

4.4.5 IET Data 4. Ward/unit survey
The final part of the data collection is the completion of a staff and patient questionnaire including the MSD health, and compliance status, of the staff and the subjective experiences of the patients being assisted.

4.5 Scoring the IET

The calculations and range of scores is explained in section 4.3. The cumulative score for the IET is based simply on the priority order created by the focus group study (Chapter 3). The design of the voting sheets (Sheet 3, 3.2.1) requested a ranked selection from the participants, and even though accumulated values were calculated in Table 3.27, it was inappropriate to use anything other than a ranked list for the final contribution. Addition of the individual contributions was totalled and a percentage calculated. Table 4.12 shows a summary of all the calculation, range and score contributions for the IET. This format was used for data collection in the evaluation phase described in Chapter 5.
<table>
<thead>
<tr>
<th>Preferred outcome</th>
<th>Score description collection</th>
<th>Data collection</th>
<th>Possible range</th>
<th>Low score 0%</th>
<th>High score 100%</th>
<th>IET score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Culture</td>
<td>Modified PHOQS score</td>
<td>Safety culture audit</td>
<td>0-120</td>
<td>0</td>
<td>120</td>
<td>12</td>
</tr>
<tr>
<td>MS health measure</td>
<td>Average level of MS health in staff</td>
<td>Staff questionnaire</td>
<td>0-6</td>
<td>&gt;5 = 0%</td>
<td>&lt;1 = 100%</td>
<td>11</td>
</tr>
<tr>
<td>Competence Compliance</td>
<td>Average modified DINO score</td>
<td>PH Observation</td>
<td>0-16</td>
<td>&lt;4=0%</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>Absence or staff health</td>
<td>Standardised lost work time</td>
<td>Organisational review</td>
<td>0-100 000</td>
<td>100 000</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Quality of care</td>
<td>Average patient handling quality score</td>
<td>Patient questionnaire</td>
<td>0-4</td>
<td>0</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Accident numbers</td>
<td>PH accidents per staff</td>
<td>Organisational review</td>
<td>0- not known</td>
<td>&gt;1=0%</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Psychological well being</td>
<td>Average psychological well-being score</td>
<td>Staff questionnaire</td>
<td>0-1</td>
<td>0</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Patient condition</td>
<td>Average subjective assessment of weakness in PH system</td>
<td>Staff questionnaire</td>
<td>0-1</td>
<td>0</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Patient perception</td>
<td>Average patient perception score</td>
<td>PH Observation</td>
<td>-4-+4</td>
<td>&lt;0 = 0%</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>MSD exposure measures</td>
<td>MSD exposure measure based on workload per patient</td>
<td>Organisational review</td>
<td>0-14</td>
<td>14</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Patient injuries</td>
<td>Patient injury ratio per bed per year</td>
<td>Organisational review</td>
<td>0- not known</td>
<td>&gt;5 =0%</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Financial</td>
<td>Standardised cost improvement for MSD per investment cost</td>
<td>Organisational review</td>
<td>Loss to savings</td>
<td>Any loss =0%</td>
<td>&gt;x1 savings = 100%</td>
<td>87 as %</td>
</tr>
</tbody>
</table>
CHAPTER 5

Evaluation of the IET
The long-term aim of developing a measurement device is to have confidence in the process. It is necessary to evaluate the IET as a whole, and its component parts, for a range of scientific qualities. For the process to be a success the IET will need to be evaluated for validity, to assess that it is a true measure of patient handling performance, and that it can differentiate between good and poor performance. It will need to be useable across the range of EU member states and the breadth of the EPPHE group. The instructions and calculations will need to be reliable for repeated measures in a single site intervention and across multiple sites with good inter-rater reliability for observer teams.

The process of validation for complex tools in the patient handling literature is limited. Some types of measures lend themselves to the validation process. Postural risk assessment tools e.g. OWAS (Karhu et al., 1977) and REBA (Hignett and McAtamney, 2000), both have validation in their original publications and have been accepted as transferrable tools. The same can be said of some of the biomechanical models, e.g. NIOSH (Warters et al., 1993) or the studies from the Dortmund Group (Jaeger et al., 2005; Jordan et al 2006). These biomechanical tools, though well validated by the physical nature of their measurement, are in some cases difficult to apply due to the level of equipment required (e.g. Marras et al., 1999) and the focus on a single transfer situation (e.g. McGill and Kavcic, 2005).

Other tools that are more widely used in patient handling applications have not been subject to the same rigour. The DiNO tool for assessing performance of single transfers identified weaknesses in inter-rater reliability in some phases of its calculation (Johnsson et al., 2004). The MAPO tool (Battevi et al., 2006) had a ten-year evaluation to show the consistency of use, but the validity of the measure was not clearly proven by even these considerable numbers. Subsequent evaluations in other locations have questioned the scoring process (Cotrim et al., 2006; and Fray, Hignett, Evans and Hunter, 2006).

In addition patient handling outcome measures lack the scientific evidence to show that a reduction in exposure to risk actually reduces the number of MS
injuries (Amick et al., 2006; Dawson et al., 2007; and Martimo et al., 2008). A full process of validation and reliability testing will be discussed later (Section 6.3). The aim of this study was to develop a version of the IET to be used in hospitals with a minimum of training, and allow peer review and evaluation.

5.1 Methodology

The calculation of the individual section and total IET scores is described in Chapter 4. This format of 12 sections was complex and too time consuming for field data collection. A series of stages were used to evaluate the calculation methods and the data collection process (Figure 5.1).

During the development of the initial version of the IET (Vi), pilot visits to UK hospitals were completed to develop a useable process and accessible documentation. The findings of the pilot visits are summarised in Appendix I.

The full IET document (Vii) was reviewed with key national representatives from the UK patient handling arena. The suggestions from this peer review panel created an acceptable version to be used for the EU trials (Viii). The IET V(iii) was converted to a data collection format (see 4.4), translated into the three EU languages, peer reviewed and corrected by the facilitators before the trials. Two sites in each of the four EU countries were used to collect data to evaluate the IET. These data were presented at an EPPHE panel to complete the peer review process, and provide comments for the evaluation and recommendations for future use (Chapter 6).
5.1.1 Pilot visits
The IET (Vi) was reviewed in two NHS sites (acute and primary care) in the UK. A senior member of the back care team (acute hospital) reviewed the document. After minor modifications it was used to collect a set of data from a single orthopaedic ward. Modifications were made to the IET format and structure based on the reviewed feedback (Appendix I). The reviewed version (Vii) was taken to a primary care hospital and was reviewed by the Back Care Advisor. Access to a ward was not possible at the time.
5.1.2 UK peer review panel
The peer review panel, consisted of UK PHAs with high levels of experience in the management of patient handling systems, plus representation from the HSE, NPSA and NBE. Each participant was given a full copy of the IET (Vii) with supporting information. A focus group format was used to allow discussion of each section. Feedback was requested on content, data selection, interpretation and the validity of the calculation method. Comments received at this panel were adopted into the EU trial version (Viii). It was decided not to add or change scoring systems or questions from the peer reviewed/ validated tools, to avoid conflict with existing validity. All participants were subject to the usual ethical procedures outlined in the Loughborough University procedures (Appendix C).

The IET (Viii) document used for the trials is in Appendix H.

5.2 IET EU trials

The next stage in the evaluation process was to return the IET to the four countries that had participated in the original focus groups, and complete an IET assessment on two separate ward areas. The data collection tools and instructions for data collection were translated. Each was sent to the EU facilitators for proofing and corrections. Many typographical and interpretation differences were corrected through the proofing process. The translation also added to the peer review process, as the facilitators had a working knowledge of the calculation format of the IET and raised questions about the specific nature and content of the questions and the required answers. MF met with all EU facilitators individually to discuss any corrections. The EU facilitators corrected the documents and a final proof was returned to the facilitators to affirm the corrections.

The EU trials were co-ordinated by the EU facilitators with the assistance of the managers and PHAs in each hospital. Where appropriate, the local permissions and ethical approval were obtained. The EU facilitators selected
two ward areas in one or two acute hospital sites. The two locations represented a well-managed unit and a poorly performing unit. The data collection was completed by the EU facilitator or a named person in the hospital (not MF). If possible dual copies of observational data (IET Data 3, 4.4.4) were collected if more than one observer was present. The principal researcher (MF) was present through all the data collection and kept notes of the different situations and potential problems.

Table 5.1 Locations for data collection

<table>
<thead>
<tr>
<th>Location</th>
<th>Hospital</th>
<th>Facilitator</th>
<th>Data Collectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>London, St Mary’s Hospital Ward 1</td>
<td>Mike Fray</td>
<td>Claire Mowbray Jenefer Fraser</td>
</tr>
<tr>
<td></td>
<td>London, St Mary’s Hospital Ward 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portugal</td>
<td>Lisbon, Hospital Egaz Moniz Almada, Hospital Garcia de Orta</td>
<td>Teresa Cotrim</td>
<td>Teresa Cotrim Natalia Parente Claudia Frencito</td>
</tr>
<tr>
<td>Finland</td>
<td>Turku, Long term elderly care unit. Turku Geriatric Hospital</td>
<td>Leena Taminnen-Peter</td>
<td>Leena Taminnen-Peter Virpi Fagerstrom</td>
</tr>
<tr>
<td>Italy</td>
<td>Milan, Niguarda Hospital Vascular Surgery Ward Emergency Medicine Ward</td>
<td>Natale Battevi</td>
<td>Olga Menoni</td>
</tr>
</tbody>
</table>

The principal researcher (MF) took the completed data sheets and provided a report to each location. The trial data, feedback from the participants and the field notes are reported below. This review information was used to create the discussion format for the final EPPHE review panel.

5.2.1 UK Trial

The chosen locations were situated in St. Mary’s Hospital, which is part of Imperial College Healthcare NHS Trust and is one of the large London teaching hospitals and delivers acute health care. The two wards were part of the medical health care provision, one mainly for elderly patients, the other a specialist stroke ward.
5.2.1.1 Site 1 (Grafton Ward, St Mary’s Hospital, Paddington)

The collection of the staff survey forms resulted in only four completed from the 11 required. A full set of patient surveys was collected.

PH tasks observed for IET Data 3

1.1 Shower transfer with 2 staff
1.2 Hoist transfer toilet to bed
1.3 Hoist transfer bed to chair
1.4 Hoist chair to bed
1.5 Assisted mobility

No patient data were collected for observation 5 due to the cognitive level of the patient.

The following comments were noted during data collection:

- The non-availability of the lead person on the site created problems
- If staff are unavailable repeat visits may be required to complete the data collection
- The responses from multiple senior staff lead to differences in the data collected
- There was a lack of clarity over whether support staff (physiotherapy/occupational therapy) were included in staff numbers
- Individual interpretation of the questions created differences between staff and senior managers responses for quality of care.
- The workload assessment in IET Data 1 was considered complex without prior knowledge of the tool
- Training needs to be considered for data collectors and the senior staff assisting in the data collection
- The experience of the observer against the staff affected the judgements of how well the task had been completed
- Patient responses to questionnaires were difficult to collect without staff being present.
- The response rate for staff questionnaires in IET Data 4 was affected by the 12 hour shift pattern
5.2.1.2 Site 2 (Albert Ward, St Mary’s Hospital, Paddington)

The general process for the second site was better than the first. A management difference observed in this area was the reliance on physiotherapy staff to assist and plan the getting out of bed activities. Eight staff survey forms and four patient survey forms were collected. As a secondary assessment two members of the back care team (JF and CM) collected DiNO assessments for this ward. Patient data were only collected via one observation due to cognitive issues.

Tasks observed for IET Data 3

2.1 Manual bed to chair
2.2 Lying to sitting
2.3 Assisted sit stand walk, bed to chair
2.4 Hoist chair to bed
2.5 Sit stand sit back in chair
2.6 Hoist bed to chair including rolling to fit sling

The following comments were noted during data collection:

- Regular shift patterns improved the data collection from staff
- A single injury recorded 12 months of decreased capacity to score high on lost time.
- Two different systems for documenting patient mobility assessments were recorded
- Equipment malfunction and availability affected the scores in the workload assessment
- Even with limited experience of the IET Data 3 there was close agreement between the two observers
- The level of cognition affected the numbers of patient surveys collected
- The reliance on physiotherapists to complete patient transfers meant tasks included an element of assessment of the patient’s function
5.2.1.3 Summary of UK results

These are the key feedback points from the data collected:

### Table 5.2 Summary results for UK trial

<table>
<thead>
<tr>
<th>Measure</th>
<th>Site 1</th>
<th>Comments</th>
<th>Site 2</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Culture (PHOQS)</td>
<td>25</td>
<td>Very high score for safety culture, the secondary visit recorded very positive responses to the PHOQS scores but earlier information had questions over link workers</td>
<td>18</td>
<td>An acceptable score for PHOQS assessment. Errors seen for lack of formal communications of risk assessment and handling plans</td>
</tr>
<tr>
<td>MSD Workload</td>
<td>26 / 1.44</td>
<td>A total of 26 tasks were found to be uncontrolled against the care thermometer (1.44 per patient). Most problems were sitting hygiene and elastic stockings</td>
<td>21 / 1.05</td>
<td>Problems with hygiene in sitting and lateral transfers</td>
</tr>
<tr>
<td>Competence Compliance</td>
<td>7.5</td>
<td>4/5 observations were not supported by the risk assessment paperwork. The average on the original DiNO score was 12 the minimum acceptable score.</td>
<td>9.75</td>
<td>An improved score for both the DiNO scores and the compliance scores but still did not make the 12/16 minimum</td>
</tr>
<tr>
<td>MSD levels in staff</td>
<td>3.4</td>
<td>2/5 staff had the full score for MSD ill-health</td>
<td>3.0</td>
<td>3/8 staff had full scores for MSD ill-health</td>
</tr>
</tbody>
</table>

5.2.2 Portugal Trial

The Lisbon visit was the first EU trial. To gain access to the healthcare system the organisations required instructions and preparation in the IET. The EU facilitator visited both sites to inform the managers of the tool, the processes and the structure of the visit. The staff survey forms were distributed via the head nurse the week before the data collection.
5.2.2.1 Site 1 (Hospital Egas Moniz, Lisbon, Internal Medicine Ward)
The patients are allocated to staff teams and not by room or location. The ward manager selected the tasks for observation and two staff demonstrated all the observed tasks. Fifteen staff surveys were completed but no patient surveys were possible.

Tasks observed for IET Data 3
1.1 Repositioning in bed with 2 staff, no slide sheets
1.2 Bed to chair, manual pivot transfer, sheet and bracelets used for restraint
1.3 Repositioning in bed with 2 staff, no slide sheets
1.4 Repositioning in bed with 2 staff, no slide sheets
1.5 Chair to bed, manual lift transfer

No patient data was collected for any of the observations due to cognitive limitations of the patients.

The following comments were noted during data collection:
- Planning and site visits by the EU facilitator improved data collection
- Sickness absence rates were recorded in the occupational health team
- Reduced capacity on the return to work was provided by the ward manager
- The lead nurse on the ward assisted with the completion of the workload scores and patient assessments
- Occupational health assisted in the completion of IET Data 2 for safety culture.
- No patient handling plans were located that gave guidance for handling
- The expectations and experience of the observers could have affected the observation scores for very high risk manual transfers

5.2.2.2 Site 2 (Hospital Garcia de Orta, Almada, Internal Medicine Ward)
Almada is a small suburb situated just over the major river crossing from the port of Lisbon. The hospital is relatively new. The same OH systems are in place as the previous site. The ward was also an internal medicine ward but
with fewer patients. Physically, there was no height or position adjustment on any bed in the hospital, except for a small number on the intensive care unit. The beds and chairs were too high for the patients, and steps were used to assist transfers.

Tasks observed for IET Data 3
2.1 Manual bed to chair
2.2 Hoist bed to chair roll to fit sling
2.3 Assisted sit-stand-walk, bed to chair
2.4 Bed to chair Patient good mobility
2.5 Reposition patient in bed

No patient data was collected for most of the observations, due to cognitive issues of the patients, and so will not be analysed.

The following comments were noted during data collection:

- The provision of fixed height beds had a significant effect on the workload score but there was a lack of clarity regarding its effect on some of the scores. If the bed is part of any of the following it could score negatively: repositioning in bed, lateral transfers, general bed to chair transfers, transfers to bath, care on bed, application of elastic stockings. This scoring would have added a further 45 negative scores to the total, and this would raise the level of work per patient.
- Inexperienced observers reported difficulties assessing the performance of transfers with very dependent patients
- 17 staff surveys were returned.
- Patient surveys were collected by staff on the ward which could affect the feedback from patients

5.2.2.3 Summary of Portugal Results
These are the key feedback points from the data collected:
### Table 5.3 Summary results for Portugal trial

<table>
<thead>
<tr>
<th>Measure</th>
<th>Site 1</th>
<th>Comments</th>
<th>Site 2</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Culture (PHOQS)</td>
<td>13</td>
<td>Weak score for management systems. Central systems in OH not supported by locality information. Poor communications score in Q9&amp;10</td>
<td>16</td>
<td>Poor mobility documented assessments and weak systems for disseminating information reduced the organisational score</td>
</tr>
<tr>
<td>MSD Workload</td>
<td>69 / 2.23</td>
<td>The workload score was high to indicate the high physical nature of the ward (2.23 manual tasks per patient). Lateral transfers, bathroom transfers and no hi/lo shower facility and the prevalence of elastic stockings scored highly.</td>
<td>29 / 1.21</td>
<td>This workload score did not accurately measure the postural and force loads placed on the staff. The effect of fixed height beds could have been interpreted more severely. If the adverse effects of beds were included the scores were 74 / 3.1</td>
</tr>
<tr>
<td>Competence Compliance</td>
<td>4.65</td>
<td>The converted DiNO score showed a poor level of competence (average 9.3) that was reduced to a very low combined score as there was no evidence of handling plans in the risk assessment process</td>
<td>5.2</td>
<td>The full DiNO scores averaged 10.4 which given the environmental considerations was high. No documented handling plans were observed so all scores were reduced in the combined score.</td>
</tr>
<tr>
<td>MSD levels in staff</td>
<td>2.73</td>
<td>No staff recorded having time away from work for MSD over the past 12 months 2 staff recorded the lowest</td>
<td>2.94</td>
<td>3 staff recorded MSD sick leave in the last 12 months, only one recorded no pain in any area on the survey</td>
</tr>
</tbody>
</table>

#### 5.2.3 Finland Trial

The EU facilitator (LTP) had arranged visits to two sections of the elderly care services of Turku health board. Like so many EU systems, the Finnish health and social care systems have been through many changes. The most recent has seen health and social services merged together.
5.2.3.1 Site 1 (Elderly Care Unit, Turku)
Geographically selected, this unit had been part of an intervention trial, but frequent management changes had meant some weaknesses in the continued implementation of change. Arrangements were made to collect the observational data (IET Data 3) early in the day, and the questionnaires (IET Data 4) had been circulated by the local manager.

This unit was well established with 35 patients in a 40-bedded unit. The patients were very long stay i.e. some in excess of 6 months. The health and social care system in Finland is integrated so long term systems are common.

Nineteen staff survey forms were collected, but as cognitive impairment was high very little patient data were collected.

Tasks observed for IET Data 3:
1.1 Assisted stand, with rollator
1.2 Sit to stand, with a transfer hoist
1.3 Off toilet, with transfer hoist
1.4 Bed to chair, with framed turning platform
1.5 Raise from bed and walk to breakfast
1.6 Off bed to chair
1.7 Off bed, walk with rollator to toilet

No patient data was collected due to the cognitive level of the staff for IET Data 3 and IET Data 4. No sling lift hoist was available on the day of the trial.

The following comments were noted during data collection:
- Different working patterns were reported at weekends to weekdays.
- A physiotherapist had much responsibility for PH decisions on this ward
- Four link workers were reported but had no specific training
• The hospital did not collate injury records. The health board collected this information with no feedback to sites. The senior nurse had collated her own records.
• The two observers (LTP, VF) were experienced in using many of the tools included in the IET.
• Observer found it difficult to score mechanical transfers for staff postures.
• Some differences were reported between the observer assessment and the staff assessment of some transfers

5.2.3.2 Site 2 (New PFI Build, Turku Geriatric Hospital)
The second site was a new build part of Turku Health and Social Care Board. The unit was opened in May 2009 and has recently won an award for the ergonomics of its design. Ward 4 included two large ward areas. The trial took place in 4C, which has 33 patient beds, 40 staff and delivered long term care for the elderly.

Twenty two staff surveys were collected and three patient surveys were collected with the help of a senior staff nurse.

The observations that were completed included:
2.1 Raise form bed to Wheelchair, with stand-aid.
2.2 Off bed to Wheelchair, using walking frame with ski/sled attachments
2.3 Off bed to wheelchair, with roto-stand.
2.4 Lateral transfer to shower trolley.
2.5 Lateral transfer to shower trolley.
2.6 Bed to wheelchair, with handling belt.
2.7 Complex hoisting needs, bed to chair.

The following comments were noted during data collection:

Comments on Data Collection
• Different working patterns were reported at weekends to weekdays.
• Staff for two units were recorded in a single record
• Organisational systems were not as well developed in this site
A physiotherapist had much responsibility for PH decisions on this ward.

Four link workers were reported but had no specific training.

Much of IET Data 1 for sickness absence was not collected due to the government recording process.

If an observer has been involved in the intervention some influence or bias may be seen in the assessment.

A debrief discussion was completed with LTP, VF and MF. It was suggested that the observation scores were weaker at Site 2 due to poor performance of high-risk tasks. MF added that the risk assessments located on the computer system had not been completed so almost all tasks had lost 50% of scores. Site 1 had better clarity in the roles and structure for the link workers, and access to the OH physiotherapist. The new ward (Site 2) will also score zero for the sickness absence data, where Site 1 had higher absence but the local manager was very conscientious and recorded the information. It was clear that the environment was much preferred in Site 2, but with the systems and support Site 1 was the better performer for the IET.

5.2.3.3 Summary of Finland Results.

These are the key points from the data collected:

<table>
<thead>
<tr>
<th>Measure</th>
<th>Site 1</th>
<th>Comments</th>
<th>Site 2</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Culture (PHOQS)</td>
<td>18</td>
<td>Good management systems were recorded (13/15). The communication processes were not clear or documented for Q9&amp;10</td>
<td>20</td>
<td>Good management systems (11/15), were supported with good communication systems (9/15)</td>
</tr>
<tr>
<td>MSD Workload</td>
<td>33 / 0.95</td>
<td>Equipment provision was good and most tasks were compliant. 16 extra risks were noted in the other column to identify the effects of dementia behaviours</td>
<td>32 / 0.97</td>
<td>32 tasks were not fully controlled and they were all related to the manual assistance of class C patients with transfers and lack of compliance as an extra risk.</td>
</tr>
<tr>
<td>Competence Compliance</td>
<td>11.1 5</td>
<td>The original DiNO scores were positive (12.14). The risk assessment documentation was complete but some compliance points were lost for minor differences to the documented plans</td>
<td>7.52</td>
<td>The true DiNO score was fair at 11.5 though one scored a very low 6. 5/7 lost marks for not having a suitable documented plan of the task.</td>
</tr>
<tr>
<td>MSD levels in staff</td>
<td>4.1</td>
<td>7/19 recorded some MSD absence in the last 12 months and the highest score. Only 1 recorded no MSD. Only 3 staff recorded not having some MSD problem in the last 7 days. 2 staff are currently unavailable for work due to MSD and were added to the data</td>
<td>4.09</td>
<td>High cumulative figures for MSD and absence (8/22). More importantly all but 2 staff reported some problems in the last week (20/22) only 1 reported no pain or discomfort during the 12 month period</td>
</tr>
</tbody>
</table>

### 5.2.4 Italy Trial

The facilitator had arranged visits to two sections of the Naguarda Hospital in Milan (Ospedale Maggiore). Naguarda has been a hospital site for 170 years and is the largest in Milan. Both units have been part of interventions trials and have been supervised by the EPM centre. Since 1999 there has been information for the selection of aids, patient handling training and an effectiveness checking process. Arrangements were made to collect the observational data (IET Data 3) early in the day. The staff and patient questionnaires, were circulated by the local manager. There was a large group of people present in the observation, and manager’s data collection including: Head nurse for ward, senior member of staff, two head nurses for hospital, two people from safety team. This was difficult to manage for the observations.

#### 5.2.4.1 Site 1. (Vascular surgery ward, Naguarda Hospital, Milan)

This ward was in the older part of the hospital. Patients were in four bedded spacious bays and corridors.
On the day of the survey 17 patients were recorded in 20 beds. Thirteen staff and 17 patient survey forms were collected.

Tasks observed for IET Data 3
1.1 Reposition in bed.
1.2 Move up bed.
1.3 Return to bed and roll into side lying.
1.4 Use of hoist, bed to wheelchair.
1.5 Bed to wheelchair.

Patient data was collected from most observations.

The following comments were noted during data collection:

Comments on data collection
- Poor availability of equipment was identified in the collection of IET Data 1.4.
- Patient handling demand was low due to many partially mobile patients on ward.
- There was a lack of clarity over the roles of link workers and physiotherapists on this ward.
- The same two staff were observed for all the tasks for IET Data 3, which will introduce bias to the score.
- The EU facilitator had experience with the DiNO tool.
- Patient responses were sought with the large numbers of observers in the room, which is likely to influence responses.
- The PHRA documentation was investigated during the trial, and little information was included for patient movement.
- The patient survey questionnaires were distributed in advance to all patients, not just those that needed assistance.

5.2.4.2 Site 2 (Emergency Medicine Ward, Niguarda Hospital, Milan)
The second site was part of a newer section of the hospital, but part of the same department with the same senior managers. The emergency medicine
ward has an average stay of four days. The ward is usually full to capacity and on the day of the survey had 26 patients in 26 beds. The type of care delivered on the ward was acute emergency medicine. Patients were not bathed or showered, and may not have had the same number of transfers as other forms of care delivery.

Seventeen staff surveys were collected and 25 patient surveys were collected with the help of staff.

The observations that were completed included:
2.1 Hoist, to change mattress
2.2 Bed to chair, with minimal assistance
2.3 Move up bed, with slide sheets
2.4 Complex hoist requirements for CP/neuro condition
2.5 Bed to stand, and walk to toilet

The following comments were noted during data collection:

Comments on Data Collection
- The data collection for site 2 was completed after the IET Data 1 and 3 at Site 1.
- The interaction between the two data collections reduced accuracy of the primary researchers evaluation of the two sites.
- The quality of information for IET Data 1 was questioned, as the section was completed from memory with no evidence being shown.
- The safety team recorded incident data. The head nurse stated the absence was nil and it was assumed that costs were nil.
- There was a lack of clarity over the roles of PHAs and link workers.
- Patient responses were sought with the large numbers of observers in the room, which is likely to influence responses.

The EU facilitator (OM) suggested that her observation and knowledge would rate site 2 as the ward with the better management systems.
5.2.4.3 Summary Results for Italy Trial

These are the key feedback points from the data collected:

Table 5.5 Summary results for Italy trial

<table>
<thead>
<tr>
<th>Measure</th>
<th>Site 1</th>
<th>Comments</th>
<th>Site 2</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Culture (PHOQS)</td>
<td>6 (11)</td>
<td>Documented systems for management of PH were in the most part absent. No PH link worker means no score from Q9&amp;10 but evidence was found to show communication to disseminate handling data.</td>
<td>11</td>
<td>The management systems scored 11/15 but as with site 1 no link system or named nurse to monitor PH so lost all points in second half.</td>
</tr>
<tr>
<td>MSD Workload</td>
<td>25 / 1.38</td>
<td>The measures for the 18 patients indicated 25 uncontrolled tasks</td>
<td>3 / 0.12</td>
<td>Only 3 tasks were not completely covered with the expected equipment provision. 16 out of 26 were recorded as A or B who need very little assistance</td>
</tr>
<tr>
<td>Competence Compliance</td>
<td>10.83</td>
<td>The original DiNO score averaged at 12.75 which is above the level of competency agreed in the tool. Compliance scores were lost for not meeting the specified technique exactly.</td>
<td>10.575</td>
<td>The competence scores again exceeded the criteria at 13.1. 2/5 tasks did not have documented information describing the task to be completed.</td>
</tr>
<tr>
<td>MSD levels in staff</td>
<td>3.46</td>
<td>Four staff recorded MSD sickness absence in the previous 12 months, only one recorded no MSD at all. 10/13 recorded some MS problem within the last week</td>
<td>0.65</td>
<td>The staff in the emergency medicine department were young. No staff recorded full scores and 9/17 recorded no pain or discomfort at all. This and the psychological data are both very positive scores</td>
</tr>
</tbody>
</table>
5.3 Discussion of EU trials.

The local knowledge and assistance of the facilitators created excellent access for the IET trials. All four of the locations were supportive in assisting with the collection of eight data sets. The objectives of the trials were to offer 1) real time and site experience in the data collection process to examine possible methodological changes and 2) to use the eight data sets to evaluate the scoring systems (Section 5.4).

5.3.1 Positive findings during data collection

a. The major success of the IET was that with little preparation on site it was possible to collect complete IET data on all eight of the trial sites.

b. The international nature of the tool supported by the EU facilitators and the translation service has clearly allowed the IET to be used and evaluated in four very different locations. The tool has validity enough to allow no major language discrepancies, whilst still picking up the differences in the provision of health care services. It may be necessary to record the important cultural differences country by country, if the tool is to be used in a wider application across the EU.

c. The range of data in the four data collection sections shows that in all areas of the IET there are subtle and obvious differences to show how each ward managed the different aspects of patient handling.

d. Some evidence was not available, but the IET process always accepted that missing data shows that the location would not score positively for certain areas of the complex tool. These gaps are more clearly explained in Section 5.4.

e. The time taken to collect a full data set was found to be to less than half a day (approximately 3 hours). The first trial (UK) showed the weakness in not completing the observation tasks (IET Data 3, DiNO) in the early part of the visit. This also created the requirement to prepare the location for the visit with a pre-trial visit and information.

f. The delivery and distribution of the staff questionnaires (IET Data 4) before the data collection was a successful method, as the numbers required (50% of total WTE) is in many situations not feasible on the day.
g. No problems were raised with IET Data 4.3
h. In three countries multiple observer results were collected for IET Data 3. There was good agreement for most of the observations though approximately one in five scores did show clear variation. In Portugal and the UK some of the observers had no experience of the tools before the day of the visit.

5.3.2 Negative findings from trial
The successful collection of full data sets in four EU countries revealed that there were no significant barriers to the data collection process, but inconsistencies in some areas of the data collection were noted. Areas where clarity of the process may be improved are shown below:

5.3.2.1 IET Data 1. Organisational review
General language and format
a. There are differences across the safety sector on the concept and definition of risk assessment. It may be possible to check the language against the language of the EU directive and ISO standards to ensure standardisation.
b. The collection of several pieces of information from section 1 proved problematic.
c. The total number of hours worked needs to be calculated by the observer and shifts missed should be requested in Section 1.2

IET Data 1.3 MSD and levels of sickness absence
d. There were differences in the recording of PH caused sickness absence as in some areas local recording was observed, but in other areas hospital systems were required.
e. Partial incapacity was rarely recorded centrally, and local managers observed the return to work process.
f. No wards could provide financial data.

IET Data 1.4 Workload from patient dependencies
g. The Care Thermometer (CT) is a complex collection and calculation format, though the alternative format developed for the IET met with approval from the two observers who had experienced the CT previously (Finland).

h. Concern was recorded that completing a bed bath is not a negative score when using a hi/lo bed. The perception of staff is that these tasks are high effort for musculoskeletal load.

i. As with previous iterations of the CT, there is a complication with category C patients. The equipment options states the use of a sit-stand hoist only but there are many rehabilitation based professionals that consider the manual facilitation of sit, stand and walk functions very important, and when used with the right patient are very safe.

j. Taking the needs based approach there is no difference in the score of an A to the score of an E if equipment is provided. It would be interesting to consider the workload of a ward of category A patients against a ward of category E’s. In the feedback report from the CT there is a chart to show ratios of the categories, but there is no added risk levels unless the equipment needs are not provided.

k. There were difficulties with B, C, and D definitions during the process. Specifically, difficulties with dementia patients who change due to behaviour (e.g. Bed 15 A by mobility C by behaviour).

l. Some observers questioned the boundary of the equipment definition e.g. rollator, framed turning platforms etc.

m. The Finland trial identified that the use of the CT did not involve the categories of passivity included in the CT, so any provision of equipment eases the workload on the staff, though it may be considered too much equipment in some circumstances.

IET Data 1.5 Patient handling management systems

n. The managers’ perceptions were recorded clearly by all the senior people in the trial. An attempt to collect more versions of IET Data 1.5 met with mixed success. Safety officers in Italy, PHA in the UK and all observers were also asked to complete the questions. Questions 1-4 proved impossible for most who did not have hands on experience on the ward
but the management commitment question (5) was a good addition to the data set.

5.3.2.2 IET Data 2. Safety culture audit

a. PHOQS has elements of organisational assessment and local area based assessment. There may need to be two score systems, or an organisation score and a local score that is combined to give an overall score. The wording of some of the questions (3 and 8) overlaps the evidence of a single ward versus the whole hospital.

b. The risk assessment described in PHOQS is the hospital wide systematic review of risks, with a priority based score system to place in order the outstanding risks to the organisation. But the second section is relative to the provision of a handling plan (mobility assessment) to assist with physical movement of a patient. This tool was originally to be collected by PHAs, but this role is not recognised in all EU countries. This needs clarification for the final version.

c. There is a need to clarify the language and definitions of RA, PHRA and PHP or mobility assessment.

d. Emphasis needs to be given for the evidence to support all sections of the PHOQS tool particularly Q9 & Q10. Q9 & Q10 need to be proven with physical evidence, considering one point for system present, and one point for evidence that it is used on day-to-day basis.

e. Further to the physical evidence, Q9 and Q10 of PHOQS suggest a high reliance on the provision of a link worker and documented systems. It is possible to show the documentary evidence with an effective management system, but without a named link worker.

5.3.2.3 IET Data 3. Patient handling transfer observation

a. Possibly out of all the data collection, 3.1 (Patient Handling Observation) based on DiNO (Johnsson et al., 2004) has the largest potential for inconsistency. It must be considered for the final version of the guidance, to tighten up the subjectivity of the following questions. The IET did not reproduce the full guidance for the DiNO observations as it adds
significantly to the document but key points may need to be included in the final copy.

a. Specific aspects of the assessment lacked clarity; hazardous under arm holds, lack of preparation for movement for Alzheimer’s patient, unconfident staff made errors with the stand-aid procedure were all difficult to score.

b. Some tasks were easier to score negatively e.g. lateral transfers with a high posture load, and handling belt transfers with a high force load.

c. Situations where a high-risk method was used to reposition as a second move were difficult to score.

b. Question 2 has no definitive specification for enough space and caused confusion in some observations.

c. Questions 5 and 6 were sometimes left blank for transfers that required no equipment.

d. The performance phase questions (8-13) clearly needs better definition and reference to the original guidance to assist the observers.

e. The scoring of postures and efficiency when equipment is being used is difficult, as the level of effort is sometimes very different to the loads of patient handling.

f. The compliance factor (Q 17,18) required a quality judgement for the PHRA/PHP information. This suggests that the information written down should allow the observer to complete the task. In order to do this the manager/PHA or lead should inform the team of the risk assessment and management system that allows the staff to read a risk assessment and then deliver the PH task. There may be a possibility to include this in the PHOQS section and transfer it to the DiNO section. There could also be a minimum requirement for a documented PH care plan.

g. There were differences between the staff perception of the method (IET Data 3.3) and the observer score, which is evidence of the expectation and knowledge of the different observers.
5.3.2.4 IET Data 4. Ward/unit survey

In general, the completion of the staff and patient surveys passed without much concern. The data sets showed much variation across the wards in the trial, which justified the methods and the question format.

a. Some questions were raised regarding staff who had high scores for many different joints in IET Data 4.1.

b. In IET Data 4.2, the staff well-being survey, there was some doubt about 11-13 as they are designed with an opposite bias to questions 1-10. Some groups of forms had a clear shift of recording e.g. Portugal but others did not e.g. UK.

c. The patient survey (IET Data 4.4) had the limitations of any questionnaire in areas where patients are elderly and may have cognitive impairment. It is important to collect this subjective view of the ward performance without bias from the staff or peer pressure from patients or family.

5.3.3 Limitations

- The selection process for tools in the IET included tools that had already been through a validation or evaluation process, and did not allow for any changes in the structure and format. This was necessary to avoid conflict with established validity, but did not allow for subtle changes in wording or direction of questions.

- The inclusion of four EU locations adds validity to in the development of a tool, but there are still limitations of only using eight separate areas.

- There was a convenience sample related to the selection of the EU locations. The areas were selected by facilitators and tended to be areas that have had some investment by the facilitator in the management systems. There is an interesting question for evaluation about the neutrality of the observer and whether anyone involved with the location can give un-biased results.

- Use of senior managers/nurses for data collection in the managerial sections is unavoidable. It was sometimes difficult to be sure that the evidence given resulted in a positive bias relative to the real data (UK Site 1). For the Italy trials, the Senior Nurse Managers from the hospital accompanied the full trial and this undoubtedly had an effect on carer and
patient feedback. The facilitator (NB) suggested that most of the
difficulties in setting up the trial were due to the management considering
that the research team were government inspectors.

5.4 IET calculation review

Table 4.12 records the calculation for each section and the total score for the
IET. The data collected in the EU trials was put through the calculation
formulae to calculate section and total scores. Table 5.6 shows the percentage
score against each section, and Table 5.8 shows the contribution of each
section to the total IET score. The first EU trial was held in the UK, and
difficulties with collecting the staff and patient questionnaires were noted in this
trial. The numbers of IET Data 4 questionnaires did not meet the requirements
for the trial. No sites could provide the data for the financial calculation. An
italic score (in Table 5.6) shows that no scores were collected in the trial and
the appropriate full positive or negative score is represented in the calculation
for Table 5.8.

Table 5.6 EU trials - % scores for each IET section

<table>
<thead>
<tr>
<th></th>
<th>UK 1</th>
<th>UK 2</th>
<th>Po 1</th>
<th>Po 2</th>
<th>Fi 1</th>
<th>Fi 2</th>
<th>It 1</th>
<th>It 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Culture</td>
<td>55.6</td>
<td>46.7</td>
<td>13.8</td>
<td>23.3</td>
<td>30.7</td>
<td>39.8</td>
<td>15.6</td>
<td>25.2</td>
</tr>
<tr>
<td>MS health measures</td>
<td>40.0</td>
<td>50.0</td>
<td>55.0</td>
<td>51.5</td>
<td>22.6</td>
<td>21.6</td>
<td>38.5</td>
<td>100</td>
</tr>
<tr>
<td>Compliance,competence</td>
<td>29.2</td>
<td>47.9</td>
<td>3.5</td>
<td>11.5</td>
<td>59.6</td>
<td>29.3</td>
<td>56.9</td>
<td>29.6</td>
</tr>
<tr>
<td>Absence or staff health</td>
<td>0.0</td>
<td>10.7</td>
<td>95.9</td>
<td>64.6</td>
<td>71.2</td>
<td>0.0</td>
<td>100</td>
<td>99.5</td>
</tr>
<tr>
<td>Quality of care</td>
<td>75.0</td>
<td>80.0</td>
<td>100</td>
<td>69.0</td>
<td>64.2</td>
<td>86.7</td>
<td>88.8</td>
<td>79.5</td>
</tr>
<tr>
<td>Incidents and accidents</td>
<td>0.0</td>
<td>97.3</td>
<td>89.5</td>
<td>69.8</td>
<td>82.5</td>
<td>72.0</td>
<td>89.8</td>
<td>88.5</td>
</tr>
<tr>
<td>Psychological well-being</td>
<td>76.2</td>
<td>82.4</td>
<td>77.7</td>
<td>70.7</td>
<td>75.0</td>
<td>70.3</td>
<td>71.7</td>
<td>81.2</td>
</tr>
<tr>
<td>Patient condition</td>
<td>64.5</td>
<td>79.9</td>
<td>45.0</td>
<td>65.9</td>
<td>64.2</td>
<td>62.5</td>
<td>69.1</td>
<td>84.4</td>
</tr>
<tr>
<td>Patient perception</td>
<td>68.7</td>
<td>100</td>
<td>100</td>
<td>66.7</td>
<td>100</td>
<td>52.1</td>
<td>93.3</td>
<td>90.0</td>
</tr>
<tr>
<td>MSD exposure measures</td>
<td>64.0</td>
<td>70.8</td>
<td>52.1</td>
<td>55.2</td>
<td>79.4</td>
<td>75.8</td>
<td>71.6</td>
<td>97.1</td>
</tr>
<tr>
<td>Patient injuries</td>
<td>0.0</td>
<td>0.0</td>
<td>91.8</td>
<td>66.8</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Financial</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
The range of scores for: Absence, Accident numbers, MSD exposure and Patient injuries was unknown before the data was collected. The ranges recorded in this trial are in Table 5.7. To complete the scoring systems the ranges in Table 5.7 were adapted into the calculation for the IET (Table 4.12) and the scores are reported into Table 5.8.

### Table 5.7 Range effect for IET calculation

<table>
<thead>
<tr>
<th></th>
<th>Scores recorded</th>
<th>Range for IET</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Absence or staff health</td>
<td>0 - 17857</td>
<td>0 - 20000</td>
</tr>
<tr>
<td>6 Incidents and Accidents</td>
<td>0.11 - 1.208</td>
<td>0 - 4</td>
</tr>
<tr>
<td>10 MSD Exposure</td>
<td>0.1154 - 1.208</td>
<td>0 - 4</td>
</tr>
<tr>
<td>11 Patient injuries</td>
<td>0 - 1.3</td>
<td>0 - 4</td>
</tr>
</tbody>
</table>

### Table 5.8 EU trials - Section scores and IET total

<table>
<thead>
<tr>
<th></th>
<th>UK 1</th>
<th>UK 2</th>
<th>Po 1</th>
<th>Po 2</th>
<th>Fi 1</th>
<th>Fi 2</th>
<th>It 1</th>
<th>It 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IET total</td>
<td>IET total</td>
<td>IET total</td>
<td>IET total</td>
<td>IET total</td>
<td>IET total</td>
<td>IET total</td>
<td>IET total</td>
</tr>
<tr>
<td>Safety Culture</td>
<td>6.7</td>
<td>5.6</td>
<td>1.7</td>
<td>2.8</td>
<td>3.7</td>
<td>4.8</td>
<td>1.9</td>
<td>3.0</td>
</tr>
<tr>
<td>MS health measures</td>
<td>4.4</td>
<td>5.5</td>
<td>6.1</td>
<td>5.7</td>
<td>2.5</td>
<td>2.4</td>
<td>4.2</td>
<td>11.0</td>
</tr>
<tr>
<td>Compliance, competence</td>
<td>2.9</td>
<td>4.8</td>
<td>0.4</td>
<td>1.2</td>
<td>6.0</td>
<td>2.9</td>
<td>5.7</td>
<td>3.0</td>
</tr>
<tr>
<td>Absence or staff health</td>
<td>0.0</td>
<td>1.0</td>
<td>8.6</td>
<td>5.8</td>
<td>6.4</td>
<td>0.0</td>
<td>9.0</td>
<td>9.0</td>
</tr>
<tr>
<td>Quality of care</td>
<td>6.0</td>
<td>6.4</td>
<td>8.0</td>
<td>5.5</td>
<td>5.1</td>
<td>6.9</td>
<td>7.1</td>
<td>6.4</td>
</tr>
<tr>
<td>Incidents and accidents</td>
<td>0.0</td>
<td>6.8</td>
<td>6.3</td>
<td>4.9</td>
<td>5.8</td>
<td>5.0</td>
<td>6.3</td>
<td>6.2</td>
</tr>
<tr>
<td>Psychological well-being</td>
<td>4.6</td>
<td>4.9</td>
<td>4.7</td>
<td>4.2</td>
<td>4.5</td>
<td>4.2</td>
<td>4.3</td>
<td>4.9</td>
</tr>
<tr>
<td>Patient condition</td>
<td>3.2</td>
<td>4.0</td>
<td>2.3</td>
<td>3.3</td>
<td>3.2</td>
<td>3.1</td>
<td>3.5</td>
<td>4.2</td>
</tr>
<tr>
<td>Patient perception</td>
<td>2.7</td>
<td>4.0</td>
<td>4.0</td>
<td>2.7</td>
<td>4.0</td>
<td>2.1</td>
<td>3.7</td>
<td>3.6</td>
</tr>
<tr>
<td>MSD exposure measures</td>
<td>1.9</td>
<td>2.1</td>
<td>1.6</td>
<td>1.7</td>
<td>2.4</td>
<td>2.3</td>
<td>2.1</td>
<td>2.9</td>
</tr>
<tr>
<td>Patient injuries</td>
<td>0.0</td>
<td>0.0</td>
<td>1.8</td>
<td>1.3</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Financial</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>IET Total</strong></td>
<td>33.5</td>
<td>46.1</td>
<td>46.3</td>
<td>40.0</td>
<td>46.5</td>
<td>36.8</td>
<td>50.8</td>
<td>57.1</td>
</tr>
<tr>
<td><strong>IET %</strong></td>
<td>38.5</td>
<td>53.0</td>
<td>53.2</td>
<td>46.0</td>
<td>53.5</td>
<td>42.3</td>
<td>58.4</td>
<td>65.6</td>
</tr>
</tbody>
</table>

The calculation for the full IET score was successful when using the scores and ranges identified. The range of total IET scores covered approximately 30% of the available range. Table 5.6 indicated full range scores for the individual sections but cumulatively the differences were cancelled out. For future
development the section scores may prove to be more useful for the PHA, to identify the level of practice in each location. Larger data sets from future trials could be used to improve the range of the cumulative scores.

5.5 EPPHE review panel

The final evaluation process that was completed was an expert panel, to provide a continuation of the peer review process by inviting different experts to discuss the IET. The EU facilitators were invited to allow member checking and respondent validation, and cross-checking of the interpretation of the evidence collected in the EU trials.

The EPPHE panel was completed in the UK. Selected participants were provided with expenses to attend and accommodation was provided for the two-day event. The attendance at the group was:

- Primary researcher (MF)
- Representatives of the project group (1 x Loughborough University, 2 x Arjo ab, UK and NL)
- Representatives from each EU trial (UK, It, Fi, Po)
- Eight invited members of EPPHE (N-Author of Care Thermometer and Policy Mirror, UK-Scottish Ambulance Service, F-Strasbourg University, UK-Editor of HOP 5, I-Secretary of EPPHE, Ger-ISSA representative, Ger-EPPHE member, UK-NBE representative).

The two-day programme was structured to allow information from the development and EU trials to be presented to the group, and feedback was collected from all participants in open discussion. Field notes were taken by the project team (SH), and the primary researcher reviewed specific discussions. The expert level of the EPPHE panel was required to assess the efficiency, accuracy and validity of the IET process, data collection and calculations. The feedback was used to support the discussion and evaluation described in Chapter 6.2. Issues relating to process and data collection are recorded in Table 5.9.
5.6 Recommendations for IET process

The pilot studies and UK peer-review panel improved the development of the IET to a system that could be used to collect data from four EU sites (IET Viii). The evaluation delivered from the EU trials and the subsequent EPPHE review panel further identified suggestions for the process of collecting data for the IET. If future development of the IET is to be completed, these issues should be included in the next version (Table 5.9). A more detailed discussion relating to the context and content of the IET is included in Chapter 6, leading to recommendations for content and philosophy for future developments.

Table 5.9 Recommendations for IET process

<table>
<thead>
<tr>
<th>IET Section</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration and background information</td>
<td>Staff surveys IET data 4 need to be distributed in advance to improve the return rate. The WTE numbers need to be clearer in the documentation. The manager needs to be primed for the visit to be able to access the information. Collection by an external observer will require proof of all processes and communications and will require more time. Absence and cost data may require secondary visits to other locations to collect information. Either computer based data collection or computer based calculation of the IET is essential for future development.</td>
</tr>
<tr>
<td>Safety culture</td>
<td>Ensure the language for IET Data 2 reads for ward-based collection. IET Data 2, Q9 and Q10. If no link worker is recorded the section score must be 0/15. It is possible that these actions can be delivered even though a named person is not in place. The evidence in the literature shows the positive effects of the inclusion of a link person / workplace supervisor so a balance needs to be drawn.</td>
</tr>
</tbody>
</table>
| MS health measures                   | The Nordic Questionnaires and derivatives are common and have been used in many studies in and out of PH. The anomaly in this study was Po vs. Fi. The younger staff in Po reported little or no MSD, though they were doing high risk, high frequency tasks. The older more experienced staff in Fi, who rarely touched a hazardous task, all reported Hi MSD scores. Some questions to consider are:  
  - Could it be age factored  
  - Could it be scored against the organisation average  
  - Could it be against the country average or EU average  
  - Could a measure of turnover be used to correct the value |
<table>
<thead>
<tr>
<th>Compliance, competence</th>
<th>Differences between manual handling methods in different countries could add to the level of error for the EU use of the IET. Inter-rater reliability and validity across such different movement types will need to be controlled.</th>
</tr>
</thead>
</table>
| Absence or staff health | The absence ratio was designed to measure the relative shift in large numbers of employees across an organisation. This value is very susceptible to a single serious injury as it gives high absence time in limited numbers of WTE. As with the MS Health data the values could be factored to improve accuracy:
- Could it be age factored
- Could it be scored against the organisation average
- Could it be against the country average or EU average
- Could a measure of turnover be used to correct the value
Clarify the numbers to be included in the staff WTE e.g. Lift teams, physiotherapists, occupational therapists, super-numery staff etc. |
| Quality of care | Little feedback has been recorded around the patient outcomes. |
| Incidents and accidents | Low numbers of accidents are recorded on each single ward. It may be useful to consider hospital ratios to deliver a larger data set for analysis. The use of non-reporting data changed the results in this section. The range of scores requires some further attention.
The score for under-reporting could be an average of all participants or possibly 50% managers multiplier and 50% staff multiplier. |
| Psychological well-being | The questionnaires were clearly understood and scored. A secondary link with MSD for the EU trial could be investigated. |
| Patient condition | The participants all understood the language and philosophy of the question. The ranges of high and low scores will need to be considered |
| Patient perception | Problems with the question set for the elderly/confused. |
| MSD exposure measures | Difficulty with the concept of the CT judgements (1.4). When assisted all staff could complete section 1.4. Conflict was noted surrounding the manual movement of Class c patients. Concern was raised about the relative workload of different conditions, the level of dependency, the frequency of task completion.
The data collection form needs to be improved with different pictures for patient groups. Section 1.4 needs to be completed by the observer and not the manager. |
| Patient injuries | Low numbers of incidents reported may cloud the performance issues. |
| Financial | This was not located in any ward area. There is a question whether it is simply the domain of the researcher or the safety department to conduct Cost Benefit Analysis data to justify rolling out an investment programme. |
CHAPTER 6

Discussion
Introduction

The Chapters leading to this point have described the data collection and analysis undertaken to complete this project. The use of literature review (Chapter 2), focus groups across Europe to collate a priority list of outcomes (Chapter 3), and the selection of measurement tools to create the IET, have been used to develop a complex evaluation process. The IET can be used to compare the performance of patient handling management systems before and after interventions, or between organisations and can be used to guide future interventions in any healthcare location.

Patient handling is a relatively new area of study when compared to the roles of occupational health and safety or occupational medicine. The evidence supporting the practices of moving physically dependent patients from one position to another has grown rapidly since EU legislation promoted a change in practice in 1989 (EC Directive). There is a growing body of evidence specifically reporting the effects and outcomes of workplace interventions to assist the reduction of MSD, and the promotion of better healthcare by the improvement of the management of patient handling practice. The literature analysis section in this study (Section 2b), reported 101 intervention studies for the improvement of patient handling outcomes.

The process of systematic evidence reviews has become well published, and guidance for the completion and reporting of such reviews is high quality and plentiful. Cochrane Reviews (Van Tulder et al., 1997 and 2003) are the most highly regarded of these processes and several systematic scientific reviews have been published reporting patient handling evidence. The limitation of the philosophy of most of these reviews (Amick et al., 2006; Bos et al., 2006; Martimo et al., 2008) is the single focus on the reduction of MSD resulting from patient handling activities and the high physical workload. The focus of these reviews has shown two key facts: 1) the volume of high quality studies in this area is low, and 2) as with other areas of MSD prevention, there are so many confounding factors in the complex work organisations of worldwide healthcare that a definitive explanation of the relationship between MSD and patient
handling is unlikely (Leboeuf-Yde et al., 1997). There is little in the evidence reviews to explain the restrictions to research in healthcare, i.e. ethical review systems and research governance controls.

What these high quality reviews fail to address is the reality of intervention research in healthcare, where there are many other outcomes that can be measured to prove the benefits of patient handling in a healthcare situation. The literature analysis (Chapter 2b) examined the range and detail of outcomes that could be measured to create evidence and prove the benefits of patient handling interventions. The range of staff, patient and organisational benefits show that given the weaknesses in the proven relationship with MSD reduction there are many other measures by which the benefits of PH interventions may be proved. The development of the IET uses the full range of outcomes, and puts into context the relationship between the losses from MSD and other measures of outcome.

6.1 The IET. The concept of a single EU measurement tool.

This study focussed on the outcomes from patient handling interventions, and how they can be combined into a single assessment tool to assess interventions. The evaluation of the IET has shown a successful tool that retrieved and analysed patient handling information from hospitals in four EU countries. The evaluation of the EU trials in Chapter 5 shows that the tool can collect information within an acceptable timeframe, and the calculation definitions showed differences in performance across the different sections.

6.1.1 Priority outcomes
The initial aim of this study was to evaluate the range of possible outcomes and use a range of EU PHAs to define the most important outcomes in priority order. The use of qualitative methods with focus groups and content, and thematic analysis, to identify the preferred outcomes showed many strengths. All of the outcome measurement tools (OMT) reviewed in 2b.6 were developed in a single country, and only some have then been subject to translation for EU wide
use. The access to, and the involvement of, fur EU locations add much to the process.

Frey and Fontana (1993: p82) point out that the group interview is an excellent and friendly method for allowing different views and opinions to be generated, and subtly positioned against another standpoint, with a skilled facilitator. This process facilitated good discussion from all participants by:

- The selection of a homogenous group via the EU facilitator, consisting of people from similar positions, and all sharing an interest in patient handling.
- Gaining individuals consent to participate from the EU facilitator at the point of interview.
- Ensuring formal individual consent is developed at the start of the focus group by the use of an information sheet and signed consent.
- The process chosen (Langford and McDonagh, 2003 based on Higgins 1994), which allowed for the initial Sheet 1 to be completed as an individual process without any peer pressure. This allows each participant to formulate their own ideas to then discuss with the group.
- The impartial recording of all outcomes that created a list of points for discussion, which meant that there was no link between the individuals and the discussion, again avoided any pressure to justify their opinion.

The reliability and validity of each section of the tool will be discussed fully in 6.3, but the methodology explained in 3.4, suggested content validity from the range of sources, facilitator checking of the translations, and open peer-review in the panels, was good. The analysis of the EU focus group data against the expert panel’s data added to the level of validity. The aim of the project was to include practitioner opinion and data. Concern was raised within the project group as to how well informed the practitioners would be in the different countries, and how much agreement there would be. The analysis (3.9) identified that the highest agreement was between the four EU priority lists and that the EU versus Expert comparison was not as strong. This difference is one area of concern, as the relationship between practitioners and the developers of tools for workplace use is often not effective. This can be identified by the list of
audit tools or evaluation programmes that have seldom seen the public domain. Though the use of many countries is included as a strength in the focus group methodology, the limited number of participants is a concern. Even with the Expert groups included only 46 PHA were included, but the agreement was good across the different locations.

The question of applicability can also be raised regarding the transferability of assessment tools across the states of the EU. Many of the OMTs in Table 2b.23 were developed in a single country and have little use outside the country of origin. The countries of the EU are guided by the same overriding regulation; the EU directive (90/269/EEC) in manual handling covers all the participating states, which implies that risk management processes should have similarities. If this were true then there should be no barrier to a universal tool for performance management. The problems of translational shift and replication between the different healthcare systems are well documented (Hignett et al., 2007).

During the expert panel to review the IET (5.5), conflicting opinions were presented surrounding the usability across Europe. The facilitators from the EU trials (Fi, It and Po), who had experience of the translation process, all reported good success with the data collection using the IET. No parts of the data collection documents (Appendix H, Part B) required further clarification during the trials. Possible reasons for lack of transferability were political (Italy), and differences in PH methods (Germany). The growing body of skills and knowledge of patient movement is focussing on a series of methods that are becoming acceptable worldwide, and there is now much less variation in recommended practice across many countries. The recommendations considered for improving the reliability of the IET, including guidance and training, should allow access to any EU region.
6.1.2 Outcome measures for the IET

The creation of the list of 12 preferred outcomes lead to a format for the data required to calculate the IET score. The structure of this particular study restricted the inclusion criteria to OMs and OMTs that had previously been used in patient handling intervention studies. This limits the quality of each individual OM for each of the identified outcomes, but increases the applicability and hence the content validity for the process. Questions related to the specific tools for each section are described in 6.2.1. The incorporation of OM and OMTs previously used for patient handling studies also improves the accessibility of the IET to practitioners. Although the use of measurement tools is not widespread, many PHAs do recognise the scores and methods, which encourages potential users to be come involved. The inclusion criteria (4.2.1) gave some control, and the use of the academic scoring system (Downs and Black, 1998), and validation studies as criteria, improved the robustness of the process.

The development of the IET was focussed on creating a tool that was to be used in healthcare sectors across the EU. In order to facilitate this process the IET needed to deliver a level of detail that provided useful and insightful information about the performance in the observed site, but without being too complex and time consuming. The EU trial process focussed on the organisational issues of data collection and the data collection process was reduced to approximately three hours with suitable pre-trial preparation.

The inclusion of 12 outcomes in the calculation of the IET showed some symmetry with four outcomes being for staff, organisation and patient benefit. It also showed the importance of MSD, as staff MS health and sickness absence were included in the highest priorities. Though the relationship between the intervention strategy and this set of outcomes has not been part of this study, the format of the IET is open for a wide spread of interventions to be evaluated.

Shaw et al. (2008) reported a review of papers describing occupational health interventions that used a return to work co-ordinator to some clear benefit. No papers were found that examined the specific management of MSD caused by
patient handling. In the UK ‘return to work’ and sickness absence management are becoming much more high profile (Black, 2008). A small ongoing study in a Salford Hospital (Briody, 2009) is recording the effects of PHA on the return to work process. These types of interventions are aimed at a clear effect on Sickness absence (4), MSD level (2) and Financial losses from MSD (12). But by managing the MSD effectively there could be a secondary effect on psychological well being (7), and by managing the return to work process could assist the MSD exposure (10) for people with known problems. It is an important addition to the patient handling knowledge that all of these different intervention styles can be compared against the traditional measures. Though the entire tool may not be suitable, the performance in each section could prove valuable.

6.2 The development of the IET

6.2.1 The 12 Preferred Outcomes
Having discussed the IET as a full process each of the 12 preferred outcomes, the data collection and the calculations will be considered.

6.2.1.1 Safety Culture
There is a greater volume of research regarding the observation and modelling of safety culture and safety climate (Flin, 2008; Silvia, Lima and Baptista, 2004; Pousette, Larsson and Torner, 2008; Hahn and Murphy, 2008; Glendon and Stanton, 2000; Turnberg and Daniell, 2008; Johnson, 2007 etc.) in healthcare than most sections in the IET review. These studies however have not been applied to the behaviours and systems that surround patient handling. The use of a supplemented PHOQS score (Hignett and Crumpton, 2005) proved successful as a score system. Participants and EU facilitators showed good understanding of the tool and accessed the required data efficiently.

The EU trials (5.2) and subsequent Expert panel (5.5) showed that the application to EU healthcare creates not only linguistic issues for translation, but
also different societal interpretations. Some of these interpretation differences may confuse different users of the IET Data 2 as a format. The following topics or definitions have been identified as possible areas of confusion:

- ‘Link worker’ was a term not used in the German system of patient handling. The person responsible for patient handling within the ward environment was noted as different across many of the participating countries. The most familiar of these link workers is the Ergo-Coach. Developed in Holland, there is an international training and information network for the Ergo-coach (www.ergo-coaches.nl). In Finland the term ‘vaastava’ (EU trial Fi 1) is used to define ‘the person responsible for’, but in patient handling this role sometimes did not come with a suitable process of education and training. Other countries have various forms of locality based PH trainers or nominated staff that assist with the process of risk assessment and development of PHRA and PHP.

- ‘Risk Assessment’ since the introduction of the EU directive for management of health and safety is common parlance. The interpretation of the terminology however is varied across the EU. The major difference is the dual meaning of a document and a process. All areas of the EU follow the EU directive, and the local interpretation, that ‘Risk Assessment’ is a process for identifying, evaluating and controlling risks in the workplace. Guidance for different countries may put more or less levels of detail in the process but overall similarities are found. The physical documented risk assessment however allows for much breadth of interpretation. The Italy Trial (Site 1 and 2) demonstrated that risk assessment was a numerical process, that measured the overall risk for MSD for healthcare workers, and was clearly represented by the MAPO process (Battevi et al., 2006). Representatives from the UK and Finland trials gave evidence that risk assessment was a multi-level process, and could deliver documentation in many forms.

- The term ‘Risk Analysis’ was less regularly used in the groups and signified a higher level of interpretation, and was associated with a numerical approach.

- The evidence for the completion of a Patient Handling Plan (PHP) is compelling (Smith (Ed), 2005; Nelson (Ed), 2006; Radovanovic and
Alexandre, 2004; Hignet, 2001a and 2001b), The provision of a patient specific document that outlines the methods, equipment and staff numbers is the clearest demonstration that risks from PH have been controlled. It is also noted that the principle of risk avoidance implied in this process can only remove dangerous handling tasks. Therefore non-compliance with completing a PHP (or mobility assessments in PHOQS, IET Data 2) is compulsory if there is inadequate provision of equipment, as the completer of the PHP would be sanctioning dangerous tasks.

During the expert panel (Section 5.5) the delivery of this process was varied across the countries represented.

For the process of the IET to be as repeatable as possible there needs to be clarity for the definitions. These definitions should be based on the content of the act described rather than on the linguistics. This allows for better translation and exchange of views in future studies. Using the EU directive on Risk Assessment (89/391/EEC), and documentation from the HSE (2006), the following definitions of the terminology have been developed for future use in this project.

- Generic Patient Handling Risk Assessment
- Patient Handling Risk Assessment.
- Patient Handling Plan
- Link Worker

Manual Handling Risk Assessment (HSE/HSC, 1998) described the process of identifying the MH hazards, evaluating the risks of those hazards for outcome and likelihood, and most importantly implementing a control system to remove the potential risks from the workplace. In this study the control systems were not always recorded in the documentation.

One concern about the scoring system for Section 1 was raised in the EU trial (Italy Sites 1 and 2) regarding the high reliance on the provision of a link worker. Fully 15/30 available points are awarded to Q9-10 in the PHOQS section of IET Data 2. The management structure in the trial site did not provide a named individual, and consequently the relatively high score of 11/15 in the first half of the assessment became a much lower score due to the 0/15 in Q9-10. The EU
facilitator (OM) was concerned that the measure did not accurately score the safety culture that was evident in the area. A possible alternative is to make the format of Q9-10 observe two criteria. The additional criteria would be to ask for evidence that the specific information covered in the different areas was actually transmitted across the workforce without the intervention of the link worker. Wider management audit tools (e.g. ISO 9001), suggest that the recognised system for information and performance management is best supported through specific named people, who have responsibility for the process. The evidence in PH also suggests that link workers provide a significant support to this process. It would therefore be unrealistic to remove all reference to the named official, but the information to staff and the provision of competent risk assessment could be positively scored.

**Table 6.1 Alternative question set for Q9-10**

<table>
<thead>
<tr>
<th>No</th>
<th>Question</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>9a</td>
<td>What systems are in place to ensure patient handling risks are controlled in this area through the nominated manual handling supervisors?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Formal training sessions</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• Formal staff meetings</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• Informal meetings initiated by patient handling advisor</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• Informal meetings initiated by the ward supervisor</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• Ad-hoc meetings</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>Score 1 for each (Max 5)</td>
<td></td>
</tr>
<tr>
<td>10a</td>
<td>What systems are in place to inform the staff of patient handling issues and ensure their competence?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Training records</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• Assessing the quality of patient mobility assessments</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• Entries in patient records/notes</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• Ward meetings/handover</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• Personal development plans</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• Problem-solving sessions/documenated supervision</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• Case conferences/multidisciplinary meetings</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• Electronic format training/training pack/ workbook</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• Informal documentation</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• Other (e.g. memos)</td>
<td>Yes 1</td>
</tr>
</tbody>
</table>
Overall the measure of Safety Culture covered in section 1 has much evidence to support the specific questions that have been included in the PHOQS tool. The areas of investigation are the provision of both generic and patient specific patient handling risks assessments, the provision of a link worker or named skilled individual to supervise the area, and the provision of supervision instruction and training to assist with the provision of safe handling activities. It is these control methods that have been proven to reduce patient handling risks most effectively according to the literature (Hignett et al., 2003).

6.2.1.2 MS Health Measure
The MS Health Measure utilises a shortened and validated version (Dickinson et al., 1991) of the Nordic Questionnaire (Kourinka et al, 1987). The full tool is widely used in MSD studies (Section 4), but in the context of the IET the full tool would be too time consuming. The aim of this section is to gain through an easy access survey a representation of the MS health status of the working population. The tool was designed to represent all MS health, and not to be very specific to LBP, which is the norm in patient handling studies. Studies by Menzel et al. (2004), Owen, Keene and Olson (2001), and Retsas and Pinikahana (2000), all show that the injuries caused by complex PH tasks are not just centred on LBP but can manifest in any limb or joint. The second consideration is that it may be unnecessary to record MS health issues that are not directly attributed to PH actions. Yet when considering the management of staff in a high risk field, if all staff carry some MSD then that clearly has an effect on the tasks and the possibility of further harm to the population.

A further consideration regarding the recording of all MS health issues was the relevance of other risk factors and their impact on MSD prevalence. The IET has a wide range of data included within the calculation structure; psycho-social and psychological well being (7), the physical workload issues (10), specific accidents showing PH injuries, and the accompanying sick leave (4,6), are all included in the calculation of the IET. Two remaining concerns were those of age and gender, which may require an alteration to the calculation in any future versions of the IET. The comparison between the MS health scores in the Finland Trials and the Portugal trials suggested an age effect (5.3.3). Even the
Age standardised score is not without complication, as there is evidence to suggest that people new to the care professions are also at risk of developing MSD (Videman et al., 2005; Nygaard-Jensen et al., 2009; and Van Niewenhuyse et al., 2004).

The EU trial required 50% of the staff to complete the staff survey document. In the three sites where the documents were pre-delivered the response was closer to 90%. Better validity is seen with higher percentage coverage, and increased numbers were possible with the improved data collection. It is also noted that it is important to include any staff members that are working with reduced capacity, and those that are unavailable to work with MSD problems, as they may be a significant addition to the MS health score. Discussions later will consider the validity of this shortened Nordic Questionnaire (6.3). One consideration may be to complete this question set over different time periods, to see if the level of MS Health remains constant, or varies with personnel changes on the ward, or with workload.

6.2.1.3 Competence and Compliance
This section encompasses the full DiNO score system designed and evaluated by Johnsson et al. (2004). During that validation study the author raised concerns about the inter-rater reliability that reported 61% agreement. A recent study conducted as part of a long term nurse practice study showed 90% agreement (Griffiths, 2009). The process described by Johnsson et al. (2004) suggests a three hour training and evaluation programme to ensure that agreement is improved. This development of high levels of accuracy and reliability are essential for the academic proofing of the IET, but consideration will be given later to the concept of usability in various workplaces and in different languages.

MacGregor (2009), Groves (2007), and Wonnacott (2005) have all been able to use the DiNO process in UK care settings, but reported terminology difficulties with the Performance Phase. Lomi, Lomi and Pinotsi (2006) and Barroso (2007) all included translations of the DiNO tool to measure the outcomes of intervention studies, but needed to translate terminology and guidance to
improve data collection. Tamminen-Peter et al. (2008) reviewed many tools, compared her own learning based tool (SOPMAS) with DiNO, and evaluated DiNO favourably. There may need to be a specific investigation to evaluate whether the information and judgements described in DiNO can meet the requirements for inter and intra-rater reliability (Section 6.3).

All facilitators in the EU trials had high levels of experience in patient handling research, and the process of conducting hospital based audit. All had experience with the DiNO tool and did not feel a fuller explanation or training process was necessary. There could also be the consideration that a local observer known by the staff on the ward could suggest a similarly biased response from the ward. The Italy facilitator (OM) suggested that the selection of the individual to complete the observations could be very influential. It was understood that for future development and a wider range of observers, improvements to the training and guidance would be necessary. The improvements would allow a wider body of data collectors, but a level of competence may need to be defined. For the most part concerns about the use of DiNO as an observational tool are equal to concerns about any observational tool, but its widespread use appear to suggest that at present it is the most suitable for inclusion.

The two additional questions to measure compliance caused little feedback from the EU trials or the Expert Panel. The definition of risk assessment, and specifically the requirement for a patient handling plan (PHP) to explain the task details for moving a patient, produced different understandings in different locations (6.2.1.1). Other countries in this trial however were not confident of the process being in place though they did not deny its importance. The inter-rater reliability question could be an issue in terms of needing a definition for what component information constitutes an effective PHP. There could also be a level of expertise implied in the tool that scores negatively for methods or tasks that are perceived as being unsafe. The inclusion of an unsafe practice list for each country could develop the applicability of the tool, but it is the author’s opinion that one aim of any international evaluation process is to set one single standard. There is a high level interaction between this measure and the safety
culture question 6, as the mobility assessment and the PHP are the same decision and document. In the UK there is agreement regarding the content of a PHP as follows (RCN 2001):

- Task to be completed
- Number of staff
- Equipment required
- Method or movement to be completed
- Specific guidance to assist with patient condition or known risks

These criteria make a suitable template for developing improved guidelines for Sections 1 and 3.

6.2.1.4 Standardised MSD Sickness Absence

The overall picture of MS health is measured in Section 2, and the detail of the specific patient handling errors and illness values are recorded in this section. The different definitions that exist across the EU describing low back pain, occupational diseases or workplace accidents will not affect this section, which requires each ward to calculate the sickness absence that is related to patient handling activities. This will include both traumatic onset injury and situations where a chronic condition may have been exacerbated by the ward activities.

The EU trial and the Expert Panel recorded the difficulties of data collection in all areas. The EU trials required information to be held at the ward level. For the future use of the IET, there will need to be of access to organisational data that may be held in occupational health, human resources or pay services. Information from Italy and Germany suggests that even those approaches would not yield the data. Individual privacy rules within those countries prevent disclosure of the reasons for absence being declared to the organisation. Both countries have conducted injury and absence intervention studies (Germany, Caffier, 2007, and Italy, Occipinti, 2007), but had to conduct self-completed questionnaires to identify the levels of illness.

The IET calculation for musculoskeletal sickness absence is standardised for exposure per work hour per individual, to allow comparison between work areas and different sizes of samples. It may also need to be corrected for age, and
the background of long-term conditions prevalent in the sample. There is a suggestion that these complications could affect the score systems, but larger numbers would need to be analysed to accurately evaluate the differences. The calculation format using the standardisation process from OSHA (OSHA, 2009) creates a wide range of values. Further investigation will be required to create an accurate score that allows 0-1 values to qualify good and poor performers.

Numerically there is concern that, given the numbers of staff in any selected area, there is a high potential for one single serious case of MSD to overshadow the general effect of sickness absence in any area. The validity of sickness absence in smaller samples is investigated in 6.3. Alternative methods of scoring the sickness absence may need to be considered in future development.

6.2.1.5 Quality of Care

The quantification and assessment of the concept of ‘Quality of Care’ has challenged health researchers for some time. Many suggestions for the calculation of such a quantity have been published in health research, but only one study (Nelson et al., 2008) related the measures of quality to patient handling. The calculation included in this study was a complex observation of all aspects of care delivery, and over 30 different measures were included in the tool. When the measure of quality was used as one part of the IET, the process was too complex. The questions incorporated in this section were extrapolated from the core questions found in the Nelson paper, and evaluate the question of patient needs being met.

Given that ‘Quality of Care’ has such a wide set of applications, the context of its use is key in the IET. The focus group analysis collected the definitions for the preferred outcomes included in the IET, where four of the outcomes were patient outcomes. It can be argued that all of them in different ways are measures of quality of care, and make up the full measure of a patient’s response to their patient handling care on an immediate basis during observations, and longer-term to all patient handling activities.
Other qualities or measures that could be considered in this area are:

- Was I asked to be involved when being moved?
- Was I allowed to be in control when being moved?
- Was I moved enough times to meet my agreed care plan?
- Whether the judgement of the patient should include everyday care actions or not would also need to be addressed in this issue for future versions of the IET.

Though there is a lack of experience and proven validity with the question set, all participants agreed in principle that this outcome was an important part of the overall measure of patient handling.

6.2.1.6 Patient Handling Accident Numbers

There is clear definition in the literature regarding the difference between accidents and incidents (HMSO, HSG 65), but the enforcement systems in different countries adds some complexity to this section. None of the EU trial sites reported difficulties with this process, and all hospital sites had clear reporting structures in place. In other industries the avoidance of serious accidents can often be used as a performance target to encourage safe behaviour. Other industries consider this route to non-reporting, and suggest the reporting of incidents and near-miss situations to increase the awareness of potential problems. UK health systems would aim for the latter but many still consider there to be a culture of under-reporting at all levels (Geiger Brown et al., 2005). There is some suspicion that the reporting enforcement systems in different countries may show differences in the outcomes.

There is also the question of the effects of specific items or occurrences in ward areas, and whether they have a larger effect in smaller populations. Standardisation for numbers and possible workload may make this section a more robust score system.

The numerical analysis of this section also raises questions about what makes a good performer. No accidents or incidents in a fully responsive ward, is a
perfect outcome. The extra questions that ask for evidence of hazardous handling tasks were completed by the staff, and increased the realism for the measure. The difficulty of reporting was investigated by a report from the UK Audit Office (1997), which suggested that in UK Acute Hospitals there was an expectation of one incident per staff per year. This level was however for all types of incidents and not just patient handling. Any scoring system for the reporting of patient handling accidents should include standardisation for staff numbers, expected accident numbers, and a measure of potential under-reporting.

6.2.1.7 Psychological Well-Being

The inclusion of psychological well-being as a desired outcome is not surprising given the clear evidence that links psychosocial evidence with MSD (Josephson et al., 1997; Kjellberg et al., 2004; Gonge et al., 2002; and Menzel 2007). What is unclear, and shown by the small number of intervention studies (Table 2b.11) that collected psychological data, is the relationship between psychological well-being and the management of MSD from patient handling. Evanoff's study (1999) used three scales to identify significant improvements of the psychological well-being in hospital orderlies who were empowered to create improvements in work practice. The psychological data matched the physical improvements through the study at three date recordings. One quality which is omitted from the Evanoff data is any subjective assessment of physical workload, and the contribution of this to the likelihood of musculoskeletal injury.

Other tools that might have been appropriate for inclusion in this study were the psychological sections of both the Work Screen tool (Gilworth et al., 2007) and the Workability Index (Tuomi et al., 1998). Ironically the full uses of these tools measure diametrically opposed descriptions of a similar objective. The Work Instability (WIS) method for nurses described by Gilworth et al. (2007) suggest a number of observations that indicate the likelihood that a nurse may be not managing their present work situation. The Workability Index (WAI) concentrates very clearly on measuring the workers ability and their subjective appraisal of their work performance. Both are tools and methods aimed at ensuring that individual staff can continue in work, though minor adaptations
may be required. Both of these tools require subjective appraisal of physical and psychological workload and include a psychometric evaluation. Though both are designed to be applicable over wider job descriptions than the IET, the selection of some elements could improve the calculation used in the IET.

In addition both the processes have undergone detailed peer-review and validation trials. In particular the Workability Index has a proven track record of use in many countries and different industrial settings (Ilmarinen, 2005). The Nurse Instability Score was the first of a series of occupational instability scores that was developed after the process and concept of instability had been developed for patients that had specific illnesses e.g. ankylosing spondylitis or rheumatoid arthritis (Gilworth et al., 2007).

**6.2.1.8 Patient Condition**

As with all the patient outcomes, there has been little application of measuring patient condition in patient handling studies. The concept of being able to improve the patient’s condition because of high standards of patient handling management is unproven, but has a high level of intent among practitioners. The PHA would find the evidence that patient condition was affected a powerful driver in all care organisations. This measure would be considered a clinical outcome, and move patient handling into a different area in the health management systems.

The opinion sought in this section was to consider the management of patient handling as a whole (i.e. ‘equipment, space, environment, skills or knowledge’), which is complex question. This question could be broken down into a series of questions to give specific problem areas as part of a more detailed investigation. As a data collection tool little was reported about the question set that was delivered as part of the management and staff questionnaires. A range of comments was recorded across the full range of scores, with the exception of ‘always’. The collection of opinions from a higher proportion of the workforce gave a better indication of the situation being observed.
The information recorded is subjective and as such is open to the interpretation of the situation, and is particularly indicative of the expectations of the ward and the experience of the staff. The subjective evaluation reported by the staff could give a skewed response, if staff were intending to promote a positive score. But in areas where patients were subjected to missing equipment and physical handling the scores were rated as poor in the trials. Much more research in this area would be needed before this measure could be converted to an objective measure, based on the condition and needs of the patient, and a projected movement plan.

It could be a benefit in the question set to consider the patient view of the questions in this section, but there would be concern over whether in-patients have the knowledge or experience to judge if they are receiving appropriate care or not. Questions like this could be construed as leading the patient into a negative assessment of their care package, which would not be of benefit to the organisation.

One concept which was omitted from the question was time. Most staff would consider that the part of operational restrictions that impairs PH and all care activities is the lack of time. A specific question related to time could add detail to the assessment, but the question would need to be investigated fully as there is a lack of clarity as to whether that is a patient handling issue or simply a health management issue.

6.2.1.9 Patient Perception

In comparison to the other patient outcomes, patient perception is recorded as a direct assessment of the transfer or task, completed in the observation section. As such the data is directly linked with the DiNO score recorded in IET Data 3. This is a comparison measure of the patient view against the observer measure of competence.

Due to the method of selection for the IET there was not an opportunity to involve patients in the assessment of what are the concepts or measures that are of value to observe after a patient transfer. The evaluation of patient
objectives relative to patient handling tasks would be a useful addition to the knowledge base, and be a powerful outcome with which to influence change in healthcare organisations.

The format of the data collection tool could be improved in future developments. The question for the staff regarding the self-assessment of the transfer contains two questions, i.e. performed well and according to your plan. Changing this to two separate questions would make a direct comparison to the observer’s ratings of the same matters in competence and compliance questions 17 and 18 of DiNO (IET Data 3.1). The use of a nine point scale was also discussed by some of the users, as it differs to many of the other tools. The 9-point scale was defined in the Kjellberg et al. (2004) study, and is delivered in isolation after the observation, and so has no interaction with other scales or decisions.

6.2.1.10 Musculoskeletal Risk Exposure

The source of information and calculation for the measure of MSD risk exposure is based on two concepts. Firstly that MSD is directly related to patient handling tasks in healthcare settings (Smedley et al., 1995), and secondly that the risk exposure measure can be accurately represented by a measure of patient handling workload (Yueng et al., 2002; and Stobbe et al., 1988). The selection of the patient handling workload tool was based on the suggestions from Knibbe and Friele (1999), which related the level of MSD and discomfort to the numbers of patient handling tasks completed over the work period. Warming et al. (2009) has added to the evidence of MSD workload. This study showed through a linear regression model, that there is a relationship between low back pain and knee pain and the number of transfers completed in one day. The reliability of the logbook process has been proven in previous studies (e.g. Hollmann et al, 1999) but all examples recommend repeated measures to gain the highest levels of accuracy. In this situation the formal collection of logbook registrations would be very time consuming for the staff in the observation area. The decision was made in the development of the IET to represent the workload with the quantities reported in the Care Thermometer. This decision was based on the validated history of the Tjil Thermometer (Knibbe and Knibbe, 2005) and
meeting the aims of the industrial sponsors who had been involved in it’s development.

The Care Thermometer (Arjo ab, b 2007), like many other patient handling outcome measurement tools, is a risk exposure score system. It observes patient handling situations in a given area, compares the equipment and environmental provision, and records the exposure to uncontrolled risks. The number of uncontrolled risks per member of staff was registered as the exposure score.

Several of the facilitators and the Expert Review panel had experience of the Care Thermometer prior to this project. The EU trials showed that the ward managers rarely had the knowledge of the patients to be able to complete Section 1.4 in the organisational review (IET Data 1). The senior nurse usually completed the form with the EU facilitator. Verbally, both facilitators and nurses considered the format of questions difficult, and the facilitators were required to have a good understanding of the no response, yes or no scores. The Finland facilitator reported that having used the CT in an intervention trial, the IET version of the data was easier to complete.

Due to the complexity of the decision making in IET Data 1.4, and because of the comprehensive development, more guidance information was included for the EU Trial documents. The ‘Mobility Gallery’ document indicated geriatric patient types and diagrams, which were reported as being difficult for some staff to relate to their ward situations. The material from Arjo (Arjo ab e 2009) has a wide range of different applications for the selection of patient types A to E. Inclusion of the different patient types would improve future developments. Little comment was recorded for the extra risk factors outside the original CT description. The non-compliance risk was the most regularly recorded extra risk factor when the patient’s behaviour indicated such (Chapter 3).

The strongest discussion point surrounding the measure of MSD exposure risk was whether the calculation of uncontrolled risk actually represented the level of physical effort required by the staff. The data collected during the EU trials did
suggest that the areas with lower dependencies and volume of handling scored lower than areas with high dependency elderly and demented patients, but the Expert Panel in particular considered some high risk situations to not be accounted for. The questions that would need to be investigated in further research or data collection were:

- Is the provision of equipment sufficient to negate the physical effort to assist a patient?
- Does a patient’s condition have an effect on the workload for patient handling?
- Even in wards where all equipment is provided is it harder to assist a ward of category C patients than a ward of category A patients?
- Are there other risk identifiers that should be added to the included list in 1.4?
- Is it accurate to measure workload and MSD exposure risk on a single snapshot or would repeated measures improve the score?

The frequency of tasks actually completed by the staff was indicated as being the single biggest difference between the recorded logs and the IET calculation. Sometimes in hospital wards and care locations the workload can be high, despite a small number of tasks with small numbers of patients because of the number of times somebody needs washing, dressing, toileting etc. This characteristic could be included by adding a numerical score for frequency against each of the physical tasks that are completed by the staff. The suggested action for future developments of the IET MSD exposure score would be to conduct trials in ward areas, to measure the workload as recorded by log registrations and compare the IET Data 1.4 scores. This measure would need to be considered over a period of time to develop the validity of the summarised measures. The caveat statement that may also need to be added to the data collection document is ‘Is the workload measured representative of your usual workload?’

6.2.1.11 Patient Injuries
The definition of patient injuries as recorded in the focus group study, and the lack of previous research, made the data collection format incorporated in the
IET very simple. The only route of data collection was to examine the accident reporting systems for patient harm accidents, and to consider the pressure ulcer prevalence score as being related to the movement and positioning of patients. The validity of these measures and the combination of the different scores is questionable. There are many factors that may confound this outcome score:

- The patient dependencies relate clearly to the possibility of developing pressure ulcers (Braden Scores are commonly recorded as a grade for pressure ulcer risk, www.bradenscore.com).
- Accident reporting relies heavily on the safety culture of the unit being investigated.
- Different EU locations have different reporting and management systems relating to pressure ulcers.
  - Italy will not support extensions in care packages due to acquired pressure ulcers.
  - Germany reported a National Standard on pressure care.
- Are there other specific injuries to be included in this section e.g. foot drop, nerve damage, contractures due to poor positioning?

Outstanding these limitations of the scoring the facilitators and expert panel regarded this outcome and the other patient clinical outcomes to be incredibly powerful, if the evidence for potential damage could be directly linked to poor patient handling performance.

6.2.1.12 Financial Outcomes
The focus on the PHA as the source of information for this study left the financial value low in the priority list. As previously discussed, using a different source of participants might have created a different order. In addition, this section in the EU Trials was not completed by any of the trial sites. The difficulties reported identified that the information was not to be found at Ward level and was likely to be higher located up in the organisation. A reasonable improvement would be to include guidance on the collection of the data, and allow the location of the assessment to identify the appropriate person in their organisation to be included in the data collection.
The format of the data collection tool was also limited to the simple models that had been reported in existing patient handling interventions studies. Future designs of this section could review the simple tool and consider further calculations and possibly other measures of financial loss, or gain. Some of those that have been identified through the EU trials and Expert Panel are:

- Positive improvements in time taken and productivity.
- Defining a financial link and value for improved quality of care.
- Information relating to the staff numbers and the relative values of nurses against nursing aides.

The financial outcome is the lowest ranked contributor to the 12 included sections relative to the focus group data. The complexity of the financial measure may well reflect its position in the PH system rather than the perception of importance. The day to day routine of the PHA mostly function at an operational level rather than strategic, and financial gain is only calculated secondary to physical PH problem solving. However if the future use of the IET develops into a series of 12 tools of equal importance, then the PHA then the detail should be investigated. The lack of financial data being available to PHAs may also have been a reason for its low position, the participants therefore ranked this low as they already know that the information will not be available, or will be so brief that it cannot be used to form a coherent argument to assist change.

6.2.2 The IET calculation
The IET creates 13 scores, 12 scores for the performance against each selected outcome, and an overall score. A benefit of this process is the ability to examine the performance against the individual outcomes, in addition to the overall performance. The EU trials and the EPPHE panel (5.3 and 5.5) considered the calculation and the development of usable scores.
6.2.2.1 The order of preferred outcomes.
The order of the 12 outcomes in the IET, was questioned by EU facilitators and
the Expert panel (5.5). One particular issue was the low position of the financial
outcome (12). A management review could have placed the financial outcome
much higher in the preferred list.

Depending upon the focus of patient handling in each country, a different
perspective will be recorded for the preferred list of outcomes. The final EPPHE
review group indicated some concern over the position of MSD exposure (10)
relative to MS Health (2), in addition to the high position of safety culture (1).
Some countries have a different focus on their research and implementation
processes and this shows in the perception of the preferred outcomes.
Examples of the different focus could be:

- Germany produces high quality research in the biomechanics of lifting
techniques and values the exposure to biomechanical risk
- Holland supported by a government programme considers the provision
  of transfer equipment to be key in the process
- UK has developed the role of the PHA in organisations that utilise the
  principles of health and safety management, such as policy, procedures,
  training, supervision etc.
- Equipment providers involved in the project focus on the cost benefits of
  interventions to facilitate improved sales

One noted limitation of the study is that the design of the project stated that the
process was aimed at the specialists that assist the management of patient
handling risks (PHA). Early in the research it was decided to include the
opinions of those people only. The tool was designed to be used by patient
handling specialists, those who are the implementers of change, and the
designers of patient handling interventions and systems. The programme of
research has gained high content validity by including the preferred outcomes of
four different EU countries, with a range of backgrounds and qualifications, and
compared those findings with findings from experts from academic conferences.
The similarity between countries was analysed by the statistical test of Kendall’s
Concordance (Seigal and Castellan, 1988) that showed good agreement
between the four EU locations. The use of a different source of participants could have created potential differences in content, order, and correlation.

The order was based on the voting scores from the focus group study. Each participant ranked the highest priority outcomes. The ranking philosophy was then carried through the analysis. This meant that some outcomes were differentiated by a single vote, and one by as much as nine. There was also a tie in one rank that was separated by using the total of votes. The similarities of these scores and rankings may point to the interactions between the outcomes having more of an effect on the overall IET score.

It could be considered important during the further validation of the IET that:

- The original research be completed with a range of participants from different areas of the healthcare structure, e.g.
  - Nursing Managers
  - Hospital Risk Managers
  - H&S Advisors
  - Occupational Health Nurses or Managers
  - Staff involved in transfers
  - Patients (past or present)
- The included outcomes of this study be evaluated by other participants to examine differences in content and order
- A secondary investigation is completed to examine the interactions between the 12 included outcomes, and re-calculate the contribution to the Total IET score based on the overall contribution rather than the ranked order. (6.3)
6.2.2.2 Inclusion and Exclusion Criteria

The use of the three classifications of outcome proved useful for the structure of the literature analysis and for the differentiation of outcomes for inclusion (Robson et al., 2007). Table 6.2 shows the Robson level for each of the 12 sections. Safety culture as defined in this project was considered by some in the EPPHE review panel as being a measure of the intervention. The development of the tool was based on the definitions and collated outcomes recorded in the focus groups and the voting scores (3.9). Robson Level 1 measures were excluded from the final list.

Table 6.2 Robson Outcome Level for 12 Outcomes

<table>
<thead>
<tr>
<th>Improvements in:</th>
<th>Robson Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Culture</td>
<td>2</td>
</tr>
<tr>
<td>MSD measures</td>
<td>3</td>
</tr>
<tr>
<td>Competence Compliance</td>
<td>2</td>
</tr>
<tr>
<td>Q17-18</td>
<td>3</td>
</tr>
<tr>
<td>Absence or staff health</td>
<td>3</td>
</tr>
<tr>
<td>Quality of care</td>
<td>2</td>
</tr>
<tr>
<td>Accident numbers</td>
<td>3</td>
</tr>
<tr>
<td>Psychological well being</td>
<td>2/3</td>
</tr>
<tr>
<td>Patient condition</td>
<td>3</td>
</tr>
<tr>
<td>Patient perception</td>
<td>3</td>
</tr>
<tr>
<td>MSD exposure measures</td>
<td>2</td>
</tr>
<tr>
<td>Patient injuries</td>
<td>3</td>
</tr>
<tr>
<td>Financial</td>
<td>3</td>
</tr>
</tbody>
</table>

The definition of each outcome (Table 3.28) clarifies the qualities and measurement requirement of each. In addition there are interactions between the outcomes. Table 6.3 shows the different levels of the Robson definitions against the outcomes that raised concern in the review panels, and gives outcome measures to explain the different levels of measurement.
Table 6.3 Review of included outcomes with Robson Score

<table>
<thead>
<tr>
<th>Robson Level</th>
<th>Safety Culture(1)</th>
<th>MSD Exposure(10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Qualities and quantities of intervention</td>
<td>Change of method, equipment provided to assist task</td>
</tr>
<tr>
<td></td>
<td>Writing policies and procedures, completion of risk assessment</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Outcome measures that have evidence based link with reduction of risk</td>
<td>Posture scores (Hignett and MacAtamney, 2000), reduction in force (Marras et al, 1999; Garg and Owen, 1992), reduction in frequency of tasks (Knibbe and Friele, 1999; Warming et al, 2009)</td>
</tr>
<tr>
<td></td>
<td>Organisational or collective behaviour that proves the management systems are being followed (PHOQS, Hignett and Crumpton, 2005 and MARCH, Smedley et al, 2005)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Real effects in target population</td>
<td>The direct and real measure of the reduction of exposure is recorded in MS Health measures (2) and the reduction in accidents (4) and the resultant effect on Financial (12).</td>
</tr>
<tr>
<td></td>
<td>The real effects of the organisational behaviour is captured in different sections of the IET</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Competence and compliance (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MS Health measures (2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Financial (12)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(The Finland focus group recorded management commitment as a very strong indicator of Safety Culture. This is recorded in the IET in the staff survey 4.3 and the managers survey 1.5)</td>
<td></td>
</tr>
</tbody>
</table>

As the included outcomes were based on the preferred selections of the participants of the focus groups, any criticism could only be corrected by further studies or an increase in participant numbers.

The secondary supporting information was the inclusion of the measure in peer-reviewed literature that the defined link exists for a patient handling study. Hignett and Crumpton (2007), used the PHOQS tool to measure organisational behaviour (Safety Culture (1)), and the existence of management structures, and compared the scores with observed behaviour and application of knowledge to find a positive relationship. This paper also gave the most
detailed match with the measures collected in the definition at the end of the EU focus groups (Table 3.28).

6.2.2.3 Interaction of 12 sections
The need for further analysis of the compiled list of 12 outcomes has some grounding in the established links already experienced in healthcare systems and patient handling interventions. Figure 6.1 shows how if an improvement is made in one outcome there will be a related improvement in the other outcomes on the IET.

Some outcomes can be seen to have many effects on other outcomes, which raises the level of their contribution to the overall score. Safety culture (1) interacts with all other groups, while financial analysis interacts with no other outcomes, which in part may explain the order of importance. Other high priority outcomes showed higher levels of interaction; competence and compliance (3), quality of care (5), and accident numbers (6), all had effects on eight or more other outcomes. Several outcomes interacted with four to six others; MS health measures (2), psychological well being (7), patient condition (8), MSD exposure and patient injuries (11). This level of interaction creates a level of interpretation of the outcomes, which explains the order of the outcomes.
Improvements in:

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety culture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MS health measures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Competence compliance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absence or staff health</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality of care</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accident numbers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychological well being</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient condition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient perception</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSD exposure measures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient injuries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Has an effect on:

<table>
<thead>
<tr>
<th></th>
<th>Safety culture</th>
<th>MS health measures</th>
<th>Competence compliance</th>
<th>Absence or staff health</th>
<th>Quality of care</th>
<th>Accident numbers</th>
<th>Psychological well being</th>
<th>Patient condition</th>
<th>Patient perception</th>
<th>MSD exposure measures</th>
<th>Patient injuries</th>
<th>Financial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
</tbody>
</table>

Figure 6.1 The interaction between outcomes
This view shows that a high priority placed on the financial outcomes can only be achieved with good performance in all the other sections, and that interventions aimed at 1, 3, 5, 6 should give the best return. The effect of this interaction will affect the selection of interventions to improve the IET performance.

The link between interventions and outcomes is the next level of interpretation of the IET and as such was outside the boundaries of this study. Findings from this study have indicated possible routes for development:

**Link intervention strategies with twelve outcome measures**

The literature analysis records academic quality, outcome type, intervention strategy, Robson level and statistical analysis. The relationship between intervention and outcome could be found with a detailed analysis of this interaction. The challenge of this analysis is the complexity of the strategies that are in place. Single strategies were found in only 41 intervention studies but multiple strategies in 60 studies and 28 studies had more than four recorded strategies. Since Nelson et al. (2006) there has been little analysis of single interventions, except in the biomechanical studies.
Intervention Scoring System

One suggestion for this analysis may be to consider the data that has been collected in the literature analysis. Each individual outcome was scored for the following:

**Table 6.4 Scores for included intervention studies**

<table>
<thead>
<tr>
<th>Score</th>
<th>Source</th>
<th>Range of scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic score (QR%)</td>
<td>(Downs and Black, 1998)</td>
<td>0-100%</td>
</tr>
<tr>
<td>Level of outcome measure (Robson)</td>
<td>(Robson et al., 2007)</td>
<td>1-3</td>
</tr>
<tr>
<td>Practitioner rating (PR)</td>
<td>(Hignett et al., 2003)</td>
<td>1-5</td>
</tr>
<tr>
<td>Position in priority outcome list (IET)</td>
<td>(Fray et al 2009)</td>
<td>1-13</td>
</tr>
</tbody>
</table>

If each score system is given parity, then an average (cumulative %) score can show the relative importance for the results of each study. The figure below describes the score system in two examples as a comparison.

**Table 6.5 Intervention Scoring System**

<table>
<thead>
<tr>
<th>Study</th>
<th>Intervention strategy</th>
<th>Outcomes</th>
<th>QR % (a)</th>
<th>Robson (b)</th>
<th>PR (c)</th>
<th>IET (d)</th>
<th>Cumulative (a+b+c+d = %)</th>
<th>Study Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passfield et al (2003)</td>
<td>Change of policies/ procedures</td>
<td>Injury rate</td>
<td>67</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>84.8</td>
<td>150.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Costs</td>
<td>67</td>
<td>3</td>
<td>4</td>
<td>12</td>
<td>65.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perceived exertion</td>
<td>70</td>
<td>2</td>
<td>4</td>
<td>10</td>
<td>63.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Patient comfort</td>
<td>70</td>
<td>2</td>
<td>4</td>
<td>9</td>
<td>63.9</td>
<td></td>
</tr>
</tbody>
</table>

The scoring system outlined shows the different factors scored on the scales used in the literature analysis. The cumulative score converts each score to a
unit (1) and then calculates an average score. The cumulative score shows how important the specific intervention to outcome relationship is, and high scores are for very important studies. The study total shows the overall value of each study, and the value of its contribution to the body of knowledge. These values can be used to analyse the different contributions to each outcome measure, intervention strategy, author or study type.

This secondary investigation will enhance the value of the interpretation of the IET, and allow future interventions to be guided to be more effective.

6.2.3 Present and future uses for IET

One of the aims of this study was to develop a single tool and process that could measure the success of patient handling interventions. As such the development of the tool created a single score that could be used to compare the pre- and post-intervention states. In its present form the IET analysis delivers two sets of scores, 12 individual section scores rating a percentage score, and an accumulated total IET score. The patient handling experts and facilitators involved in the evaluation have indicated as much interest in the section scores as the total. It may be this difference that creates an opportunity for the future uses of the IET. The section scores become a detailed performance measurement tool for the PHA, or person responsible for managing patient handling in the organisation. Though there is a tendency for the total IET score to average high and low scores from each of the sections, during a long-term intervention repeated IET evaluations should record the performance in each section, and allow regular monitoring. The aim of the PHA will be to focus on improvements in specific sections whilst maintaining the scores in other sections. This will create an improvement in the total IET score. Short-term interventions are unlikely to show the benefits in sickness absence (4) or MS health (2), but there will be opportunities to improve scores in safety culture (1) and competence and compliance (3), and some patient assessments (5, 8, 9).

The UK trial site, in a large acute hospital, showed high levels of support for a tool like the IET to assist with the measurement of performance. The
development of a larger database of assessments would enhance its validity and robustness. It is important to gain support from the target audience (i.e. the PHA in healthcare) and the development and expansion of the IET needs to be managed effectively. With the practical and organisational improvements suggested (5.6, 6.2.4) in this report, the IET could be used as:

- A pre- to post-intervention evaluation tool
- An intra- and inter-site comparison tool
- A between country comparison for similar healthcare providers

The evaluation has only been possible for single ward locations. The replication of the measurements to assess the performance across a hospital site, or a health service, have yet to be explored and will require future trials.

The development of a single score raised the issue that this could not only be used as an intervention evaluation, but also a benchmarking system for regular audit. The management systems observed in the UK Trial clearly showed that the healthcare system regarded the audit process highly, and assessment systems were already in place to support the use of a tool like IET (CNST 2009). One difference between the processes of assessment versus audit is the setting of standards of achievement. The observation of EU systems during this study would suggest a lack of agreement in various areas. The development of standard approaches is being developed as an ISO standard and EU performance indicators may be possible based on those standards.

### 6.2.4 Summary of recommendations for next generation of IET

The analysis of the EU trials, EPPHE panel results, and the discussion above, have identified that in future developments of the IET the following considerations could improve the content and assessment of the different sections and the IET total:

- Improve the clarity of definitions for various included items in the IET process, e.g.:
  - Generic Patient Handling Risk Assessment. This use of risk assessment examines the risks present in a geographical location by considering the tasks, patient dependencies and the
environmental configuration to identify the level of risk for that area.

- **Patient Handling Risk Assessment.** The application here examines only the tasks and risks associated with an individual patient. The control measures identified by this process should be recorded in the patient's medical notes or treatment plan as a Patient Handling Plan.

- **Patient Handling Plan:** A clear set of instructions to allow staff and carers to assist a patient to move from one position to another. The basic requirements of such should include the following: patient identifying descriptors, the task to be completed, known hazards to assisting movement, number of staff required, equipment to be used, a clear description of the movement to be completed. In some healthcare premises the description of the method could be held centrally or in a collection of PH procedures, to which the PHP refers.

- **Link Worker:** A person working in a specific area who has the responsibility for assisting with the management of patient handling activities in that specific area. The roles they could complete are training and supervision in patient handling skills, completion of risk assessment for the area, and completion or assistance in completing patient handling plans.

- Consider the alternative question set for questions 9 & 10 in the PHOQS assessment to measure performance as well as named link workers.

- Evaluate the inclusion of age and experience factors in the MS health measure.

- Consider and evaluate the process of training and guidance for observers especially in the observation of transfers (IET Data 3)
• Reporting of patient handling accidents should include standardisation for staff numbers, expected numbers and a measure of potential under-reporting.

• Consider the addition of a measure of subjective assessment of workload to contrast both 7 and 10.

• The staff evaluation of each transfer IET Data 3.2 to be changed to 2 questions to match competence and compliance.

• Add a frequency count to the workload assessment to improve the links with the logbook registrations for lift frequency.

6.3 Validity and reliability

Scientifically, the validity of any measurement tool is paramount to encourage the confidence of the end user (Bryman, 2008). The IET in its 12 section format is complex. The interactions between the sections have already been identified, and some sections have already been identified as having little background. This section discusses the different aspects of validity with reference to the previous evidence, and makes suggestions for future improvements. The content validity (Bryman, 2008) is addressed in the multi-location, multi-participant generation of the tool. The IET is strengthened through the peer review and EU trials but external validity needs to be developed by a series of real world applications of the tool.

The question of measurement or construct validity (Bryman, 2008) however is open to investigation. The IET aims to measure the level of control of patient handling risks in healthcare, and use the data to compare across time and site. The EPPHE panel (5.5) reviewed the question of validity in detailed discussion. Some themes were identified that should be considered in this evaluation of the IET:
• MS health and sickness absence figures could be affected by age and experience variation

• The use of single time point data collection in some sections was considered as a potential weakness. A range of intervention studies should be investigated to examine if snapshot data collection proves effective.

• Sample size in the IET is kept deliberately low to assist the ease of data collection. The sample numbers need to give a true representation of the performance of the unit under examination across all the section scores.

To investigate some of the validity issues a survey of the tools included in the IET was completed. The information found to support the use of the different tools is included in Table 6.6.

Table 6.6 describes the development and validation processes for the different sections of the IET. Some of the included tools have a long history of use in epidemiology (Nordic Questionnaire), and some have specific validation for use in the measurement of PH studies (1,3,7,10), whilst others have little or no proven validity for this application.
The EPPHE panel discussed the requirements for validation of the IET. The discussion focussed on two key issues: the use of small samples during the single site data collection, and the differences between interpretation across EU countries. When considering the development and validation of previous OMTs, all have been developed in their source language, validated and then translated (MAPO, DiNO, and PHOQS). Uniformly this has created difficulties with getting the OMT used outside the country of origin. To develop the measurement validity of the IET, the validity of the 12 sections need to be considered. In an ideal scientific methodology validation would be proven for:

- Each section score.
- The total IET score
- The total IET score in all participating languages

### Table 6.6 Validity of measurements for outcomes in IET

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Culture</td>
<td>The PHOQS tool has both a development paper and use in a further trial</td>
</tr>
<tr>
<td>MSD measures</td>
<td>The Nordic Questionnaire has a log history in many epidemiology studies. Its validity for small sample sizes needs investigating.</td>
</tr>
<tr>
<td>Competence</td>
<td>DiNO has development studies and comparison but questions over reliability remain</td>
</tr>
<tr>
<td>Compliance</td>
<td>Large national data review from government systems</td>
</tr>
<tr>
<td>Absence or staff health</td>
<td>Large national data review from government systems</td>
</tr>
<tr>
<td>Quality of care</td>
<td>None</td>
</tr>
<tr>
<td>Accident numbers</td>
<td>Problems remain due to the mis-reporting issues</td>
</tr>
<tr>
<td>Psychological well being</td>
<td>The original tool has some validation but the application to PH is not tested</td>
</tr>
<tr>
<td>Patient condition</td>
<td>None</td>
</tr>
<tr>
<td>Patient perception</td>
<td>Likert scales and measures of patient comfort are common but the validation of this scale is not proven</td>
</tr>
<tr>
<td>MSD exposure measures</td>
<td>Two studies have attempted to validate the CT measures as a whole but the work is not complete</td>
</tr>
<tr>
<td>Patient injuries</td>
<td>None</td>
</tr>
<tr>
<td>Financial</td>
<td>There is no validation for this application</td>
</tr>
</tbody>
</table>
It would appear that if the IET can be simultaneously validated in the key EU languages, at its outset, then more widespread acceptance of the process could be expected. The previous lack of validation may have had an effect on why there has been no standard approach that would have allowed the development of a tool like the IET.

### 6.3.1 Reliability

Given the EU application of the IET, one concern would always be the reliability of the measures with a wide range of observers. Some of the sections that have been through a recognised validation process, already have more complex guidance and instructions to assist the observer. The aim of the original development of the IET was to allow the highest level of access to potential observers.

The debate between developing a complex tool, with high levels of fixed and possibly objective measures against every criteria, would reduce the accessibility of the tool, and increase the skill and training required for any observers prior to use. The restriction of access to a limited group of expert observers would be a method to improve the accuracy and reliability (Johnsson et al., 2004; and Kjellberg et al., 2004). This group of expert observers could be used in the development phase and through any validation studies. Once the validation and guidance is clear, then assess the reliability as the range of observers is increased. The second consideration is to develop an accreditation system for IET observers. This system could assess the level of competence of an observer and increase the number of observers slowly, and country by country, or location by location. With either of these monitored growth options, a series of intra- and inter-rater reliability trials will be required (Figure 6.3).
6.4 Future research

The IET has been developed and evaluated as a measurement tool for assessing different levels of performance in the management of patient handling risks. The data collection has been proven to be efficient and accessible for different healthcare providers in four EU countries. For the IET to reach its full potential there needs to be a series of research studies to improve the reliability and validity of the process and tool. Section 6.2.3 shows that the IET could be extended for use in a range of settings. This would suggest that the route for future evaluations could:

a. Validate the IET as an assessment of patient handling performance;
   a. at ward level
   b. at hospital level
b. Develop the IET as a benchmark tool to improve EU practice
c. Develop the IET as an audit tool for an EU standard

The EPPHE review panel (5.5) suggested many possibilities for future research projects, including examining the cultural differences, adding a complex financial calculation, comparing occupations, and comparing educational systems. The robustness of the IET as a measurement tool must be the main focus of any future research, as the tool must be proven to measure effectively before any of the other investigations can take place. To this end an outline research process has been described to validate the IET as a ward based assessment tool in Figure 6.3.

<table>
<thead>
<tr>
<th>Aims: Method</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confirming the validity of the IET:</td>
<td>Database of site measures</td>
</tr>
<tr>
<td>A large number of sites and locations will be needed to expand the collective experience of measuring performance with the IET. Previous complex tools measuring patient handling have attempted to develop a large background database. Initially these site measurements can be a one off baseline IET score. User evaluations will be completed on all sites.</td>
<td>User evaluations</td>
</tr>
</tbody>
</table>
Given the existing validity of some sections of the IET and the complexity of the tool the sections of the tool can be evaluated in organisational, staff and patient groups.

Evaluations could consider
- Repeated measures in the same site to check for inter-rater reliability for the observation IET Data 3.
- Repeated collection of IET Data 1 with different observers on the same site over small time frame changes to compare assessment of management and workload issues
- Compare MSD exposure measure with other workload measures e.g. log registrations or subjective workload
- Compare PHOQS score with other safety climate/culture measures
- The overall IET score could be compared with the subjective assessment of a panel of expert PHA to assess if the order of IET total agrees with judgement.

**Intervention Trial for IET**

The IET will also need to be evaluated in intervention trials. Though the management of a multi-site evaluation across several EU locations will be difficult a full evaluation of the pre- to post-intervention trial is essential. This trial would examine the ability of the IET to differentiate between conditions and levels of compliance with best practice. The observer should be an expert IET practitioner, blind to the intervention to ensure accuracy with the IET scoring. A second option would be to conduct an RCT in a specific centre or comparable healthcare settings and evaluate case versus control interventions.

---

**Figure 6.3 Recommendations for future research**

The importance of the interactions between outcomes in Figure 6.1 suggests that improved validity may be achieved by examining these links further. The methodology used in this study developed the 12 ordered sections from the preferences described from the focus groups. If each section is equally weighted an analysis could be conducted to evaluate the overall contribution of each section. When investigating the methods available for scoring complex tools, factor analysis or multivariate analysis models are common (Salkind,
These statistical methods investigate how the different outcomes interact and show the links between the different contributions. An alternative may be to consider structural equation modelling (Salkind, 2004; Gotham et al., 2003) which could evaluate whether the 1-12 ranking scores are an acceptable score system. It is noted that one difficulty with any future investigation into the relative importance of each section to the overall performance score is the lack of a scale or single measurement method against which to compare the total score against.

The facilitators and EPPHE panel showed enthusiasm for developing the tool further. The IET has been incorporated into a research application in Portugal that examines the interactions between ageing, work ability and exposure to physical and mental demands among nurses (Cotrim et al., 2009). Given the drive to management performance indicators in modern healthcare, the development, and enhancement, of the IET as a method to measure and improve patient handling standards would be a suitable solution.

### 6.5 Comparison of IET against other tools

The development of the IET has added to the range of tools discussed in the analysis of OMT, described in Table 2b.23. The review showed that the range of OMT concentrated on a specific area of patient handling performance. Competence assessment and the appropriate provision of equipment were particularly well represented. There were no methods that allowed a comparison across the different outcomes or the OMT. The IET offers a structured approach to evaluating the whole range of outcomes based, on the priority list of PH practitioners across the EU.

The area of application of the IET is comparable with the other tools reviewed in this study. They are all designed to assess either the management, or the completion, of patient handling tasks. In many of the applications of patient handling practice, the boundary between the movement and positioning of a patient and the delivery of care tasks is difficult to unravel. Some research and
guidance documents (Knibbe and Friele, 1999; Arjo ab, d, 2006) discuss bathing, toileting etc. as patient handling activities. It has been the author’s experience that many people in the patient handling field consider the entire task as patient handling and then only deliver advice, guidance, training and documented safe systems of work for the patient movement and positioning aspects of the task. Collins et al (2006) define the role very specifically as, “require assistance for repositioning and movement”. This definition observes the difference between the cleaning, treatment and care sections, and the patient movement actions. For the purpose of this project this was the accepted definition. There is however no doubt that the design of health care environments, and all the human and equipment interfaces that occur, are firmly in the domain of healthcare ergonomics. It is important to recognise that the interventions and methodological recommendations made in the growing volume of evidence are almost entirely aimed at patient movement tasks, and it would be improper to include the extension areas until the general format of patient handling interventions is extended to include all aspects of care.

The development of all the OMTs assist the PHA to identify the level of performance, but then expect an expert interpretation to create a solution for the recognised problems. The lack of EU standards for acceptable performance is a weakness in some of the trials. Only the equipment provision tools have robust levels of acceptance. Though the IET has not been able to develop the links with the intervention database in this study, there may be future opportunities. An interesting development of the IET post-validation would be to develop a definitive algorithm, that incorporates all the collected evidence to show which intervention types demonstrate the best scientific evidence, to improve the performance across the different sections. It should be possible using the literature analysis methods developed in Section 2b to rate the relative value of each study, and then group the papers into each IET section, to evaluate which intervention types and content have the proven effect. This development would be worthwhile after the IET has been validated and accepted as a suitable measure for the field of patient handling.
In contrast to all of the reviewed tools, the IET is a European tool, developed with EU participants, translated during development, and trialled in four EU centres. Previous tools have all been developed in one county and then translated for international use. Many tools indicate the context of where the different countries were in the development of safer patient handling systems. Italy as an example concentrates on improving equipment provision and developed the MAPO Index (Battevi et al., 2006) to show that equipment versus no equipment improves the MSD prevalence. Though evaluated, Cotrim et al. (2006) did not find the same relationship in Portugal, and Fray et al. (2006) recorded ‘no risk’ scores in acute healthcare areas that were not compliant with best practice. Evidence from countries with improved patient handling systems also indicate the reliance on equipment provision and the Care Thermometer (Arjo ab d, 2007) is very much evidence for the same. This is in part, contradictory to the multi-factorial approaches suggested by Nelson et al. (2006) and Hignett et al. (2003).

The depth and detail in the IET measure many different aspects of organisational, staff and patient management systems, and offer much more than any of the single measure OMTs. The EU trials have proved data collection can be effective and efficient, differences in performance have been shown in the sections, and that the overall IET score differentiates between levels of performance. The evidence from the EU trials indicates that this method and process can indeed offer a measure of value to those with poorly developed systems to show faults and omissions in the system, but also has something to offer the better performing locations, to become systems of excellence with all areas of a high performing unit being measured. This has all been developed with application in four different locations across the EU making it a truly EU based assessment tool.
CHAPTER 7

Conclusions
The research question posed in this study asked whether it was possible to develop a single assessment method to evaluate the management of patient handling risks in healthcare locations. A mixed method approach was used to include the opinions and considerations of practitioners and experts across the EU. Focus groups in four EU countries and two Expert panels at international conferences were used to explore the range of outcomes required by patient handling practitioners. A priority scoring system created a list of the 12 most important outcomes. A systematic review of literature selected the most suitable methods for measuring the 12 outcomes, and compiled a single data collection format. This Intervention Evaluation Tool (IET) was evaluated by field trials in four EU countries, and peer-reviewed by an expert panel from the EPPHE group. The conclusions drawn from this project are:

- The study of patient handling management systems is new and research support for many interventions is weak.
- The focus on musculoskeletal prevalence though logical excludes many valuable outcomes that support patient handling interventions.
- A systematic literature review showed staff, patient and organisational outcomes were measured in patient handling intervention studies.
- Focus group studies in four EU countries created a priority list of 12 clearly defined outcomes, with good agreement between the four sites.
- A single tool (IET) was created to measure the performance of patient handling risk management against the 12 outcomes.
- Data was successfully collected in eight EU sites in four countries.
- Positive feedback reported that the IET can be used to score across the 12 outcomes included in the tool.
- The IET can differentiate between different levels of performance in the 12 outcome sections and in the overall total.

This study has created and evaluated the IET, but the limitations of developing and evaluating a 12 section assessment tool across four EU countries is recognised. The positive feedback from the trial sites, and the recommendations enclosed in this study (Chapter 6), suggest that this process has many opportunities for development across the EU, but as with other
complex processes a more robust version will need to be supported by further research, to improve the reliability and validity of the IET.
References


Bigos S., Battie M., Spengler D., Fisher L., Fordyce W., Hansson T, Nachemson


CNST (2009) NHSLA Risk Management Standards for Acute Trusts, Primary Care


Cotrim T. et al. (2009). Interactions between ageing, work ability and exposure to physical and mental demands among nurses. Research proposal to Fundacao para a Ciencia e a Tecnologia - Projectos De Investigacao Cientifica.


http://europa.eu/abc/european_countries/eu_members/index_en.htm


Routledge.


MacGregor H. (2009) *Is there a difference in training outcomes between staff who have had classroom based training and staff who have had training on the ward?* Unpublished MSc project, Loughborough University.


Owen, B. and Hasler-Hanson, C.R (1999). A study comparing three methods of repositioning “patients” up in bed.. *Journal of Healthcare Safety Compliance and*
Infection Control 3, 8: 362-267.


Royal College Of Midwives, (1999) Handle with care. Royal College of Midwives,
London


---

301


methods in two NHS Trusts. Loughborough University


APPENDIX A

Literature Analysis (328 studies)

i. Included reference list
ii. Full data extraction for literature analysis
<table>
<thead>
<tr>
<th>Paper No</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Santoro, M. (1994) Lifting teams can help hospitals eliminate costly back injuries to nurses. <em>Hospital Employee Health</em> 13, 7: 81-87</td>
</tr>
<tr>
<td></td>
<td>Reference</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Reference</td>
</tr>
<tr>
<td>---</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td>Author(s) and Year</td>
</tr>
<tr>
<td>---</td>
<td>-------------------</td>
</tr>
<tr>
<td>61</td>
<td>Owen, B.D., Welden, N. and Kane, J. (1999)</td>
</tr>
<tr>
<td>Page</td>
<td>Reference</td>
</tr>
<tr>
<td>------</td>
<td>--------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Page</td>
<td>Reference</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
</tr>
</tbody>
</table>

314
<table>
<thead>
<tr>
<th>Reference</th>
<th>Authors</th>
<th>Title</th>
</tr>
</thead>
</table>


<table>
<thead>
<tr>
<th>Number</th>
<th>Author(s)</th>
<th>Title and Year</th>
<th>Source</th>
</tr>
</thead>
</table>


<table>
<thead>
<tr>
<th>Page</th>
<th>Citation</th>
</tr>
</thead>
<tbody>
<tr>
<td>235</td>
<td>Flint J., McLeod M., Gardiner A. Persistence in partnership. Evaluation of a back injury intervention by WorkCover NSW in the NSW Health Services Industry. E-mail: <a href="mailto:john.flint@workcover.NSW.gov.au">john.flint@workcover.NSW.gov.au</a></td>
</tr>
<tr>
<td>258</td>
<td>Harrison P. (2005). Moving and handling patients with actual or suspected spinal cord injuries <a href="http://www.mascip.co.uk/sci-link">www.mascip.co.uk/sci-link</a> (May 2005)</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Page</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Page</td>
<td>Reference</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
</tr>
</tbody>
</table>
APPENDIX A

Literature Analysis (328 studies)
i. Included reference list
ii. Full data extraction for literature analysis

Legend:
Red = Intervention study (Included Appendix B)
PO = Professional Opinion (no QR scores)
NR = No result (Scoring not possible)
<table>
<thead>
<tr>
<th>Paper No</th>
<th>Date</th>
<th>Author</th>
<th>No. of outcomes</th>
<th>Outcome</th>
<th>Outcomes measures</th>
<th>Beneficiary</th>
<th>Tested Y/N</th>
<th>Significant Y/N</th>
<th>Used in conclusions Y/N</th>
<th>Ranked outcome list 1-12</th>
<th>Intervention Strategy</th>
<th>QR score %</th>
<th>PR score</th>
<th>Robson score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1998</td>
<td>Peers</td>
<td>4</td>
<td>Staff absence</td>
<td>Lost time from injuries,</td>
<td>Org</td>
<td>No</td>
<td>4</td>
<td>5 10 13 15 20</td>
<td>37 3 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff absence</td>
<td>Lost time from recurrence,</td>
<td>Org</td>
<td>No</td>
<td>4</td>
<td>37 3 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Modified Work</td>
<td>modified work from new injuries</td>
<td>Org</td>
<td>No</td>
<td>4</td>
<td>37 3 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Modified Work</td>
<td>modified work due to recurrence</td>
<td>Org</td>
<td>No</td>
<td>4</td>
<td>37 3 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1996</td>
<td>Gingher</td>
<td>3</td>
<td>Time for task</td>
<td>Speed of transfer,</td>
<td>Task</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>13</td>
<td>78 4 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Effect on staff, Questionnaire</td>
<td>Staff</td>
<td>No</td>
<td>No</td>
<td>10</td>
<td>78 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Patient perception</td>
<td>Impact of resident from staff view</td>
<td>Patient</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>9</td>
<td>78 4 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1995</td>
<td>Scott</td>
<td>1</td>
<td>Staff perception</td>
<td>Questionnaire of staff perceptions of hazards and interventions</td>
<td>Staff</td>
<td>No</td>
<td>Yes</td>
<td>7</td>
<td>8 1 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1996</td>
<td>Gray</td>
<td>2</td>
<td>Staff knowledge</td>
<td>Staff knowledge</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>4</td>
<td>5 43 2 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Psychological Well-being</td>
<td>Staff satisfaction</td>
<td>Staff</td>
<td>No</td>
<td>Yes</td>
<td>4</td>
<td>43 2 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1994</td>
<td>Holliday</td>
<td>5</td>
<td>Time for task</td>
<td>Time to complete task</td>
<td>Task</td>
<td>Yes</td>
<td>NS</td>
<td>No</td>
<td>13</td>
<td>2 50 4.5 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Number of staff</td>
<td>Number of staff to complete</td>
<td>Task</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>13</td>
<td>50 4.5 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>Author</td>
<td>Study Type</td>
<td>Research Question</td>
<td>Participant Group</td>
<td>Staff Use of Equipment</td>
<td>Financial Org</td>
<td>Physical Workload</td>
<td>Staff Perception</td>
<td>Patient Perception</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>--------</td>
<td>------------</td>
<td>-------------------</td>
<td>-------------------</td>
<td>------------------------</td>
<td>--------------</td>
<td>------------------</td>
<td>----------------</td>
<td>------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>Santoro</td>
<td>2</td>
<td>Reduction in staff injuries</td>
<td>Staff</td>
<td>No</td>
<td>2</td>
<td>35</td>
<td>4.5</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>Newman</td>
<td>1</td>
<td>Questionnaire for availability and use of equipment</td>
<td>Staff</td>
<td>No</td>
<td>13</td>
<td>39</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>Overd</td>
<td>1</td>
<td>Questionnaire for methods of positioning after hip surgery</td>
<td>Task</td>
<td>No</td>
<td>13</td>
<td>41</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>Harber</td>
<td>1</td>
<td>LBP</td>
<td>Staff</td>
<td>Yes</td>
<td>NS</td>
<td>Yes</td>
<td>2</td>
<td>5</td>
<td>73</td>
<td>4.5</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>Meyer</td>
<td>2</td>
<td>Questionnaires to staff using hoists</td>
<td>Equip</td>
<td>No</td>
<td>10</td>
<td>32</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>Addington</td>
<td>2</td>
<td>Total back injuries reported</td>
<td>Staff</td>
<td>No</td>
<td>2</td>
<td>5</td>
<td>22</td>
<td>37</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1986</td>
<td>Mckellar</td>
<td>1</td>
<td>Informal interview</td>
<td>Staff</td>
<td>No</td>
<td>7</td>
<td>po</td>
<td>3.5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td>Tracsz</td>
<td>1</td>
<td>Sickness absence</td>
<td>Org</td>
<td>No</td>
<td>4</td>
<td>2</td>
<td>5</td>
<td>33</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>Griffith</td>
<td>1</td>
<td>Interviews to identify perceptions of workload and risk factors</td>
<td>Staff</td>
<td>No</td>
<td>10</td>
<td>5</td>
<td>42</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>Lavender</td>
<td>2</td>
<td>Posture analysis by Lumbar motion mtr</td>
<td>Staff</td>
<td>No</td>
<td>10</td>
<td>59</td>
<td>4.5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>Zelenka</td>
<td>1</td>
<td>Forces to transfer</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>48</td>
<td>3.5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>Bewick</td>
<td>2</td>
<td>Injury data for participants</td>
<td>Staff</td>
<td>No</td>
<td>2</td>
<td>55</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The table above summarizes the research questions and participant groups associated with each study.
<table>
<thead>
<tr>
<th>Year</th>
<th>Author</th>
<th>Value</th>
<th>Method</th>
<th>Measurement</th>
<th>Group</th>
<th>Score</th>
<th>Score1</th>
<th>Score2</th>
<th>Score3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>Bertollazzi</td>
<td>2</td>
<td>Risk assessment</td>
<td>Physical workload</td>
<td>Staff</td>
<td>13</td>
<td>25</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>1998</td>
<td>Engels</td>
<td>3</td>
<td>Physical workload</td>
<td>OWAS posture scores</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10 5 8 10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff competence</td>
<td>Checklist for performance of staff</td>
<td>Staff</td>
<td>Yes</td>
<td>NS</td>
<td>No</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Borg score for perceived exertion</td>
<td>Staff</td>
<td>Yes</td>
<td>NS</td>
<td>Yes</td>
<td>10</td>
</tr>
<tr>
<td>1998</td>
<td>Monaghan</td>
<td>4</td>
<td>Training numbers</td>
<td>Training update numbers</td>
<td>Org</td>
<td>No</td>
<td>13 1 2 5 10 13</td>
<td>31</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Staff attitude</td>
<td>Staff</td>
<td>No</td>
<td>1</td>
<td>31</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff knowledge skill</td>
<td>Staff knowledge of policy and equipment</td>
<td>Staff</td>
<td>No</td>
<td>3</td>
<td>31</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Risk assessment</td>
<td>Number of patient assts completed</td>
<td>Staff</td>
<td>No</td>
<td>13</td>
<td>31</td>
<td>2.5</td>
</tr>
<tr>
<td>1996</td>
<td>Allen</td>
<td>1</td>
<td>Staff injuries</td>
<td>Injury rates for nurses</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>2</td>
</tr>
<tr>
<td>1995</td>
<td>DeGeorge</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td>18</td>
<td>2.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>Wright A</td>
<td>2</td>
<td>Physical workload</td>
<td>EMG recordings for action</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Patient perception</td>
<td>Questionnaire Patient control</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>9</td>
</tr>
<tr>
<td>1994</td>
<td>King</td>
<td>1</td>
<td>PH techniques</td>
<td>Comparisons of methods in consultation with surgeons</td>
<td>Task</td>
<td>No</td>
<td>13</td>
<td>25</td>
<td>3</td>
</tr>
<tr>
<td>1986</td>
<td>Gagnon</td>
<td>1</td>
<td>Physical workload</td>
<td>Complex biomechanical data and models</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
</tr>
<tr>
<td>1996</td>
<td>Tracey</td>
<td>1</td>
<td>Incident/Accident</td>
<td>Staff incidents</td>
<td>Staff</td>
<td>No</td>
<td>6</td>
<td>po</td>
<td>4</td>
</tr>
<tr>
<td>1998</td>
<td>Fazel</td>
<td>1</td>
<td>Financial</td>
<td>Financial evaluation</td>
<td>Org</td>
<td>No</td>
<td>12</td>
<td>po</td>
<td>4</td>
</tr>
<tr>
<td>1997</td>
<td>Tracey</td>
<td>1</td>
<td>Physical workload</td>
<td>Forces to slide</td>
<td>Staff</td>
<td>No</td>
<td>10</td>
<td>26</td>
<td>3</td>
</tr>
<tr>
<td>Year</td>
<td>Author</td>
<td>Type</td>
<td>Methodology</td>
<td>Variable</td>
<td>Staff</td>
<td>Use</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>------</td>
<td>--------</td>
<td>------</td>
<td>-------------</td>
<td>----------</td>
<td>-------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>2001</td>
<td>Hignett</td>
<td>1</td>
<td>Staff perception</td>
<td>Interviews to develop hierarchical tree</td>
<td>Staff</td>
<td>No</td>
<td>13</td>
<td>85</td>
<td>5</td>
</tr>
<tr>
<td>1998</td>
<td>Alexander</td>
<td>2</td>
<td>Staff perception</td>
<td>Quantitative survey of risk perceptions</td>
<td>Staff</td>
<td></td>
<td>10</td>
<td>1 2 6 11 13 16</td>
<td>50</td>
</tr>
<tr>
<td>1997</td>
<td>Quintana</td>
<td>3</td>
<td>Physical workload</td>
<td>RWL NIOSH</td>
<td>Staff</td>
<td>No</td>
<td>10</td>
<td>po</td>
<td>3</td>
</tr>
<tr>
<td>1993</td>
<td>Switzer</td>
<td>2</td>
<td>Staff competence</td>
<td>Observations of practice</td>
<td>Staff</td>
<td>No</td>
<td>3</td>
<td>62</td>
<td>4.5</td>
</tr>
<tr>
<td>1990</td>
<td>McGill</td>
<td>1</td>
<td>Physical workload</td>
<td>Biomechanical loading model</td>
<td>Staff</td>
<td>No</td>
<td>10</td>
<td>32</td>
<td>3.5</td>
</tr>
<tr>
<td>1998</td>
<td>Edlund</td>
<td>1</td>
<td>Patient result</td>
<td>Angular measures for sitting position in sling and after move</td>
<td>Task</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
</tr>
<tr>
<td>1997</td>
<td>Bruno</td>
<td>0</td>
<td>Design process description with no data presented</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7</td>
<td>2.5</td>
</tr>
<tr>
<td>1999</td>
<td>Duffy</td>
<td>1</td>
<td>Staff use of equipment</td>
<td>Questionnaire survey outlining use of equip and training</td>
<td>Staff</td>
<td>No</td>
<td>13</td>
<td>39</td>
<td>3</td>
</tr>
<tr>
<td>2000</td>
<td>Brulin</td>
<td>1</td>
<td>Staff perception</td>
<td>Interviews followed by grounded theory</td>
<td>Staff</td>
<td>No</td>
<td></td>
<td>73</td>
<td>4</td>
</tr>
<tr>
<td>1990</td>
<td>Connolly</td>
<td>1</td>
<td>Staff use of equipment</td>
<td>Questionnaire survey on attitudes and use of eqpt</td>
<td>Staff</td>
<td>No</td>
<td>1</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2001</td>
<td>Hui</td>
<td>3</td>
<td>Staff perception</td>
<td>Subjective assessment of severity of task</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Physical workload</td>
<td>Physical demands over a shift</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff injuries</td>
<td>Back Muscle fatigue</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
</tr>
<tr>
<td>1999</td>
<td>Paternoster</td>
<td>1</td>
<td>Staff competence</td>
<td>Level of correctness of completed task</td>
<td>Staff</td>
<td>No</td>
<td>3</td>
<td>5</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Year</td>
<td>Author</td>
<td>Issue</td>
<td>Methodology</td>
<td>Participant</td>
<td>Yes/No</td>
<td>Score</td>
<td>Comments</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>------</td>
<td>--------</td>
<td>-------</td>
<td>-------------</td>
<td>-------------</td>
<td>--------</td>
<td>-------</td>
<td>----------</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>1999</td>
<td>Baglioni</td>
<td>0</td>
<td>Review of issues that have relevance to patient handling.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>2001</td>
<td>Daynard</td>
<td>3</td>
<td>Physical workload</td>
<td>Biomechanical loading for peak force</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Physical workload</td>
<td>Biomechanical loading over time</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff competence</td>
<td>Compliance with methods taught</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>43</td>
<td>1981</td>
<td>Daws</td>
<td>2</td>
<td>Staff injuries</td>
<td>Injury Data</td>
<td>Staff</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Questionnaire on attitudes on eqpt, training etc</td>
<td>Staff</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>2001</td>
<td>Billin</td>
<td>0</td>
<td>Staff use of equipment</td>
<td>Use criteria scored for range of eqpt</td>
<td>Equip</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff use of equipment</td>
<td>Helpfulness and envisaged use</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>45</td>
<td>1999</td>
<td>Pain</td>
<td>2</td>
<td>Physical workload</td>
<td>Movement velocity and acceleration</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Physical workload</td>
<td>Spinal stressors from LMM data</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Rating of preference of the subjects</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>46</td>
<td>2000</td>
<td>Elford</td>
<td>3</td>
<td>Physical workload</td>
<td>Observational data from LMM goniometer</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Physical workload</td>
<td>Biomechanical modelling of spinal stress</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>47</td>
<td>1999</td>
<td>Lavender</td>
<td>2</td>
<td>Staff injuries</td>
<td>Semi structured questionnaire for LBP</td>
<td>Staff</td>
<td>Yes</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff absence</td>
<td>Semi structured questionnaire for Absence</td>
<td>Org</td>
<td>Yes</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>Author</td>
<td>Methodology</td>
<td>Variables</td>
<td>Target</td>
<td>Yes</td>
<td>No</td>
<td>Score</td>
<td>Comments</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>--------</td>
<td>-------------</td>
<td>-----------</td>
<td>--------</td>
<td>-----</td>
<td>----</td>
<td>-------</td>
<td>----------</td>
<td></td>
</tr>
</tbody>
</table>
| 1999 | Owen   |             | Staff perception | Rate of perceived exertion | Staff | Yes | Yes | Yes | 10 | 59 | 4.5 | 2  
|      |        |             | Patient perception | Patient comfort | Patient | Yes | Yes | Yes | 9   | 59 | 4.5 | 2  
|      |        |             | Patient perception | Patient security | Patient | Yes | Yes | Yes | 9   | 59 | 4.5 | 2  
| 1999 | Torri  |             | Physical workload | Risk exposure measurement | Staff | No | 10 | 2  | 5   | 50 | 4  | 2  
|      |        |             | Staff injuries    | Health surveillance   | Staff  | 4   | 50  | 4  | 3   |    |     |    
|      |        |             | Staff absence     | Sickness absence      | Org   | No  | 4   | 50  | 4  | 3   |    |     |    
| 1992 | Fourie |             |                  |时间 to develop the skills of bridging| Patient | Yes | Yes | Yes | 13  | 85 | 5  | 1  
| 2001 | Collins|             | Staff injuries    | Injury rates          | Staff  | No  | 2   | 1  | 5  | 12 | 13 | 14 | 52 | 5  | 3  
| 1988 | Gagnon |             | Physical workload | Biomechanical         | Staff  | No  | 10  | 63  | 4  | 2   |    |     |    
| 2001 | Engkvist|            | Physical workload | MSD Risk factors      | Staff  | Yes | Yes | Yes | 10 | 2  | 5   | 100 | 5 | 2  
| 2000 | Lynch  |             | PH techniques     | Changes in Work practice/method | Task  | Yes | Yes | Yes | 3   | 5   | 50  | 3.5 | 2  
|      |        |             | Staff knowledge skill | Self reported knowledge | Staff  | Yes | Yes | Yes | 3   | 50  | 3.5 | 2  
|      |        |             | Staff competence  | Observed practice      | Staff  | No  | 3   | 50  | 3.5 | 2   
|      |        |             | Staff injuries    | Back injury statistics | Staff  | No  | 2   | 50  | 3.5 | 3   
| 2000 | Dietz  |             | Staff perception  | Staff perceptions - semi struct interview | Staff  | No  | 1   | 5   | 33 | 3.5 | 2  
|      |        |             | Risk assessment    | Documentation review    | Org   | No  | 1   | 33  | 3.5 | 1   
|      |        |             | Staff competence  | Staff performance       | Staff  | No  | 3   | 33  | 3.5 | 2   
| 2001 | Nussbaum|            | Staff perception  | RPE                     | Staff  | Yes | Yes | Yes | 10  | 5   | 59  | 3  | 2   
|      |        |             | Physical workload | Postures                | Staff  | Yes | Yes | Yes | 10  | 59  | 3  | 2   
|      |        |             | Physical workload | Forces                  | Staff  | Yes | Yes | Yes | 10  | 59  | 3  | 2   
| 1997 | MacKenzie|           |                | po                       | po    | 4.5 |     |      |     |     |     
| 1996 | Love   |             |                | po                       | po    | 4.5 |     |      |     |     |     
| 1999 | Menoni |             | Physical workload | MAPO scores             | Org   | ??? | 57  | 3   |     |     |     
| 1999 | Owen   |             |                |                          | 66   | 4   |     |      |     |     |     

336
<table>
<thead>
<tr>
<th>ID</th>
<th>Year</th>
<th>Author</th>
<th>Study Type</th>
<th>Outcome</th>
<th>Methodology</th>
<th>Changes in Method</th>
<th>Staff</th>
<th>No</th>
<th>3</th>
<th>5</th>
<th>10</th>
<th>29.5</th>
<th>1.5</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>62</td>
<td>1989</td>
<td>Tuffnell</td>
<td>PH techniques</td>
<td></td>
<td></td>
<td>Changes in method completed</td>
<td>Staff</td>
<td>No</td>
<td>Staff</td>
<td>3</td>
<td>5</td>
<td>10</td>
<td>29.5</td>
<td>1.5</td>
</tr>
<tr>
<td>63</td>
<td>1987</td>
<td>Troup</td>
<td>Staff competence</td>
<td></td>
<td></td>
<td>Task performance by the staff</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Staff</td>
<td>3</td>
<td>5</td>
<td>54</td>
</tr>
<tr>
<td>64</td>
<td>1996</td>
<td>Foster</td>
<td>PH techniques</td>
<td></td>
<td></td>
<td>Self reported changes in practice</td>
<td>Staff</td>
<td>No</td>
<td>Staff</td>
<td>3</td>
<td>5</td>
<td>57</td>
<td>2.5</td>
<td>2</td>
</tr>
<tr>
<td>65</td>
<td>1997</td>
<td>Furber</td>
<td>Staff injuries</td>
<td></td>
<td></td>
<td>Injury rates</td>
<td>Staff</td>
<td>No</td>
<td>Staff</td>
<td>2</td>
<td>2</td>
<td>66</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>66</td>
<td>1997</td>
<td>Best</td>
<td>Staff injuries</td>
<td></td>
<td></td>
<td>Back pain Questionnaire</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Staff</td>
<td>2</td>
<td>5</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Physical workload</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Staff</td>
<td>10</td>
<td>70</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Handling behaviour OWAS</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Staff</td>
<td>9</td>
<td>70</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Patient comfort</td>
<td>Patient</td>
<td>No</td>
<td>9</td>
<td>70</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sickness absence</td>
<td>Org</td>
<td>Yes</td>
<td>NS</td>
<td>Yes</td>
<td>Staff</td>
<td>4</td>
<td>70</td>
<td>3</td>
</tr>
<tr>
<td>67</td>
<td>1994</td>
<td>Lee</td>
<td>Staff perception</td>
<td></td>
<td></td>
<td>Risk factors questionnaire</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Staff</td>
<td>10</td>
<td>39</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PH techniques</td>
<td></td>
<td></td>
<td>Model for Handling capacity</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Staff</td>
<td>10</td>
<td>39</td>
<td>3.5</td>
</tr>
<tr>
<td>68</td>
<td>1995</td>
<td>Garb</td>
<td>Staff knowledge skill</td>
<td></td>
<td></td>
<td>Awareness and knowledge of the staff</td>
<td>Staff</td>
<td>No</td>
<td>Staff</td>
<td>3</td>
<td>56</td>
<td>3.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff injuries</td>
<td></td>
<td></td>
<td>Injury rates</td>
<td>Staff</td>
<td>No</td>
<td>Staff</td>
<td>2</td>
<td>56</td>
<td>3.5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>1993</td>
<td>Feldstein</td>
<td>Staff injuries</td>
<td></td>
<td></td>
<td>Back pain</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Staff</td>
<td>3</td>
<td>5</td>
<td>18</td>
</tr>
<tr>
<td>70</td>
<td>1998</td>
<td>Caska</td>
<td>Staff injuries</td>
<td></td>
<td></td>
<td>Injury rates</td>
<td>Staff</td>
<td>No</td>
<td>Staff</td>
<td>2</td>
<td>17</td>
<td>69</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>71</td>
<td>1996</td>
<td>Backers</td>
<td>Staff injuries</td>
<td></td>
<td></td>
<td>Injury rates</td>
<td>Staff</td>
<td>No</td>
<td>Staff</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>1999</td>
<td>Owen</td>
<td>Staff perception</td>
<td></td>
<td></td>
<td>Staff perception RPE</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Staff</td>
<td>10</td>
<td>76</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Patient perception</td>
<td></td>
<td></td>
<td>Patient Perception Security and comfort</td>
<td>Patient</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Staff</td>
<td>9</td>
<td>76</td>
<td>5</td>
</tr>
<tr>
<td>73</td>
<td>1994</td>
<td>Garg</td>
<td>Physical workload</td>
<td></td>
<td></td>
<td>Biomechanical Model</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Staff</td>
<td>10</td>
<td>67</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
<td></td>
<td></td>
<td>Perceived Stress</td>
<td>Staff</td>
<td>Yes</td>
<td>NS</td>
<td>Yes</td>
<td>Staff</td>
<td>10</td>
<td>67</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Patient perception</td>
<td></td>
<td></td>
<td>Patient Comfort/security</td>
<td>Patient</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Staff</td>
<td>9</td>
<td>67</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Time for task</td>
<td></td>
<td></td>
<td>Transfer Time</td>
<td>Task</td>
<td>No</td>
<td>Task</td>
<td>13</td>
<td>67</td>
<td>4.5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
<td></td>
<td></td>
<td>Acceptability Rate Staff perception</td>
<td>Staff</td>
<td>No</td>
<td>Staff</td>
<td>10</td>
<td>67</td>
<td>4.5</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

337
<table>
<thead>
<tr>
<th>Year</th>
<th>Authors</th>
<th>Methodology</th>
<th>Subject</th>
<th>Measurement</th>
<th>Control</th>
<th>Data</th>
<th>Effect Size</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>Benevolo</td>
<td>Survey</td>
<td>Staff perception</td>
<td>Safety and comfort of staff perception</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>1993</td>
<td>Benevolo</td>
<td>Survey</td>
<td>Staff perception</td>
<td>Injury rates</td>
<td>Staff</td>
<td>No</td>
<td>2</td>
<td>67</td>
</tr>
<tr>
<td>1993</td>
<td>Benevolo</td>
<td>Survey</td>
<td>Time for task</td>
<td>Transfer Time</td>
<td>Task</td>
<td>No</td>
<td>13</td>
<td>67</td>
</tr>
<tr>
<td>2001</td>
<td>Hignett</td>
<td>Accident Reporting System</td>
<td>Incident/Accident Reporting</td>
<td>Incident reports</td>
<td>Org</td>
<td>No</td>
<td>2</td>
<td>67</td>
</tr>
<tr>
<td>1998</td>
<td>Hampton</td>
<td>Questionnaire</td>
<td>Staff perception</td>
<td>Staff perceptions from questionnaire</td>
<td>Staff</td>
<td>No</td>
<td>10</td>
<td>76</td>
</tr>
<tr>
<td>1997</td>
<td>Ng</td>
<td>Survey</td>
<td>Staff perception</td>
<td>Subjective assessment of programme</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>1998</td>
<td>Billin</td>
<td>Survey</td>
<td>Staff injuries</td>
<td>Injury rates</td>
<td>Staff</td>
<td>No</td>
<td>2</td>
<td>54</td>
</tr>
<tr>
<td>1997</td>
<td>Goodridge</td>
<td>Survey</td>
<td>Staff injuries</td>
<td>Injury rates</td>
<td>Staff</td>
<td>No</td>
<td>2</td>
<td>44</td>
</tr>
<tr>
<td>1997</td>
<td>Goodridge</td>
<td>Audit</td>
<td>Compliance with audit</td>
<td>1</td>
<td>Staff</td>
<td>No</td>
<td>44</td>
<td>3.5</td>
</tr>
<tr>
<td>1994</td>
<td>De Looze</td>
<td>Survey</td>
<td>Physical workload</td>
<td>Biomechanical exposure to hazard</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>1997</td>
<td>Lagerstrom</td>
<td>Survey</td>
<td>Staff perception</td>
<td>Subjective assessment of programme</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>1997</td>
<td>Lagerstrom</td>
<td>Survey</td>
<td>Staff perception</td>
<td>Prevalence of MSD</td>
<td>Staff</td>
<td>Yes</td>
<td>NS</td>
<td>Yes</td>
</tr>
<tr>
<td>1999</td>
<td>Evanoff</td>
<td>Survey</td>
<td>Staff injuries</td>
<td>MSD Risk factors</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>1999</td>
<td>Evanoff</td>
<td>Survey</td>
<td>Staff absence</td>
<td>Lost time injuries</td>
<td>Org</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>1999</td>
<td>Evanoff</td>
<td>Survey</td>
<td>Psychological Well-being</td>
<td>Compensation costs</td>
<td>Org</td>
<td>No</td>
<td>Yes</td>
<td>12</td>
</tr>
<tr>
<td>1996</td>
<td>Dixon</td>
<td>Survey</td>
<td>Staff absence</td>
<td>Staff sickness</td>
<td>Staff</td>
<td>No</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>1995</td>
<td>McGuire</td>
<td>Survey</td>
<td>Staff absence</td>
<td>Staff sickness</td>
<td>Staff</td>
<td>No</td>
<td>4</td>
<td>39</td>
</tr>
<tr>
<td>1995</td>
<td>Lavender</td>
<td>Survey</td>
<td>Physical workload</td>
<td>Biomechanical model</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>1992</td>
<td>Garg</td>
<td>Survey</td>
<td>Physical workload</td>
<td>Biomechanical model</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year</td>
<td>Author</td>
<td>Study Title</td>
<td>Staff Perception</td>
<td>RPE</td>
<td>Staff Use of Equipment</td>
<td>Acceptability of Equipment Staff Perception</td>
<td>Staff Use of Equipment</td>
<td>Acceptability of Equipment Staff Perception</td>
</tr>
<tr>
<td>------</td>
<td>--------</td>
<td>-------------</td>
<td>-----------------</td>
<td>-----</td>
<td>------------------------</td>
<td>--------------------------------------------</td>
<td>------------------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>1977</td>
<td>Charney</td>
<td>Staff absence</td>
<td></td>
<td></td>
<td></td>
<td>L0st time from injuries, compensation costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>Lindbeck</td>
<td>Physical workload</td>
<td>Biomechanical forces</td>
<td></td>
<td></td>
<td>RPE</td>
<td>Staff</td>
<td>Yes</td>
</tr>
<tr>
<td>1998</td>
<td>Gagnon</td>
<td>Physical workload</td>
<td>Biomechanical model</td>
<td></td>
<td></td>
<td>RPE</td>
<td>Staff</td>
<td>Yes</td>
</tr>
<tr>
<td>1996</td>
<td>Entwistle</td>
<td>Staff absence</td>
<td>Sickness absence</td>
<td></td>
<td></td>
<td>RPE</td>
<td>Staff</td>
<td>Yes</td>
</tr>
<tr>
<td>1995</td>
<td>Knibbe</td>
<td>Physical workload</td>
<td>Postures Owas</td>
<td></td>
<td></td>
<td>RPE</td>
<td>Staff</td>
<td>Yes</td>
</tr>
<tr>
<td>1996</td>
<td>Green</td>
<td>Staff perception</td>
<td>Staff perceptions of risk factors</td>
<td></td>
<td></td>
<td>RPE</td>
<td>Staff</td>
<td>Yes</td>
</tr>
<tr>
<td>1993</td>
<td>Roth</td>
<td>Staff perception</td>
<td>Rating for preference of method</td>
<td></td>
<td></td>
<td>RPE</td>
<td>Staff</td>
<td>No</td>
</tr>
<tr>
<td>1993</td>
<td>Oddy</td>
<td>PH techniques</td>
<td>Elimination of drag lift</td>
<td></td>
<td></td>
<td>RPE</td>
<td>Staff</td>
<td>No</td>
</tr>
<tr>
<td>1994</td>
<td>Love</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RPE</td>
<td>Staff</td>
<td>No</td>
</tr>
<tr>
<td>1995</td>
<td>Luntley</td>
<td>Physical workload</td>
<td>Staff knowledge skill</td>
<td></td>
<td></td>
<td>RPE</td>
<td>Staff</td>
<td>No</td>
</tr>
<tr>
<td>2000</td>
<td>Robertson</td>
<td>Physical workload</td>
<td>Forces to slide using slide sheets</td>
<td></td>
<td></td>
<td>RPE</td>
<td>Staff</td>
<td>No</td>
</tr>
<tr>
<td>1981</td>
<td>Raistrick</td>
<td>Staff injuries</td>
<td>% back injuries per population</td>
<td></td>
<td></td>
<td>RPE</td>
<td>Staff</td>
<td>No</td>
</tr>
</tbody>
</table>

339
<table>
<thead>
<tr>
<th></th>
<th>Date</th>
<th>Last Name</th>
<th>Study Type</th>
<th>Measure</th>
<th>Staff</th>
<th>No</th>
<th>T</th>
<th>5</th>
<th>38</th>
<th>3.5</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>1985</td>
<td>Rodgers</td>
<td>1</td>
<td>Staff competence</td>
<td>Staff</td>
<td>No</td>
<td>3</td>
<td>38</td>
<td>3.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>101</td>
<td>1979</td>
<td>Stubbs</td>
<td>1</td>
<td>Physical workload</td>
<td>Staff</td>
<td>No</td>
<td>10</td>
<td>31</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>102</td>
<td>1982</td>
<td>Scholey</td>
<td>1</td>
<td>Physical workload</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>41</td>
<td>4</td>
</tr>
<tr>
<td>103</td>
<td>1988</td>
<td>Skarplik</td>
<td>2</td>
<td>Staff perception</td>
<td>Staff</td>
<td>No</td>
<td>10</td>
<td>po</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>104</td>
<td>1981</td>
<td>Wright</td>
<td>1</td>
<td>Physical workload</td>
<td>Staff</td>
<td>No</td>
<td>10</td>
<td>67</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>105</td>
<td>1997</td>
<td>Ulin</td>
<td>2</td>
<td>Physical workload</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>65</td>
<td>4</td>
</tr>
<tr>
<td>106</td>
<td>1998</td>
<td>Varcin-Coad</td>
<td>1</td>
<td>Physical workload</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>65</td>
<td>4</td>
</tr>
<tr>
<td>107</td>
<td>1999</td>
<td>Owen</td>
<td>2</td>
<td>Staff perception</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>po</td>
<td>4</td>
</tr>
<tr>
<td>108</td>
<td>1991</td>
<td>Waldenstrom</td>
<td>4</td>
<td>Relative perception</td>
<td>Patient</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>9</td>
<td>93</td>
<td>5</td>
</tr>
<tr>
<td>109</td>
<td>2000</td>
<td>Kothiyal</td>
<td>2</td>
<td>Physical workload</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>32</td>
<td>4</td>
</tr>
<tr>
<td>110</td>
<td>2000</td>
<td>Schibye</td>
<td>1</td>
<td>Physical workload</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>65</td>
<td>4</td>
</tr>
<tr>
<td>111</td>
<td>2000</td>
<td>Panciera</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>112</td>
<td>2000</td>
<td>Proteau</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>113</td>
<td>2000</td>
<td>Pan</td>
<td>3</td>
<td>Physical workload</td>
<td>Staff</td>
<td>No</td>
<td>10</td>
<td>33</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Staff</td>
<td>No</td>
<td>10</td>
<td>33</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Time for task</td>
<td>Task</td>
<td>No</td>
<td>13</td>
<td>33</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Year</td>
<td>Author</td>
<td>Task No.</td>
<td>Task</td>
<td>Task efficiency</td>
<td>Task</td>
<td>No.</td>
<td>10</td>
<td>32</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>-----</td>
<td>-------</td>
<td>--------------</td>
<td>----------</td>
<td>-------------------------------</td>
<td>------------------------------------------</td>
<td>------</td>
<td>-----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>114</td>
<td>2000</td>
<td>Kato</td>
<td>1</td>
<td>Time for task</td>
<td>Task efficiency</td>
<td>Task</td>
<td>No.</td>
<td>10</td>
<td>32</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>115</td>
<td>2000</td>
<td>Caboor</td>
<td>3</td>
<td>Physical workload</td>
<td>Postures of staff</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Physical workload</td>
<td>EMG</td>
<td>Staff</td>
<td>Yes</td>
<td>NS</td>
<td>Yes</td>
<td>10</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
<td>RPE</td>
<td>Staff</td>
<td>Yes</td>
<td>NS</td>
<td>Yes</td>
<td>10</td>
<td>61</td>
</tr>
<tr>
<td>116</td>
<td>2000</td>
<td>Wood</td>
<td>4</td>
<td>Staff knowledge skill</td>
<td>Staff skill</td>
<td>Staff</td>
<td>No</td>
<td>3</td>
<td>5</td>
<td>46</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Risk assessment</td>
<td>Accuracy of risk assessments/mobility</td>
<td>Staff</td>
<td>No</td>
<td>1</td>
<td>46</td>
<td>3.5</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Staff perceptions</td>
<td>Staff</td>
<td>No</td>
<td>10</td>
<td>46</td>
<td>3.5</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff injuries</td>
<td>Staff injuries</td>
<td>Staff</td>
<td>No</td>
<td>2</td>
<td>46</td>
<td>3.5</td>
<td>2</td>
</tr>
<tr>
<td>117</td>
<td>1987</td>
<td>Johnston</td>
<td>2</td>
<td>Staff perception</td>
<td>Perception of Risks</td>
<td>Staff</td>
<td>No</td>
<td>10</td>
<td>5</td>
<td>43</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Risk assessment</td>
<td>Risk assessment process and info</td>
<td>Staff</td>
<td>No</td>
<td>1</td>
<td>43</td>
<td>3.5</td>
<td>2</td>
</tr>
<tr>
<td>118</td>
<td>1993</td>
<td>Haigh</td>
<td>1</td>
<td>Patient result</td>
<td>Transfer of micro-organisms</td>
<td>Task</td>
<td>No</td>
<td>13</td>
<td>52</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>119</td>
<td>2000</td>
<td>Thompson</td>
<td>1</td>
<td>Physical workload</td>
<td>Postures both owas and reba</td>
<td>Staff</td>
<td>No</td>
<td>10</td>
<td>57</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>120</td>
<td>2000</td>
<td>Revie</td>
<td>0</td>
<td>Physical workload</td>
<td>Postures both owas and reba</td>
<td>Staff</td>
<td>No</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>121</td>
<td>2000</td>
<td>Massad</td>
<td>1</td>
<td>Physical workload</td>
<td>Accident causation measures</td>
<td>Staff</td>
<td>No</td>
<td>10</td>
<td>55</td>
<td>3.5</td>
<td>2</td>
</tr>
<tr>
<td>122</td>
<td>1988</td>
<td>Owen</td>
<td>1</td>
<td>Staff perception</td>
<td>Staff perceptions of equipment</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>13</td>
<td>2</td>
</tr>
<tr>
<td>123</td>
<td>1995</td>
<td>Hignett</td>
<td>1</td>
<td>Staff perception</td>
<td>Nurses perceptions</td>
<td>Staff</td>
<td>Yes</td>
<td></td>
<td>81</td>
<td>4.5</td>
<td>2</td>
</tr>
<tr>
<td>124</td>
<td>1996</td>
<td>Hignett</td>
<td>0</td>
<td>Staff perception</td>
<td>Subjective assessment questionnaire</td>
<td>Staff</td>
<td>No</td>
<td>??</td>
<td>57</td>
<td>4.5</td>
<td>2</td>
</tr>
<tr>
<td>125</td>
<td>1999</td>
<td>Hignett</td>
<td>1</td>
<td>Staff perception</td>
<td>Subjective appraisal of risk factors</td>
<td>Staff</td>
<td>No</td>
<td>10</td>
<td>96</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>126</td>
<td>1996</td>
<td>Hignett</td>
<td>1</td>
<td>Staff perception</td>
<td>Subjective assessment questionnaire</td>
<td>Staff</td>
<td>No</td>
<td>??</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>127</td>
<td>2000</td>
<td>Busse</td>
<td>0</td>
<td>Physical workload</td>
<td>Biomechanics model Lumb Motion Mon</td>
<td>Staff</td>
<td>No</td>
<td>10</td>
<td>96</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>128</td>
<td>1994</td>
<td>Collins</td>
<td>1</td>
<td>Physical workload</td>
<td>Biomechanics model Lumb Motion Mon</td>
<td>Staff</td>
<td>No</td>
<td>10</td>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>129</td>
<td>1998</td>
<td>Collins</td>
<td>1</td>
<td>Physical workload</td>
<td>Biomechanics model Lumb Motion Mon</td>
<td>Staff</td>
<td>No</td>
<td>10</td>
<td>19</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>ID</td>
<td>Year</td>
<td>Author</td>
<td>Number</td>
<td>Type of Measurement</td>
<td>Description</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>-----</td>
<td>------</td>
<td>---------</td>
<td>--------</td>
<td>--------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>----</td>
<td>---</td>
</tr>
<tr>
<td>130</td>
<td>1999</td>
<td>Knibbe</td>
<td>1</td>
<td>Physical workload</td>
<td>Log of pre and post task numbers</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>131</td>
<td>2000</td>
<td>Kilson</td>
<td>0</td>
<td>Physical workload</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>132</td>
<td>2000</td>
<td>Knapik</td>
<td>3</td>
<td>Physical workload</td>
<td>Physiological response</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>57</td>
</tr>
<tr>
<td>133</td>
<td>1995</td>
<td>Stevenson</td>
<td>1</td>
<td>Physical workload</td>
<td>Biomechanical model</td>
<td>Staff</td>
<td>No</td>
<td>Yes</td>
<td></td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>134</td>
<td>1993</td>
<td>Scopa</td>
<td>1</td>
<td>Staff injuries</td>
<td>Compliance with WRBME</td>
<td>Staff</td>
<td>Yes</td>
<td>NS</td>
<td>Yes</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>135</td>
<td>1995</td>
<td>Smedley</td>
<td>1</td>
<td>Physical workload</td>
<td>Risk factors for Nurses</td>
<td>Staff</td>
<td>No</td>
<td></td>
<td></td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>136</td>
<td>1983</td>
<td>Scholey</td>
<td>1</td>
<td>Physical workload</td>
<td>Intra-abdominal pressures</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>137</td>
<td>1989</td>
<td>St-Vincent</td>
<td>1</td>
<td>Physical workload</td>
<td>Observation tool for posture movement</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>138</td>
<td>1983</td>
<td>Stubbs</td>
<td>3</td>
<td>Physical workload</td>
<td>Intra-abdominal pressures</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Nurse Comfort</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Physical workload</td>
<td>Intra-abdominal Pressure 2nd test</td>
<td>Staff</td>
<td>Yes</td>
<td>NS</td>
<td>Yes</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>139</td>
<td>1993</td>
<td>Robertson</td>
<td>1</td>
<td>Physical workload</td>
<td>Forces in lifting</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>71</td>
</tr>
<tr>
<td>140</td>
<td>1998</td>
<td>Pohjonen</td>
<td>3</td>
<td>Physical workload</td>
<td>Posture ovas</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Physical workload</td>
<td>Heart rate</td>
<td>Staff</td>
<td>No</td>
<td></td>
<td></td>
<td>10</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff injuries</td>
<td>Work ability index</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>4</td>
<td>58</td>
</tr>
<tr>
<td>141</td>
<td>1996</td>
<td>Petzall</td>
<td>3</td>
<td>Physical workload</td>
<td>Forces</td>
<td>Staff</td>
<td>No</td>
<td></td>
<td></td>
<td>10</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Subjective appraisal of the staff</td>
<td>Staff</td>
<td>No</td>
<td></td>
<td></td>
<td>13</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Patient perception</td>
<td>Subjective appraisal of occupier</td>
<td>Patient</td>
<td>No</td>
<td></td>
<td></td>
<td>13</td>
<td>48</td>
</tr>
<tr>
<td>142</td>
<td>1992</td>
<td>Olssen</td>
<td>1</td>
<td>Staff perception</td>
<td>Questionnaire data from staff survey</td>
<td>Staff</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td>75</td>
</tr>
<tr>
<td>143</td>
<td>1994</td>
<td>Owen</td>
<td>4</td>
<td>Staff perception</td>
<td>Subjective ratings of the staff</td>
<td>Staff</td>
<td>No</td>
<td>Yes</td>
<td></td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>Physical workload</td>
<td>Biomechanical model</td>
<td>Staff</td>
<td>No</td>
<td>Yes</td>
<td>10</td>
<td>50</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------</td>
<td>-------</td>
<td>----</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient perception</td>
<td>Patient subjective ratings</td>
<td>Patient</td>
<td>No</td>
<td>Yes</td>
<td>9</td>
<td>50</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time for task</td>
<td>Transfer times</td>
<td>Task</td>
<td>No</td>
<td>Yes</td>
<td>13</td>
<td>50</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>144</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>Owen</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff perception</td>
<td>Subjective ratings of the staff</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>82</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff perception</td>
<td>Ranking of tasks</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>82</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff injuries</td>
<td>Back tension</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>82</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical workload</td>
<td>L5/S1 compression</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>82</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>145</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td>Owen</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff absence</td>
<td>Sickness absence L</td>
<td>Org</td>
<td>Yes</td>
<td>NS</td>
<td>Yes</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>146</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>Owen</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff perception</td>
<td>Staff perception</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>po</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>147</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>Sparks</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>148</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td>Nestor</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff injuries</td>
<td>Low back pain index</td>
<td>Staff</td>
<td>No</td>
<td>Yes</td>
<td>2</td>
<td>50</td>
<td>2.5</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment</td>
<td>Bed design criteria</td>
<td>Equip</td>
<td>No</td>
<td></td>
<td>13</td>
<td>50</td>
<td>2.5</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>149</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>Nyran</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff injuries</td>
<td>Injury Rates</td>
<td>Staff</td>
<td>No</td>
<td>Yes</td>
<td>2</td>
<td>65</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial</td>
<td>Lost Time Claims</td>
<td>Org</td>
<td>No</td>
<td>Yes</td>
<td>4</td>
<td>65</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff perception</td>
<td>Subjective views of managers</td>
<td>Staff</td>
<td>No</td>
<td></td>
<td>13</td>
<td>65</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>150</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>Mital</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>151</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>Miller</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carer perception</td>
<td>Questionnaire. Subjective responses of carers</td>
<td>Staff</td>
<td>No</td>
<td></td>
<td>10</td>
<td>50</td>
<td>3.5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>152</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>Marras</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff injuries</td>
<td>Low back disorder model</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>2</td>
<td>72</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical workload</td>
<td>Biomechanical load model</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>72</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>153</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>Menckel</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incident/Accident</td>
<td>Accident reports and feedback</td>
<td>Org</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>6</td>
<td>63</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incident/Accident</td>
<td>Number reports completed</td>
<td>Org</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>1</td>
<td>63</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>154</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td>Mulligan</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

343
<table>
<thead>
<tr>
<th>ID</th>
<th>Year</th>
<th>Author</th>
<th>Type</th>
<th>Description</th>
<th>Meas Final</th>
<th>Meas Initial</th>
<th>Meas Final</th>
<th>Meas Initial</th>
<th>Meas Final</th>
<th>Meas Initial</th>
<th>Meas Final</th>
<th>Meas Initial</th>
<th>Meas Final</th>
<th>Meas Initial</th>
<th>Meas Final</th>
<th>Meas Initial</th>
</tr>
</thead>
<tbody>
<tr>
<td>155</td>
<td>1997</td>
<td>McGuire</td>
<td>Staff perception</td>
<td>Manager knowledge and attitude</td>
<td>Staff</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>64</td>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>156</td>
<td>1996</td>
<td>McGuire</td>
<td>Patient perception</td>
<td>Clients attitudes to equipment</td>
<td>Patient</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>50</td>
<td>3.5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>157</td>
<td>1996</td>
<td>Moody</td>
<td>Staff perception</td>
<td>Nurses attitudes to equipment</td>
<td>Staff</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>41</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>158</td>
<td>1996</td>
<td>McGuire</td>
<td>Equipment</td>
<td>Equipment performance</td>
<td>Equip</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>54</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Staff perception of equipment</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>54</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Patient perception</td>
<td>Patient perception</td>
<td>Patient</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>54</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>159</td>
<td>2000</td>
<td>Zhuang</td>
<td>Staff perception</td>
<td>Subjective Forces</td>
<td>Staff</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>54</td>
<td>4.5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Subjective ease of use</td>
<td>Staff</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>13</td>
<td>54</td>
<td>4.5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Perceived time of task</td>
<td>Staff</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>13</td>
<td>54</td>
<td>4.5</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Patient perception</td>
<td>Patient comfort</td>
<td>Patient</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>9</td>
<td>54</td>
<td>4.5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Patient perception</td>
<td>Patient security</td>
<td>Patient</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>9</td>
<td>54</td>
<td>4.5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>160</td>
<td>1999</td>
<td>Zhuang</td>
<td>Physical workload</td>
<td>Work posture</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>59</td>
<td>4.5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Physical workload</td>
<td>Forces</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>59</td>
<td>4.5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>161</td>
<td>1994</td>
<td>Winkelmolen</td>
<td>Physical workload</td>
<td>Work posture</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>63</td>
<td>4.5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Physical workload</td>
<td>Biomechanical loading</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>63</td>
<td>4.5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Perceived effort</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>63</td>
<td>4.5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>162</td>
<td>1987</td>
<td>Wachs</td>
<td>Staff competence</td>
<td>Compliance with standards</td>
<td>Staff</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>3</td>
<td>5</td>
<td>86</td>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>163</td>
<td>1987</td>
<td>Wood</td>
<td>Staff injuries</td>
<td>Injuries</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>2</td>
<td>5</td>
<td>8</td>
<td>56</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff absence</td>
<td>Lost time</td>
<td>Org</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>4</td>
<td>56</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>164</td>
<td>1988</td>
<td>Venning</td>
<td>0</td>
<td>po</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>165</td>
<td>1988</td>
<td>Videman</td>
<td>Staff knowledge skill</td>
<td>Skill assessment</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>3</td>
<td>5</td>
<td>41</td>
<td>3.5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff injuries</td>
<td>Back Pain</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>2</td>
<td>41</td>
<td>3.5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Subjective workload</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>41</td>
<td>3.5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>166</td>
<td>1987</td>
<td>Torma-</td>
<td>Physical workload</td>
<td>Spinal loading</td>
<td>Staff</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>43</td>
<td>2.5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Krajewski</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>167</td>
<td>1987</td>
<td>Takala</td>
<td>Staff perception</td>
<td>Subjective view on loads</td>
<td>Staff</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>10</td>
<td>50</td>
<td>3.5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Physical workload</td>
<td>Postures</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>50</td>
<td>3.5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>168</td>
<td>1997</td>
<td>Le Bon</td>
<td>Staff use of equipment</td>
<td>Equipment evaluation</td>
<td>Equip</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>13</td>
<td>41</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Patient perception</td>
<td>User trial data Patient</td>
<td>Patient</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>9</td>
<td>41</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>Reference</td>
<td>Study Type</td>
<td>Measure</td>
<td>Staff Perception</td>
<td>User Trial Staff</td>
<td>Physical Evaluation</td>
<td>Staff</td>
<td>No</td>
<td>Yes</td>
<td>Value</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
<td>------------</td>
<td>---------</td>
<td>------------------</td>
<td>-----------------</td>
<td>---------------------</td>
<td>-------</td>
<td>----</td>
<td>----</td>
<td>-------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>169</td>
<td>Love</td>
<td>Staff</td>
<td>Subjective perceptions of hazards</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>36</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Incident/Accident</td>
<td>Factors in accident</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>36</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>170</td>
<td>Laflin</td>
<td>Physical workload</td>
<td>Biomech Models</td>
<td>Staff</td>
<td>No</td>
<td>Yes</td>
<td>10</td>
<td>46</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>171</td>
<td>Lee</td>
<td>Physical workload</td>
<td>Postures OWAS</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>39</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical workload</td>
<td>Biomechanical Force</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>39</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>172</td>
<td>Ljungberg</td>
<td>Physical workload</td>
<td>HR / VO2</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>2</td>
<td>6</td>
<td>7</td>
<td>65</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff perception</td>
<td>RPE</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>65</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical workload</td>
<td>Lift force</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>65</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical workload</td>
<td>Lift exposurefreq</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>65</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical workload</td>
<td>Postures</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>65</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>173</td>
<td>Love</td>
<td>Equipment</td>
<td>Equipment measures</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>2</td>
<td>66</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff injuries</td>
<td>Injuries</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>2</td>
<td>66</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical workload</td>
<td>Heart Rate</td>
<td>Staff</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>10</td>
<td>66</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Subjective feedback</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>66</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>175</td>
<td>Knibbe</td>
<td>Staff injuries</td>
<td>Back Pain Questionnaire</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>2</td>
<td>77</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical workload</td>
<td>Task Exposure</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>2</td>
<td>77</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>176</td>
<td>Kilbom</td>
<td>Physical workload</td>
<td>Forces on staff</td>
<td>Staff</td>
<td>No</td>
<td>Yes</td>
<td>10</td>
<td>2</td>
<td>6</td>
<td>7</td>
<td>27</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time for task</td>
<td>Time taken</td>
<td>Task</td>
<td>No</td>
<td>Yes</td>
<td>13</td>
<td>27</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>177</td>
<td>Jackson</td>
<td>Physical workload</td>
<td>Postures owas</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>66</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>178</td>
<td>Khalil</td>
<td>Physical workload</td>
<td>Biomechanical loading</td>
<td>Staff</td>
<td>No</td>
<td>Yes</td>
<td>10</td>
<td>36</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>179</td>
<td>Head</td>
<td>Staff injuries</td>
<td>Injuries</td>
<td>Staff</td>
<td>No</td>
<td>Yes</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>28</td>
<td>3</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff absence</td>
<td>Lost time</td>
<td>Org</td>
<td>No</td>
<td>Yes</td>
<td>4</td>
<td>28</td>
<td>3</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Financial</td>
<td>Cost</td>
<td>Org</td>
<td>No</td>
<td>Yes</td>
<td>4</td>
<td>28</td>
<td>3</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>Hellsing</td>
<td>Training numbers</td>
<td>Training Outcomes</td>
<td>Staff</td>
<td>Yes</td>
<td>NS</td>
<td>Yes</td>
<td>13</td>
<td>5</td>
<td>18</td>
<td>19</td>
<td>58</td>
<td>3</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff injuries</td>
<td>Back Pain</td>
<td>Staff</td>
<td>Yes</td>
<td>NS</td>
<td>Yes</td>
<td>2</td>
<td>58</td>
<td>3</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff competence</td>
<td>Observed compliance with teaching</td>
<td>Staff</td>
<td>Yes</td>
<td>NS</td>
<td>Yes</td>
<td>3</td>
<td>58</td>
<td>3</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>181</td>
<td>Garg</td>
<td>Staff perception</td>
<td>Perceived exertion</td>
<td>Staff</td>
<td>No</td>
<td>Yes</td>
<td>10</td>
<td>55</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical workload</td>
<td>Spinal loading</td>
<td>Staff</td>
<td>No</td>
<td>Yes</td>
<td>10</td>
<td>55</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>Study</td>
<td>Study Type</td>
<td>Workload</td>
<td>Staff</td>
<td>No</td>
<td>Yes</td>
<td>Values</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-------</td>
<td>------------</td>
<td>----------</td>
<td>-------</td>
<td>----</td>
<td>-----</td>
<td>--------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1986</td>
<td>Gagnon</td>
<td>Physical workload</td>
<td>Trunk angles</td>
<td>Biomechanical model</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>57</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>Garg</td>
<td>Physical workload</td>
<td>Spinal Loading</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>48</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>Garg</td>
<td>Physical workload</td>
<td>Spinal Loading</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>80</td>
<td>4.5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td>Gagnon</td>
<td>Physical workload</td>
<td>Muscle activity</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>57</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>Larthe</td>
<td>Staff absence</td>
<td>Days lost</td>
<td>Org</td>
<td>No</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>8</td>
<td>10</td>
<td>13</td>
<td>22</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>Engst</td>
<td>Patient result</td>
<td>Resident agitation</td>
<td>Patient</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>9</td>
<td>1, 2, 5, 7</td>
<td>63</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>Fenety</td>
<td>Physical workload</td>
<td>Lifting load</td>
<td>Staff</td>
<td>No</td>
<td>No</td>
<td>10</td>
<td>18</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>Fraga</td>
<td>Staff injuries</td>
<td>Injury rates</td>
<td>Staff</td>
<td>No</td>
<td>po</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>Hutchinson</td>
<td>Staff perception</td>
<td>Perception of Risks</td>
<td>Staff</td>
<td>po</td>
<td>po</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>Hooghiemstra</td>
<td>Physical workload</td>
<td>Postures</td>
<td>Staff</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>po</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>Looze</td>
<td>Physical workload</td>
<td>Spinal Loading</td>
<td>Staff</td>
<td>Yes</td>
<td>NS</td>
<td>No</td>
<td>10</td>
<td>66</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>Doormaal</td>
<td>Physical workload</td>
<td>Posture</td>
<td>Staff</td>
<td>Yes</td>
<td>NS</td>
<td>Yes</td>
<td>10</td>
<td>64</td>
<td>3.5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>Authors</td>
<td>Study Title</td>
<td>Study Design</td>
<td>Staff Perception</td>
<td>Physical Workload</td>
<td>Equipment</td>
<td>Financial Impact</td>
<td>Patient Perception</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>-------------</td>
<td>--------------</td>
<td>------------------</td>
<td>------------------</td>
<td>----------</td>
<td>-----------------</td>
<td>-------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 1979 | Bell    | PH Technique | Design        | Yes              | Yes              | No       | Yes             | No                | 82 3.5 1          
| 1975 | Dehlin  | Physical Workload | Force Plate Measures for Lift Burden | Yes             | Yes              | Yes     | Yes             | Yes               | 63 3 2            
| 1993 | Charney | Staff Injuries | Injury Rates for Staff | No              | Yes              | Yes     | Yes             | Yes               | 17 37 2 3         
| 1998 | Conneely| Patient Perception | Patient Perspective | No              | No               | Yes     | Yes             | No                | 92 5 2            
| 1984 | Bell    | Equipment     | Problems when operating hoists | No              | Yes              | Yes     | Yes             | Yes               | 33 4 1            
| 1991 | Charney | Time for Task | Time to operate hoists Lab trial | Yes             | Yes              | Yes     | Yes             | Yes               | 33 4 1            
| 1998 | Botha   | Staff Injuries | Back Pain Questionnaire | No              | Yes              | No      | Yes             | Yes               | 75 5 3            
| 1979 | Bell    | Physical Workload | Number of patients to be lifted | Yes             | Yes              | Yes     | Yes             | Yes               | 82 3.5 2          
| 1979 | Bell    | PH Technique | Method to move patient | Yes             | Yes              | Yes     | Yes             | Yes               | 82 3.5 1          
| 1984 | Bell    | Equipment     | Appraisal of range of hoists | Yes             | Yes              | Yes     | Yes             | Yes               | 33 4 1            
| 1979 | Bell    | Physical Workload | Number of staff to lift | Yes             | Yes              | Yes     | Yes             | Yes               | 82 3.5 1          
| 1979 | Bell    | PH Technique | Importance of the task | Yes             | Yes              | Yes     | Yes             | Yes               | 82 3.5 1          
| 1979 | Bell    | Physical Workload | Frequency of lifting | Yes             | Yes              | Yes     | Yes             | Yes               | 82 3.5 2          
| 1979 | Bell    | Physical Workload | Physical effort | Yes             | Yes              | Yes     | Yes             | Yes               | 82 3.5 2          
| 1984 | Bell    | Equipment     | Problems when operating hoists | No              | Yes              | Yes     | Yes             | Yes               | 33 4 1            
<p>| 1992 | Atkinson|             |                |                  |                  |          |                 |                   | 347               |</p>
<table>
<thead>
<tr>
<th>Year</th>
<th>Authors</th>
<th>Method</th>
<th>Topic</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1986</td>
<td>Alavosius</td>
<td>Staff competence</td>
<td>% tasks performed safely</td>
<td>Staff No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Subjective feedback of intervention</td>
<td>Staff No</td>
</tr>
<tr>
<td>1998</td>
<td>Aird</td>
<td>Staff injuries</td>
<td>Injury rates</td>
<td>Staff No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff use of equipment</td>
<td>Use of equipment for tasks</td>
<td>Staff Yes Yes Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Perceived benefits</td>
<td>Staff Yes Yes Yes</td>
</tr>
<tr>
<td>2006</td>
<td>Nelson</td>
<td>Staff injuries</td>
<td>Injury rate</td>
<td>Staff Yes Yes Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff absence</td>
<td>Lost days and modified days</td>
<td>Org Yes No Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Psychological wellbeing</td>
<td>Job satisfaction</td>
<td>Staff Yes Yes Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff competence</td>
<td>Self reported unsafe acts (compliance)</td>
<td>Staff Yes Yes Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Financial</td>
<td>Cost benefit</td>
<td>Org No Yes Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff perception</td>
<td>perceived effectiveness of intervention</td>
<td>Staff No Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Perceived support of organisation (Culture)</td>
<td>Staff No Yes</td>
</tr>
<tr>
<td>2003</td>
<td>Smedley</td>
<td>Staff injuries</td>
<td>Low back pain</td>
<td>Staff Yes Yes Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Psychological wellbeing</td>
<td>Psychosocial stress</td>
<td>Staff Yes Yes Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff competence</td>
<td>Number of unassisted transfers/compliance</td>
<td>Staff Yes Yes Yes</td>
</tr>
<tr>
<td>2003</td>
<td>Evanoff</td>
<td>Staff injuries</td>
<td>Injury rate</td>
<td>Staff Yes Yes Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff absence</td>
<td>Lost Time</td>
<td>Org Yes Yes Yes</td>
</tr>
<tr>
<td>2005</td>
<td>Fujushiro</td>
<td>Staff injuries</td>
<td>MSD Rate</td>
<td>Staff Yes Yes Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff absence</td>
<td>Days lost</td>
<td>Org Yes Yes Yes</td>
</tr>
<tr>
<td>2006</td>
<td>Tamminen Peter</td>
<td>Staff competence</td>
<td>Staff competence SOPMAS</td>
<td>Staff Yes No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical workload</td>
<td>EMG</td>
<td>Staff Yes No</td>
</tr>
<tr>
<td>ID</td>
<td>Year</td>
<td>Author</td>
<td>Physical workload</td>
<td>Biomechanical models</td>
</tr>
<tr>
<td>-----</td>
<td>------</td>
<td>--------</td>
<td>-------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>215</td>
<td>1981</td>
<td>Wright</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>216</td>
<td>1987</td>
<td>Gagnon</td>
<td>2</td>
<td>Biomechanical</td>
</tr>
<tr>
<td>216</td>
<td>1987</td>
<td>Gagnon</td>
<td>2</td>
<td>Muscle activity</td>
</tr>
<tr>
<td>217</td>
<td>1998</td>
<td>Mughal</td>
<td>4</td>
<td>Staff injuries</td>
</tr>
<tr>
<td>218</td>
<td>2005</td>
<td>Wright</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>218</td>
<td>2006</td>
<td>Proteau</td>
<td>3</td>
<td>Forces to slide</td>
</tr>
<tr>
<td>219</td>
<td>1998</td>
<td>Nicholls</td>
<td>2</td>
<td>Staff competence</td>
</tr>
<tr>
<td>219</td>
<td>1998</td>
<td>Nicholls</td>
<td>2</td>
<td>Physical workload</td>
</tr>
<tr>
<td>219</td>
<td>1998</td>
<td>Nicholls</td>
<td>2</td>
<td>Staff competence</td>
</tr>
<tr>
<td>220</td>
<td>2005</td>
<td>Swain</td>
<td>0</td>
<td>Biomechanical</td>
</tr>
<tr>
<td>221</td>
<td>2005</td>
<td>Ferreira</td>
<td>1</td>
<td>Compliance Questionnaire</td>
</tr>
<tr>
<td>222</td>
<td>2003</td>
<td>Swain</td>
<td>2</td>
<td>Knowledge</td>
</tr>
<tr>
<td>223</td>
<td>2003</td>
<td>Trinkoff</td>
<td>1</td>
<td>MSD prevalence</td>
</tr>
<tr>
<td>224</td>
<td>2006</td>
<td>Pinder</td>
<td>3</td>
<td>Perceptions of Management systems</td>
</tr>
<tr>
<td>225</td>
<td>2003</td>
<td>Hefti</td>
<td>3</td>
<td>Staff injuries</td>
</tr>
<tr>
<td>225</td>
<td>2003</td>
<td>Hefti</td>
<td>3</td>
<td>Staff absence</td>
</tr>
<tr>
<td>226</td>
<td>2002</td>
<td>Crumpton</td>
<td>2</td>
<td>Physical workload</td>
</tr>
<tr>
<td>Year</td>
<td>Author</td>
<td>Study Type</td>
<td>Dependent Variable</td>
<td>Independent Variable</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
<td>------------</td>
<td>--------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>2004</td>
<td>Kjellberg</td>
<td>Staff injuries</td>
<td>back pain MSD (SF36)</td>
<td>Staff competence</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Work Technique (kjellberg method)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Patient perception</td>
</tr>
<tr>
<td>2002</td>
<td>Ronald</td>
<td>Staff injuries</td>
<td>MSD rates per 100 000 hours</td>
<td>Staff perception</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RPE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Equipment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Accessibility of equipment</td>
</tr>
<tr>
<td>2007</td>
<td>Hignett</td>
<td>Staff competence</td>
<td>Org</td>
<td>Safety Culture PHOQS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical workload</td>
<td>Posture REBA</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time for task</td>
<td>Time taken</td>
<td>Task</td>
</tr>
<tr>
<td>2007</td>
<td>Lavender</td>
<td>Physical workload</td>
<td>EMG</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical workload</td>
<td>Biomechanical LMM2</td>
<td>Staff</td>
</tr>
<tr>
<td>2007</td>
<td>Morgan</td>
<td>Financial</td>
<td>Costs</td>
<td>Org</td>
</tr>
<tr>
<td>2004</td>
<td>Heacock</td>
<td>Staff use of equipment</td>
<td>Subjective ease of use</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time for task</td>
<td>Time taken</td>
<td>Task</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff perception</td>
<td>RPE for body regions</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Patient perception</td>
<td>Patient perspective</td>
<td>Patient</td>
</tr>
<tr>
<td>2003</td>
<td>Brinkhoff</td>
<td>Physical workload</td>
<td>Postures OWAS</td>
<td>Staff</td>
</tr>
<tr>
<td>2005</td>
<td>Ruszala</td>
<td>Incidence/Accident</td>
<td>Incidence rate</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time for task</td>
<td>Time taken</td>
<td>Task</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff use of equipment</td>
<td>Subjective ease of use</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff perception</td>
<td>RPE</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical workload</td>
<td>Posture REBA</td>
<td>Staff</td>
</tr>
<tr>
<td>Study</td>
<td>Year</td>
<td>Staff perception</td>
<td>Subjective performance rating</td>
<td>Patient perception</td>
</tr>
<tr>
<td>---------------</td>
<td>------</td>
<td>------------------</td>
<td>-------------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Santaguida</td>
<td>2005</td>
<td>Physical workload</td>
<td>Biomechanical strain</td>
<td>Staff Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time for task</td>
<td>Time taken</td>
<td>Task Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff perception</td>
<td>RPE</td>
<td>Staff Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Ranking of preference</td>
<td>Staff Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Patient perception</td>
<td>Ranking of preference</td>
<td>Patient Yes</td>
</tr>
<tr>
<td>Swann</td>
<td>2006</td>
<td>PH technique</td>
<td>Descriptive functions</td>
<td>Staff No</td>
</tr>
<tr>
<td>Yeung</td>
<td>2005</td>
<td>Physical workload</td>
<td>Workload exposure</td>
<td>Staff Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Risk perception</td>
<td>Staff Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Comfort</td>
<td>Staff Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Financial</td>
<td>Injury costs</td>
<td>Org No</td>
</tr>
<tr>
<td>Millar</td>
<td>2006</td>
<td>Staff perception</td>
<td>Risk perception</td>
<td>Staff Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Comfort</td>
<td>Staff Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Financial</td>
<td>Injury costs</td>
<td>Org No</td>
</tr>
<tr>
<td>Knibbe</td>
<td>2006</td>
<td>Physical workload</td>
<td>Exposure to hazards</td>
<td>Staff No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff competence</td>
<td>Prevention strategies /Compliance Policy</td>
<td>Org No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Org</td>
<td>mirror</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff injuries</td>
<td>LBP</td>
<td>Staff No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff absence</td>
<td>Sick leave</td>
<td>Org No</td>
</tr>
<tr>
<td>Nelson</td>
<td>2008</td>
<td>Quality of care</td>
<td>Quality of care RAI tool p37</td>
<td>Patient Yes</td>
</tr>
<tr>
<td>Knibbe</td>
<td>2006</td>
<td>Staff absence</td>
<td>Absence</td>
<td>Org No</td>
</tr>
<tr>
<td>Hess</td>
<td>2006</td>
<td>Staff perception</td>
<td>RPE Borg</td>
<td>Staff Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical workload</td>
<td>Biomechanical load</td>
<td>Staff Yes</td>
</tr>
<tr>
<td>Pearce</td>
<td>2001</td>
<td>Staff absence</td>
<td>Lost time</td>
<td>Org No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff injuries</td>
<td>Pain reporting</td>
<td>Staff No</td>
</tr>
<tr>
<td>Wardell</td>
<td>2007</td>
<td>Staff perception</td>
<td>Staff perception</td>
<td>Staff No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff injuries</td>
<td>Injury Rate</td>
<td>Staff No</td>
</tr>
<tr>
<td>Hye-Knudson</td>
<td>2006</td>
<td>Staff competence</td>
<td>Compliance / skill (Warming tool</td>
<td>Staff Yes</td>
</tr>
<tr>
<td>Charney</td>
<td>2006</td>
<td>Staff injuries</td>
<td>Injury Rates</td>
<td>Staff No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff absence</td>
<td>Time lost</td>
<td>Org No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff injuries</td>
<td>Injury Rates</td>
<td>Staff No</td>
</tr>
<tr>
<td>Year 2002</td>
<td>Author</td>
<td>Physical workload</td>
<td>Costs</td>
<td>Org</td>
</tr>
<tr>
<td>----------</td>
<td>--------------</td>
<td>-------------------</td>
<td>-------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>249</td>
<td>Allen</td>
<td>Physical workload</td>
<td>L5/S1 compression</td>
<td>Staff</td>
</tr>
<tr>
<td>250</td>
<td>Nelson</td>
<td>Staff perception</td>
<td>Comfort</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical workload</td>
<td>Lumbar force moment</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical workload</td>
<td>Muscle activity</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical workload</td>
<td>External applied force</td>
<td>Staff</td>
</tr>
<tr>
<td>251</td>
<td>Passfield</td>
<td>Staff injuries</td>
<td>Injury Rate</td>
<td>Staff</td>
</tr>
<tr>
<td>252</td>
<td>Skotte</td>
<td>Physical workload</td>
<td>Biomechanical model</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical workload</td>
<td>Muscle force</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff perception</td>
<td>RPE</td>
<td>Staff</td>
</tr>
<tr>
<td>253</td>
<td>Hye-Knudson</td>
<td>Physical workload</td>
<td>Lumbar Motion</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical workload</td>
<td>EMG</td>
<td>Staff</td>
</tr>
<tr>
<td>254</td>
<td>Yassi</td>
<td>Physical workload</td>
<td>Number lifts observed</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Subjective assessment of work effects</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff injuries</td>
<td>Pain/discomfort</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff injuries</td>
<td>Injury rate</td>
<td>Staff</td>
</tr>
<tr>
<td>255</td>
<td>Johnsson</td>
<td>Staff competence</td>
<td>Method assessment (Compliance)</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff perception</td>
<td>RPE</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Patient perception</td>
<td>Patient comfort</td>
<td>Staff</td>
</tr>
<tr>
<td>256</td>
<td>Engkvist</td>
<td>Staff use of equipment</td>
<td>Use of Equipment</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff perception</td>
<td>RPE/fatigue</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff injuries</td>
<td>Pain Discomfort</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff injuries</td>
<td>Injury rates</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Time lost</td>
<td>Org</td>
</tr>
<tr>
<td>257</td>
<td>Schibye</td>
<td>Physical workload</td>
<td>Biomechanical loads</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Perceived exertion</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time for task</td>
<td>Time taken</td>
<td>Task</td>
</tr>
<tr>
<td>258</td>
<td>Harrison</td>
<td>Patient result</td>
<td>Clinical benefit</td>
<td>Patient</td>
</tr>
<tr>
<td>259</td>
<td>Garg</td>
<td>Staff absence</td>
<td>Number injuries</td>
<td>Org</td>
</tr>
<tr>
<td></td>
<td>Year</td>
<td>Author</td>
<td>No.</td>
<td>Measure</td>
</tr>
<tr>
<td>---</td>
<td>------</td>
<td>---------</td>
<td>-----</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>260</td>
<td>2004</td>
<td>Cohen</td>
<td>5</td>
<td>Number of staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Number of staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff injuries</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff absence</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff absence</td>
</tr>
<tr>
<td>261</td>
<td>2006</td>
<td>Jordan</td>
<td>1</td>
<td>Physical workload</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Physical workload</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Physical workload</td>
</tr>
<tr>
<td>262</td>
<td>2004</td>
<td>Keir</td>
<td>2</td>
<td>Physical workload</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Physical workload</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Physical workload</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Physical workload</td>
</tr>
<tr>
<td>263</td>
<td>2005</td>
<td>Chokhar</td>
<td>2</td>
<td>Staff injuries</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Physical workload</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Physical workload</td>
</tr>
<tr>
<td>264</td>
<td>2005</td>
<td>Anderson</td>
<td>1</td>
<td>Physical workload</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Physical workload</td>
</tr>
<tr>
<td>265</td>
<td>2005</td>
<td>Engst</td>
<td>3</td>
<td>Staff perception</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
</tr>
<tr>
<td>266</td>
<td>2005</td>
<td>McGill</td>
<td>3</td>
<td>Physical workload</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Physical workload</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Physical workload</td>
</tr>
<tr>
<td>267</td>
<td>2004</td>
<td>Siguardsson</td>
<td>1</td>
<td>Financial costs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Financial costs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Financial costs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Financial costs</td>
</tr>
<tr>
<td>268</td>
<td>2001</td>
<td>O'Reilly</td>
<td>3</td>
<td>Staff injuries</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff injuries</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Financial costs</td>
</tr>
<tr>
<td>269</td>
<td>2002</td>
<td>Silvia</td>
<td>2</td>
<td>Physical workload</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
</tr>
<tr>
<td>270</td>
<td>1999</td>
<td>Bohannon</td>
<td>1</td>
<td>Physical workload</td>
</tr>
<tr>
<td>271</td>
<td>2006</td>
<td>Baptiste</td>
<td>5</td>
<td>Staff perception</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff perception</td>
</tr>
<tr>
<td>272</td>
<td></td>
<td>Knibbe</td>
<td>NR</td>
<td></td>
</tr>
<tr>
<td>273</td>
<td>2007</td>
<td>Mark</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>Author</td>
<td>Study Type</td>
<td>Measure</td>
<td>Sample Size</td>
</tr>
<tr>
<td>------</td>
<td>--------</td>
<td>------------</td>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>2007</td>
<td>Lavender</td>
<td>2</td>
<td>Physical workload</td>
<td>EMG</td>
</tr>
<tr>
<td>2007</td>
<td>Lavender</td>
<td>2</td>
<td>Physical workload</td>
<td>RPE</td>
</tr>
<tr>
<td>2007</td>
<td>Craib</td>
<td>2</td>
<td>Staff injuries</td>
<td>Injury rates</td>
</tr>
<tr>
<td>2007</td>
<td>Reid</td>
<td>2</td>
<td>Staff knowledge skill</td>
<td>Retention of knowledge</td>
</tr>
<tr>
<td>2007</td>
<td>Cornish</td>
<td>1</td>
<td>Staff perception</td>
<td>Subjective evaluation</td>
</tr>
<tr>
<td>2007</td>
<td>Muir</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>Owen</td>
<td>5</td>
<td>Patient perception</td>
<td>Patient security</td>
</tr>
<tr>
<td>2000</td>
<td>Logan</td>
<td>1</td>
<td>Carer perception</td>
<td>Subjective views of carers</td>
</tr>
<tr>
<td>2003</td>
<td>Meek</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>Griffiths</td>
<td>1</td>
<td>Incident/Accident</td>
<td>MH Incidents</td>
</tr>
<tr>
<td>2003</td>
<td>Robotham</td>
<td>1</td>
<td>Financial</td>
<td>Financial</td>
</tr>
<tr>
<td>2001</td>
<td>Thompson</td>
<td>1</td>
<td>Physical workload</td>
<td>Force</td>
</tr>
<tr>
<td>2001</td>
<td>Spencer</td>
<td>1</td>
<td>Physical workload</td>
<td>Force</td>
</tr>
<tr>
<td>2002</td>
<td>Hunter</td>
<td>2</td>
<td>Physical workload</td>
<td>Force</td>
</tr>
<tr>
<td>2005</td>
<td>Murphy</td>
<td>4</td>
<td>Physical workload</td>
<td>Postures REBA</td>
</tr>
<tr>
<td>2006</td>
<td>Howlett</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>Gray</td>
<td>2</td>
<td>Physical workload</td>
<td>EMG</td>
</tr>
<tr>
<td>2006</td>
<td>Fray</td>
<td>3</td>
<td>Physical workload</td>
<td>Observed movement</td>
</tr>
<tr>
<td>Patient perception</td>
<td>Patient comfort</td>
<td>Patient</td>
<td>No</td>
<td>9</td>
</tr>
<tr>
<td>--------------------</td>
<td>----------------</td>
<td>---------</td>
<td>----</td>
<td>---</td>
</tr>
<tr>
<td>293 2006 Michaelis</td>
<td>4</td>
<td>Staff competence</td>
<td>Competence/ completed new methods</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Perceived work load</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff injuries</td>
<td>Back pain</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff absence</td>
<td>Sickness absence</td>
<td>Org</td>
</tr>
<tr>
<td>294 2005 Hartvigsen</td>
<td>1</td>
<td>Staff injuries</td>
<td>Back pain</td>
<td>Staff</td>
</tr>
<tr>
<td>295 2004 Nevala</td>
<td>4</td>
<td>Physical workload</td>
<td>EMG</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical workload</td>
<td>HR</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff perception</td>
<td>Perceived strain</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff use of equipment</td>
<td>Useability</td>
<td>Staff</td>
</tr>
<tr>
<td>296 2004 Collins</td>
<td>3</td>
<td>Financial</td>
<td>Workers compensation claims</td>
<td>Org</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff absence</td>
<td>Lost work days</td>
<td>Org</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Financial</td>
<td>Cost benefit analysis</td>
<td>Org</td>
</tr>
<tr>
<td>297 2003 McFarlane</td>
<td>1</td>
<td>Physical workload</td>
<td>Force</td>
<td>Staff</td>
</tr>
<tr>
<td>298 2006 Pellino</td>
<td>3</td>
<td>Staff perception</td>
<td>Perceived exertion</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time for task</td>
<td>Time taken</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Patient perception</td>
<td>Patient comfort</td>
<td>Patient</td>
</tr>
<tr>
<td>299 2001 Best</td>
<td>1</td>
<td>Financial</td>
<td>Claims</td>
<td>Org</td>
</tr>
<tr>
<td>300 2003 Owen</td>
<td>1</td>
<td>Staff perception</td>
<td>RPE</td>
<td>Staff</td>
</tr>
<tr>
<td>301 2004 Karahan</td>
<td>1</td>
<td>Staff injuries</td>
<td>Back pain</td>
<td>Staff</td>
</tr>
<tr>
<td>302 2001 Walls</td>
<td>1</td>
<td>Physical workload</td>
<td>Biomechanical relative risk</td>
<td>Staff</td>
</tr>
<tr>
<td>303 2004 Victoria Aus</td>
<td>2</td>
<td>Financial</td>
<td>Nurse claims</td>
<td>Org</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Financial</td>
<td>Cost benefit analysis</td>
<td>Org</td>
</tr>
<tr>
<td>304 2001 Connelly</td>
<td>3</td>
<td>Staff knowledge skill</td>
<td>Perception of learning</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff use of equipment</td>
<td>Ease of use</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff competence</td>
<td>Competence assessment (observ)</td>
<td>Staff</td>
</tr>
<tr>
<td>305 2007 Occipinti</td>
<td>3</td>
<td>Risk assessment</td>
<td>Risk assessments</td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>Author</td>
<td>Value</td>
<td>Type</td>
<td>Equipment</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>-------</td>
<td>-----------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>2007</td>
<td>Kindblom-Rising</td>
<td>1</td>
<td>Staff perception</td>
<td>Risk perception after training</td>
</tr>
<tr>
<td>2006</td>
<td>Moseley</td>
<td>1</td>
<td>Staff competence</td>
<td>Competency scores</td>
</tr>
<tr>
<td>2008</td>
<td>Bar-Niv</td>
<td>3</td>
<td>Physical workload</td>
<td>Biomech load</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Psychological well-being</td>
<td>Psychosocial stress questionnaire</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff injuries</td>
<td>MSD (nordic)</td>
</tr>
<tr>
<td>2008</td>
<td>Alexander</td>
<td>2</td>
<td>Training numbers</td>
<td>Training numbers in hoist skills</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff knowledge skill</td>
<td>Number incorrect answers</td>
</tr>
<tr>
<td>2008</td>
<td>Skotte</td>
<td>1</td>
<td>Physical workload</td>
<td>Biomechanical load</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff injuries</td>
<td>Back pain injuries</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff injuries</td>
<td>Severity of back pain</td>
</tr>
<tr>
<td>2008</td>
<td>Warming</td>
<td>2</td>
<td>Training numbers</td>
<td>Training numbers in hoist skills</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff knowledge skill</td>
<td>Number incorrect answers</td>
</tr>
<tr>
<td>2002</td>
<td>Kuiper</td>
<td>1</td>
<td>Physical workload</td>
<td>Serum concentrations Physiological</td>
</tr>
<tr>
<td>2002</td>
<td>Spiegel</td>
<td>1</td>
<td>Financial</td>
<td>Costs</td>
</tr>
<tr>
<td>2003</td>
<td>Hignett</td>
<td>0</td>
<td></td>
<td>? Constitutes new presentation of data</td>
</tr>
<tr>
<td>2001</td>
<td>Moreton</td>
<td>0</td>
<td>Handling method</td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>Moreton</td>
<td>0</td>
<td>Handling method</td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>Millar</td>
<td>0</td>
<td>Handling method</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>Betts</td>
<td>0</td>
<td>Handling method</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>Rader</td>
<td>0</td>
<td>Handling method</td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>Palmer</td>
<td>0</td>
<td>Handling method</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Kneafsey</td>
<td>1</td>
<td>Staff perception</td>
<td>Confidence of staff post training</td>
</tr>
<tr>
<td>2006</td>
<td>Love</td>
<td>0</td>
<td></td>
<td>Mixed assessment</td>
</tr>
<tr>
<td>2004</td>
<td>Kothiyal</td>
<td>2</td>
<td>Physical workload</td>
<td>Muscle effort</td>
</tr>
</tbody>
</table>

IQR: 85 4 1

356
<table>
<thead>
<tr>
<th>Staff perception</th>
<th>RPE</th>
<th>Staff</th>
<th>Yes</th>
<th>Yes</th>
<th>Yes</th>
<th>10</th>
<th>73</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>324 2004 Guthrie 5</td>
<td>Staff injuries</td>
<td>Injuries</td>
<td>Staff</td>
<td>No</td>
<td>2</td>
<td>2 5 17</td>
<td>37</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Financial</td>
<td>Costs</td>
<td>Org</td>
<td>No</td>
<td>12</td>
<td></td>
<td>37</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Staff competence</td>
<td>Compliance</td>
<td>Staff</td>
<td>No</td>
<td>3</td>
<td></td>
<td>37</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Patient perception</td>
<td>Patient satisfaction</td>
<td>Patient</td>
<td>No</td>
<td>9</td>
<td></td>
<td>37</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Psychological well-being</td>
<td>Staff satisfaction</td>
<td>Staff</td>
<td>No</td>
<td>7</td>
<td></td>
<td>37</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>325 2008 Berthellete 2</td>
<td>Staff competence Org</td>
<td>Organisational support</td>
<td>Org</td>
<td>NR</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Training numbers</td>
<td>Efficiency of training</td>
<td>Org</td>
<td>NR</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>326 2008 Leduc 0</td>
<td>Training numbers</td>
<td>Training Outcomes</td>
<td>NR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>327 2007 Engkvist 1</td>
<td>Staff perception</td>
<td>Subjective nurses</td>
<td>Staff</td>
<td>NR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>328 1997 Engels 1</td>
<td>Staff competence</td>
<td>Errors</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>3</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>
APPENDIX B

Literature Analysis
Intervention Studies (101 studies)
<table>
<thead>
<tr>
<th>Intervention</th>
<th>Paper No</th>
<th>Date</th>
<th>Author</th>
<th>No. of outcomes</th>
<th>Outcomes measures</th>
<th>Beneficiary</th>
<th>Tested Y/N</th>
<th>Significant Y/N Used in conclusions Y/N</th>
<th>Intervention Strategy</th>
<th>QR score %</th>
<th>PR score</th>
<th>Robson score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1998</td>
<td>Peers</td>
<td>4</td>
<td>Lost time from injuries,</td>
<td>Org</td>
<td>No</td>
<td>5 10 13 15 20</td>
<td>37 3 3</td>
<td>37 3 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lost time from recurrence,</td>
<td>Org</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Modified work from new injuries</td>
<td>Staff</td>
<td>No</td>
<td>37 3 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Modified work due to recurrence</td>
<td>Staff</td>
<td>No</td>
<td>37 3 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>1996</td>
<td>Gray</td>
<td>2</td>
<td>Staff knowledge</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>5 43 2 2</td>
<td>43 2 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff satisfaction</td>
<td>Staff</td>
<td>No</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>1994</td>
<td>Holliday</td>
<td>5</td>
<td>Time to complete task</td>
<td>Task</td>
<td>Yes</td>
<td>NS</td>
<td>2 50 4.5 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Number of staff to complete</td>
<td>Task</td>
<td>Yes</td>
<td>Yes</td>
<td>50 4.5 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RPE staff</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>50 4.5 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Comfort score for staff</td>
<td>Staff</td>
<td>Yes</td>
<td>NS</td>
<td>50 4.5 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Comfort score for patient</td>
<td>Patient</td>
<td>Yes</td>
<td>NS</td>
<td>50 4.5 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>1994</td>
<td>Santoro</td>
<td>2</td>
<td>Reduction in staff injuries</td>
<td>Staff</td>
<td>No</td>
<td>17 35 2.5 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Financial</td>
<td>Staff</td>
<td>Yes</td>
<td>NS</td>
<td>35 2.5 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>9</td>
<td>1994</td>
<td>Harber</td>
<td>1</td>
<td>LBP</td>
<td>Staff</td>
<td>Yes</td>
<td>NS</td>
<td>5 73 4.5 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>11</td>
<td>1994</td>
<td>Addington</td>
<td>2</td>
<td>Total back injuries reported</td>
<td>Staff</td>
<td>No</td>
<td>5 22</td>
<td>37 3 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Musculoskeletal sickness absence</td>
<td>Org</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>13</td>
<td>1982</td>
<td>Tracsz</td>
<td>1</td>
<td>Sickness absence</td>
<td>Org</td>
<td>No</td>
<td>2 5</td>
<td>33 4 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>14</td>
<td>1999</td>
<td>Griffith</td>
<td>1</td>
<td>Interviews to identify perceptions of workload and risk factors</td>
<td>Staff</td>
<td>No</td>
<td>5 42 3 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>19</td>
<td>1998</td>
<td>Engels</td>
<td>3</td>
<td>OWAS posture scores</td>
<td>Staff</td>
<td>Yes</td>
<td>Yes</td>
<td>5 8 10 44 3 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Checklist for performance of staff</td>
<td>Staff</td>
<td>Yes</td>
<td>NS</td>
<td>44 3 2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

359
<table>
<thead>
<tr>
<th>Reference</th>
<th>Year</th>
<th>Methodology</th>
<th>Frequency</th>
<th>Data Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monaghan</td>
<td>1998</td>
<td>Borg Score</td>
<td>Staff</td>
<td>10 20 44 32 2</td>
</tr>
<tr>
<td>Alexander</td>
<td>1998</td>
<td>Questionnaire</td>
<td>Org</td>
<td>11 30 50 52 2</td>
</tr>
<tr>
<td>Paternoster</td>
<td>1999</td>
<td>Questionnaire</td>
<td>Staff</td>
<td>12 40 50 43 2</td>
</tr>
<tr>
<td>Daynard</td>
<td>2001</td>
<td>Questionnaire</td>
<td>Staff</td>
<td>13 42 50 43 2</td>
</tr>
<tr>
<td>Daws</td>
<td>1981</td>
<td>Questionnaire</td>
<td>Org</td>
<td>14 43 50 43 2</td>
</tr>
<tr>
<td>Fanello</td>
<td>1999</td>
<td>Questionnaire</td>
<td>Org</td>
<td>15 48 50 43 2</td>
</tr>
<tr>
<td>Torri</td>
<td>1999</td>
<td>Questionnaire</td>
<td>Staff</td>
<td>16 50 50 43 2</td>
</tr>
<tr>
<td>Collins</td>
<td>2001</td>
<td>Questionnaire</td>
<td>Org</td>
<td>17 52 50 43 2</td>
</tr>
<tr>
<td>Engkvist</td>
<td>2001</td>
<td>Questionnaire</td>
<td>Org</td>
<td>18 54 50 43 2</td>
</tr>
<tr>
<td>Year</td>
<td>Age</td>
<td>Date</td>
<td>Author</td>
<td>Method</td>
</tr>
<tr>
<td>------</td>
<td>-----</td>
<td>-------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>19</td>
<td>55</td>
<td>2000</td>
<td>Lynch</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>56</td>
<td>2000</td>
<td>Dietz</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>57</td>
<td>2001</td>
<td>Nussbaum</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>62</td>
<td>1989</td>
<td>Tuffnell</td>
<td>1</td>
</tr>
<tr>
<td>23</td>
<td>63</td>
<td>1987</td>
<td>Trupp</td>
<td>1</td>
</tr>
<tr>
<td>24</td>
<td>64</td>
<td>1996</td>
<td>Foster</td>
<td>1</td>
</tr>
<tr>
<td>25</td>
<td>66</td>
<td>1997</td>
<td>Best</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>69</td>
<td>1993</td>
<td>Feldstein</td>
<td>1</td>
</tr>
<tr>
<td>27</td>
<td>70</td>
<td>1998</td>
<td>Caska</td>
<td>1</td>
</tr>
<tr>
<td>28</td>
<td>78</td>
<td>1998</td>
<td>Billin</td>
<td>1</td>
</tr>
<tr>
<td>29</td>
<td>79</td>
<td>1997</td>
<td>Goodridge</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>81</td>
<td>1997</td>
<td>Lagerstrom</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>82</td>
<td>1999</td>
<td>Evanoff</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>83</td>
<td>1996</td>
<td>Dixon</td>
<td>1</td>
</tr>
<tr>
<td>Code</td>
<td>Year</td>
<td>Author</td>
<td>Staff</td>
<td>Patient</td>
</tr>
<tr>
<td>------</td>
<td>------</td>
<td>--------</td>
<td>-------</td>
<td>---------</td>
</tr>
<tr>
<td>33</td>
<td>1992</td>
<td>Garg</td>
<td>5</td>
<td>Staff</td>
</tr>
<tr>
<td>34</td>
<td>1997</td>
<td>Charney</td>
<td>2</td>
<td>Org</td>
</tr>
<tr>
<td>35</td>
<td>1996</td>
<td>Entwistle</td>
<td>2</td>
<td>Staff</td>
</tr>
<tr>
<td>36</td>
<td>1993</td>
<td>Oddy</td>
<td>1</td>
<td>Staff</td>
</tr>
<tr>
<td>37</td>
<td>1985</td>
<td>Rodgers</td>
<td>1</td>
<td>Staff</td>
</tr>
<tr>
<td>38</td>
<td>2000</td>
<td>Wood</td>
<td>4</td>
<td>Staff</td>
</tr>
<tr>
<td>39</td>
<td>1987</td>
<td>Johnston</td>
<td>2</td>
<td>Staff</td>
</tr>
<tr>
<td>40</td>
<td>1995</td>
<td>Hignett</td>
<td>1</td>
<td>Staff</td>
</tr>
<tr>
<td>41</td>
<td>1999</td>
<td>Knibbe</td>
<td>1</td>
<td>Staff</td>
</tr>
<tr>
<td>42</td>
<td>1993</td>
<td>Scopa</td>
<td>1</td>
<td>Staff</td>
</tr>
<tr>
<td>43</td>
<td>1983</td>
<td>Scholey</td>
<td>1</td>
<td>Staff</td>
</tr>
<tr>
<td>44</td>
<td>1989</td>
<td>St-Vincent</td>
<td>1</td>
<td>Staff</td>
</tr>
<tr>
<td>45</td>
<td>1983</td>
<td>Stubbs</td>
<td>3</td>
<td>Staff</td>
</tr>
<tr>
<td>ID</td>
<td>Year</td>
<td>Author</td>
<td>Methodology</td>
<td>Outcome</td>
</tr>
<tr>
<td>----</td>
<td>------</td>
<td>--------</td>
<td>-------------</td>
<td>---------</td>
</tr>
<tr>
<td>46</td>
<td>1998</td>
<td>Pohjonen</td>
<td>3</td>
<td>Posture owas</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Heart rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Work ability index</td>
</tr>
<tr>
<td>47</td>
<td>1991</td>
<td>Nyran</td>
<td>3</td>
<td>Injury Rates</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lost Time Claims</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Subjective views of managers</td>
</tr>
<tr>
<td>48</td>
<td>1992</td>
<td>Miller</td>
<td>1</td>
<td>Questionnaire. Subjective responses of carers</td>
</tr>
<tr>
<td>49</td>
<td>1997</td>
<td>Menckel</td>
<td>2</td>
<td>Accident reports and feedback</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Number reports completed</td>
</tr>
<tr>
<td>50</td>
<td>1987</td>
<td>Wachs</td>
<td>1</td>
<td>Compliance with standards</td>
</tr>
<tr>
<td>51</td>
<td>1987</td>
<td>Wood</td>
<td>2</td>
<td>Injuries</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lost time</td>
</tr>
<tr>
<td>52</td>
<td>1988</td>
<td>Videman</td>
<td>3</td>
<td>Skill assessment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Back Pain</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Subjective workload</td>
</tr>
<tr>
<td>53</td>
<td>1989</td>
<td>Ljungberg</td>
<td>5</td>
<td>HR / VO2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RPE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lift force</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lift exposure/freq</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Postures</td>
</tr>
<tr>
<td>54</td>
<td>185</td>
<td>Kilbom</td>
<td>2</td>
<td>Forces on staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Time taken</td>
</tr>
<tr>
<td>55</td>
<td>1996</td>
<td>Head</td>
<td>3</td>
<td>Injuries</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lost time</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Cost</td>
</tr>
<tr>
<td>56</td>
<td>1993</td>
<td>Hellsing</td>
<td>3</td>
<td>Training Outcomes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Back Pain</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Observed compliance with teaching</td>
</tr>
<tr>
<td>57</td>
<td>2002</td>
<td>Larthe</td>
<td>1</td>
<td>Days lost</td>
</tr>
<tr>
<td>58</td>
<td>2004</td>
<td>Engst</td>
<td>4</td>
<td>Resident agitation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MSD exposure score</td>
</tr>
<tr>
<td>Publication year</td>
<td>Author(s)</td>
<td>Designation</td>
<td>Number of cases</td>
<td>PH incidents</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------</td>
<td>-------------</td>
<td>----------------</td>
<td>--------------</td>
</tr>
<tr>
<td>59 198 1991</td>
<td>Charney</td>
<td>Staff</td>
<td>63</td>
<td>4</td>
</tr>
<tr>
<td>60 199 1993</td>
<td>Charney</td>
<td>Staff</td>
<td>61</td>
<td>4</td>
</tr>
<tr>
<td>61 207 1986</td>
<td>Alavosius</td>
<td>Staff</td>
<td>63</td>
<td>4</td>
</tr>
<tr>
<td>62 208 1998</td>
<td>Aird</td>
<td>Staff</td>
<td>63</td>
<td>4</td>
</tr>
<tr>
<td>63 210 2006</td>
<td>Nelson</td>
<td>Staff</td>
<td>63</td>
<td>4</td>
</tr>
<tr>
<td>64 211 2003</td>
<td>Smedley</td>
<td>Staff</td>
<td>63</td>
<td>4</td>
</tr>
<tr>
<td>65 212 2003</td>
<td>Evanoff</td>
<td>Staff</td>
<td>63</td>
<td>4</td>
</tr>
<tr>
<td>66 213 2005</td>
<td>Fujushiro</td>
<td>Staff</td>
<td>63</td>
<td>4</td>
</tr>
<tr>
<td>67 217 2003</td>
<td>Mughal</td>
<td>Org</td>
<td>63</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>68</td>
<td>219</td>
<td>1998</td>
<td>Nicholls</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>225</td>
<td>2003</td>
<td>Hefti</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>226</td>
<td>2002</td>
<td>Crumpton</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>228</td>
<td>2002</td>
<td>Ronald</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>232</td>
<td>2007</td>
<td>Morgan</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>Number</td>
<td>Authors</td>
<td>Method</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>--------</td>
<td>---------</td>
<td>--------</td>
<td>-------------</td>
</tr>
<tr>
<td>2001</td>
<td>254</td>
<td>Yassi</td>
<td>4</td>
<td>Number lifts observed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Subjective assessment of work effects</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pain/discomfort</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Injury rate</td>
</tr>
<tr>
<td>2002</td>
<td>255</td>
<td>Johnsson</td>
<td>3</td>
<td>Method assessment (Compliance)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RPE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Patient comfort</td>
</tr>
<tr>
<td>2006</td>
<td>256</td>
<td>Engkvist</td>
<td>5</td>
<td>Use of Equipment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RPE/fatigue</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pain Discomfort</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Injury rates</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Time lost</td>
</tr>
<tr>
<td>2006</td>
<td>259</td>
<td>Garg</td>
<td>1</td>
<td>Number injuries</td>
</tr>
<tr>
<td>2004</td>
<td>262</td>
<td>Keir</td>
<td>2</td>
<td>EMG</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Time product</td>
</tr>
<tr>
<td>2005</td>
<td>263</td>
<td>Chokhar</td>
<td>2</td>
<td>MS injury rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Costs</td>
</tr>
<tr>
<td>2005</td>
<td>265</td>
<td>Engst</td>
<td>3</td>
<td>Risk Perception</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Comfort</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Injury Costs</td>
</tr>
<tr>
<td>2004</td>
<td>267</td>
<td>Sigurdsson</td>
<td>1</td>
<td>Costs</td>
</tr>
<tr>
<td>2001</td>
<td>268</td>
<td>O'Reilly</td>
<td>3</td>
<td>No LBP injuries</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lost work days</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Costs</td>
</tr>
<tr>
<td>2002</td>
<td>280</td>
<td>Owen</td>
<td>5</td>
<td>Patient security</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Patient comfort</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Injury reports</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RPE shoulder</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RPE back</td>
</tr>
<tr>
<td>ID</td>
<td>Year</td>
<td>Author</td>
<td>Type</td>
<td>Measure</td>
</tr>
<tr>
<td>----</td>
<td>------</td>
<td>------------</td>
<td>-------------------------------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>90</td>
<td>2006</td>
<td>Joseph</td>
<td>Costs</td>
<td>Org</td>
</tr>
<tr>
<td>91</td>
<td>2003</td>
<td>Griffiths</td>
<td>MH Incidents</td>
<td>Org</td>
</tr>
<tr>
<td>92</td>
<td>2005</td>
<td>Murphy</td>
<td>Postures REBA</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>93</td>
<td>2006</td>
<td>Michaelis</td>
<td>Competence/ completed new methods</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>94</td>
<td>2005</td>
<td>Hartvigsen</td>
<td>Back pain</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>95</td>
<td>2004</td>
<td>Collins</td>
<td>Workers compensation claims</td>
<td>Org</td>
</tr>
<tr>
<td>96</td>
<td>2001</td>
<td>Best</td>
<td>Claims</td>
<td>Org</td>
</tr>
<tr>
<td>97</td>
<td>2004</td>
<td>Victoria Aus</td>
<td>Nurse claims</td>
<td>Org</td>
</tr>
<tr>
<td>98</td>
<td>2008</td>
<td>Bar-Niv</td>
<td>Biomech load</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>99</td>
<td>2008</td>
<td>Warming</td>
<td>Back pain injuries</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>2004</td>
<td>Guthrie</td>
<td>Injuries</td>
<td>Staff</td>
</tr>
<tr>
<td>101</td>
<td>1997</td>
<td>Engels</td>
<td>Errors</td>
<td>Staff</td>
</tr>
</tbody>
</table>
APPENDIX C

Documentation for Focus Groups

i. Ethics proposal permission statement
ii. Focus Group Scenario (Health)
iii. Focus Group Scenario (Social)
iv. Data Collection Sheets
v. Information Sheet for Facilitator
i) Ethics proposal permission statement.
**ii) Focus Group Scenario (Healthcare)**

You have recently been appointed as a patient handling advisor in a healthcare service provider. You have been requested to investigate the patient handling situation on Laurel Ward as they have reported a high rate of musculoskeletal problems in the staff, a poor performance on patient satisfaction scores and they recently performed poorly in a Health and Safety Management Audit.

**Description of the Unit**

The unit has 64 beds spread over two distinct care areas, Laurel A and Laurel B. All the care is delivered in single bed rooms with en-suite facilities. The unit delivers care to people with serious medical and neurological needs and has primarily older people in residence at the present time.

The handling needs of the patients are varied. They range from some that are dependent on the carers for all activities of care and movement, through a variety of conditions and levels, to some patients that require only monitoring or supervision and receive little physical assistance.

Laurel A has traditionally managed higher dependency patients than Laurel B

**Staffing**

There is a staff of 60 wte to fulfil the care delivery in this unit. Due to the nature of the workforce there are 90 individuals involved in the staff rota.

The staff breakdown is as follows:
- Unit manager (Runs the unit and reports to the director of Nursing.)
- 2 x Senior (Sisters that manage the operational aspects of the units.)
- 10 x Senior Nurses
- 31 x Nurses
- 40 x Health Care Assistants
- 4 x Domestic Assistants
- 1 x Part-time Physiotherapist
- 1 x Part-time Occupational Therapist

Many other people deliver services to the unit but these are the only ones employed directly within the unit.

**Patient Handling Information**

- The unit has a Patient Handling Risk Assessment system.
- They have a hoist in each area and a small selection of slings.
- They have some small aids that are kept in the linen cupboard.
- The unit manager showed you some training records that showed that some staff had received training from a reputable source.
- The unit has a series of policies and working procedures for manual handling, occupational health, incident and accident reporting and Health and Safety

You are to be given a free license to identify the key points of a new risk management system and the finances will be made available to support your proposals and help with implementing the system.

**The Scenario for you to Consider**

You have carried out a series of detailed onsite visits with analysis of all aspects of the patient handling system and have made a series of recommendations for changes including guidance on:

- Risk Assessment Processes and Documentation
- Policy changes
- The development of key personnel in the unit
- Provision of equipment
- Training
- The management of the health status of the staff with Occupational Health

You are to make a presentation to the Senior Management Team to gain the Boards support for your recommendations. They have specifically asked you to point out how you are going to justify the investment.

What items, qualities or objective measures will you measure before and after the implementation of your system, to prove the success of your recommendations?

Our research here at Loughborough University would suggest that you should consider:
- Benefits for the organisation as a whole
- Benefits for the staff delivering the care
- Benefits for the patient receiving the care
- Benefits to the quality/performance of the delivery of care

Are there any other outcome criteria that you might consider measuring to help prove your case?
iii) Focus Group Scenario (Long Term Care)

You have recently been appointed as a patient handling advisor in a long term care service provider. You have been requested to investigate the moving and handling of clients in the Laurels Care Home as they have reported a high rate of musculoskeletal problems in the staff, a poor performance on patient satisfaction scores and they recently performed poorly in a Health and Safety Management Audit.

Description of the Unit

The unit has 64 beds spread over two distinct care areas, Laurel A and Laurel B. All the care is delivered in single bed rooms with en-suite facilities. The unit delivers care to people with serious medical and neurological needs and has primarily older people in residence at the present time.

The handling needs of the clients are varied. They range from some that are dependent on the carers for all activities of care and movement, through a variety of conditions and levels, to some people that require only monitoring or supervision and receive little physical assistance.

Laurel A has traditionally managed higher dependency people than Laurel B

Staffing

There is a staff of 60 wte to fulfil the care delivery in this unit. Due to the nature of the workforce there are 90 individuals involved in the staff rota.

The staff breakdown is as follows:
  - Unit manager (Runs the unit and reports to the director of the care company.)
  - 2 x Deputy Managers (that manage the operational aspects of the units.)
  - 10 x Senior Carers (That act as senior staff and shift supervisors)
  - 31 x Carers (All have been through the NVQ3 programme)
  - 40 x Care Assistants
  - 4 x Domestic Assistants
  - 1 x Part-time Physiotherapist
  - 1 x Part-time Occupational Therapist

Many other people deliver services to the unit but these are the only ones employed directly within the unit.

Moving and Handling Information

- The unit has a Manual Handling Risk Assessment system.
- They have a hoist in each area and a small selection of slings.
- They have some small aids that are kept in the linen cupboard.
- The unit manager showed you some training records that showed that some staff had received training from a reputable source.
The unit has a series of policies and working procedures for manual handling, occupational health, incident and accident reporting and Health and Safety.

You are to be given a free license to identify the key points of a new risk management system and the finances will be made available to support your proposals and help with implementing the system.

The Scenario for you to Consider

You have carried out a series of detailed onsite visits with analysis of all aspects of the patient handling system and have made a series of recommendations for changes including guidance on:

- Risk Assessment Processes and Documentation
- Policy changes
- The development of key personnel in the unit
- Provision of equipment
- Training
- The management of the health status of the staff with Occupational Health

You are to make a presentation to the Senior Management Team to gain the Boards support for your recommendations. They have specifically asked you to point out how you are going to justify the investment.

What items, qualities or objective measures will you measure before and after the implementation of your system, to prove the success of your recommendations?

Our research here at Loughborough University would suggest that you should consider:

Benefits for the organisation as a whole
Benefits for the staff delivering the care
Benefits for the person receiving the care
Benefits to the quality/performance of the delivery of care

Are there any other outcome criteria that you might consider measuring to help prove your case?
iv) Focus Group data Collection Sheet (1)

<table>
<thead>
<tr>
<th>Benefits to:</th>
<th>Outcome, Quality, Quantity or Risk Identified</th>
<th>Give examples of the actual quantity you would observe or record</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.g. Staff benefit</td>
<td>Hazardous Postures</td>
<td>REBA, OWAS, Angle of inclination of trunk</td>
</tr>
<tr>
<td>The Organisation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Staff</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The person being cared for</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The performance of the care tasks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other issues</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
iv) Focus Group data Collection Sheet (2)

<table>
<thead>
<tr>
<th>Benefits to:</th>
<th>Outcome, Quality, Quantity or Risk Identified</th>
<th>Give examples of the actual quantity you would observe or record</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.g. Staff benefit</td>
<td>Hazardous Postures</td>
<td>REBA, OWAS, Angle of inclination of trunk</td>
</tr>
<tr>
<td>The Organisation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Staff</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The person being cared for.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The performance of the care tasks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other issues</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
iv) Focus Group Data Collection Sheet (3)

Using the items you have identified in column 2 of the previous two tables.

**Outcome, Quality, Quantity or Risk Identified**

Could you identify the 5 most important outcomes from the perspective of your role as a handling advisor. Please record them in the table in rank order where 1 is the most important in ranked order the 5 most important outcomes that you have discussed today.

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Outcome, Quality, Quantity or Risk Identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Most important</td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>
v) Instructions for Focus Group Facilitator

Circle or Square table
Microphone
Sheets
Tea Coffee Biscuits

1. Tea/Coffee on entrance
2. Introduction to Group
3. Consent Forms.
4. Personal History
5. Outline the scenario and allow to read BLACK PENS
6. Give data collection (1) Collect in and list top 5 points in each category plus any unusual or needing explanation. Give back to participants.
7. Develop discussion
8. The facilitator should try and ask the group the following series of questions:
   a. Why do you think that issue is important.
   b. How would you measure that in a real working situation
   c. Have you tried to use that measure in an intervention.
   d. Do you think senior management will appreciate that measure
9. Give data collection (2) Allow participants to add further information to second sheet as it comes up? Different coloured pens for sheet 2
10. 15 minutes for each set of criteria plus any others
11. Question sheet (3). Ask the group to rank the top 5 in ascending order. Collect the sheets and thank the group for their participation
12. Tea coffee, expenses etc
13. Feedback on the focus group and the different phases.
<table>
<thead>
<tr>
<th>Section</th>
<th>Outcome for discussion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX D

Field Notes for Pilot Studies
Observer - Anna Jones

Notes:

**Organisational Data**

Incidents and accidents - easier to collect

Sickness absence

- Organisations do not keep figures to access
- Datex system - 3-4 months before available in the system
- Sometimes incorrectly coded e.g. patient assault coded as patient handling
- A couple of the group had recorded sickness absence case by case
- Some monitor on an annual basis – but 6 months after any financial assessment
- Need a year before there is any reliable data.
- Systems change so long-term data comparisons difficult to find
- Can get incident hotspots – type of wards, type of sickness, can look at trends, can get costs, not NHS wide system
- Some people work through sickness so not in data – need measure
- Powerful measure but difficult to measure
- Financial impact

Replacement and retention – Staff turnover, recruitment, people leave for lots of reasons - reasons given not always true, data could not be used alone. People move to other jobs to avoid injuries e.g. older peoples wards tend to be very heavy workload.

Staff morale – linked with job satisfaction - too complex for measurement. Some organisations are constantly advertising jobs, why is this.

Turnover rate – measure over entire Trust – Is there a level of expectation?

Bed-blocking – discharging less patients because of manual handling problems. Discharge from one organisation to another can’t because of MH problems.

Poor practice and targets – compromise – adhere to poor practice to meet targets – people do not follow protocols.

Policies – not adhered to – is it monitoring that is needed – managers not aware of policies – compliance not good – people don’t follow policies, most accidents would be avoided if followed policy.

**Staff Data**

Staff don’t fill in incident reports – too busy – incident reporting not effective. Sometimes over-reporting e.g. 24 reports in 24 hours, for 3 incidents.
Name on a piece of paper, people don’t report as they don’t want ownership – link with culture.

Staff satisfaction linked with staff turnover – if staff valued then greater productivity, not always negative.

Staff treatment service – referred to physio home or work – measure number of people that use the service and how much longer staff could wait for service if not staff access.

Return to work – improve transition back to work, very positive feedback

Measure staff fatigue – compare old methods with new methods

Measures of physical work
- Task error measure
- Manual handling stress different day-to-day
- Workload measure Glenfield Hospital successful system
- To configure staff systems
- Complex system may not always be filled in
- Sometimes not give true picture of whole thing
- Meaningless to staff
- Could measure without such labour intensive methods

Training – Scrapped ? – doesn’t work – management? – Changing practice on ward, is it any different to training outside ward, people get called away from the sessions.

Observation of staff PH – What are they doing – What equipment are they using – Minimising risk – problem solving.

**Patient Data**

Complaints – info about patient being moved – injuries to patient – M&H staff issue not a patient issue - don’t get much info about patient injuries, incidents or complaints – only get incidents when everything has gone wrong. H&S depts. Are different to patient safety depts..

Patient independence – can be about equipment – profiling beds – enough therapeutic input – promoting independence – patient specific – don’t automatically help patient.

PH issues related to patient care
- Delay
- Learn – then get faster
- Having equipment available
- People have to be invested in
- Not just staff problem – important for patient care
- Good manual handling determines good patient care
- Core skills but in present system is bolted on to other skills
‘Box in factory more care than patient in hospital’

Other Data

Staff time on wards - Have a good system and save staff

Electric beds implies good system for saving staff time and promoting independence.

Field Notes for UKLT Pilot Study

Observer – Sue Hignett

Notes:

Process

Consent e-mailed in advance
Introduction - round table – each station numbered
Tapes switched on (2 for backup)
Scenario to read individually
Context described, located in literature review.
Pro-forma handed out after 20 mins.
MF reviewed key points to give prompts for discussion (10 mins)
2nd sheet, discuss issues raised and if you hear a good idea, then add to the blue sheet

Measures used in practice

1. Tests as part of training – problem solve – activity – assessment of performance – evaluation of training, reaction to the session
2. Follow up training in workplace with observations
3. M&H audit of establishment – relies on 3rd hand (managers) opinion
5. Quantity versus quality
6. Income generation for organisation

Organisational benefits

About losses to organisation, aims to decrease MSD

Sickness absence

- V difficult to get figures
- Confidential, anonymous
- Bradford Score (PCT)
- Cause of sickness absence not always recorded
- Lack of detail in report
- Lack of knowledge by data inputters. What is MSD? What is other?
- Records periods or episodes

Financial

- Legal costs
- Recruitment – retention – retrain
- Sickness absence
- Claims
- Losses spread between many budgets therefore hidden

HSE prosecutions
- Outcome – lack of prosecution / HSE action
- Use as levelr for intervention, not as an actual outcome

Staff Morale
- Don’t know how to measure, but sure it’s a benefit
- Communication improves at all levels, expectations of self and others, archival document analysis e.g. minutes of meetings
- Better patient care
- Decease stress – related problems
- Decrease in-house bickering
- Improve recruitment
- Psychological measure – feel appreciated

Thoughts (Observer)
For non-english focus groups suggest have pilot in English for facilitator to understand process
2 stage focus group to get 1st proforma translated before discussion and so you can prepare / discuss prompts with facilitator before group. Supply lunch to allow for translation.

Staff benefits
- Measures usually sickness absence, for organisational measures.
- Fatigue
- Avoidance of ill-health, not prevention of illness/injury/ health promotion
- Occupational health data
- Ability to comply with training – peer pressure – observations – audit handling plans (not staff benefit)
- Staff confidence link with morale. Supports safe system of work
- Other measures – skills, postures, use of equipment, decision making, interactions with patients, competency
- Improve job satisfaction – secondary measure – based on primary measure, e.g. sickness absence, turnover etc

Patient benefits

Injuries to patient – lots of unreported e.g. bruising, laceration from hoists, falls. Falls is a patient handling issue (PCT) – factors that indicate patient is at risk and needs proactive systems e.g. movement indicator in bed – some PH methods encourage falling.

Improved independence – How to measure in the scenario? – Dependency levels – small goals /steps target setting / achievement in programme – decreased recovery time with rehabilitation and mobility

Quality of care –
• How to measure – but would be a very good outcome.
• Covers lots of areas, hygiene, food, interactions etc expectations
• Target of inspections
• Survey visitors and relatives
• Essence of care programme

Consistency
• Sticking to care plan
• Across different care givers
• Continual re-assessment
• Staff morale, working together

Performance measures

Decrease in incidents
Efficiency – quicker or better – decrease effort and not time link with staff or organisational outcome
Equipment availability, appropriate equipment, continuity of effort through use of equipment/machine, Need to measure how skills are maintained
Safety culture – custom and practice
APPENDIX E

Focus Group Data

i. UKAH – UK Acute Health
ii. UKLT – UK Long Term Health
iii. EXPA – Expert Athens
iv. EXPB – Expert Boston
v. Fi – Finland Group
vi. Po – Portugal Group
vii. It – Italy Group
<table>
<thead>
<tr>
<th>Page</th>
<th>Content</th>
<th>Outcome Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Organisational Organisations do not keep records</td>
<td>MSD absence</td>
</tr>
<tr>
<td>3</td>
<td>Identification of hot spots MSD sickness absence needs to include MSD and still working. Not an absolute measure.</td>
<td>MSD absence</td>
</tr>
<tr>
<td>4</td>
<td>Need record of those leaving due to MSD Redeployment</td>
<td>Recruitment / retention</td>
</tr>
<tr>
<td>5</td>
<td>Feel like the organisation does not care Feelings filter through organisation Measure of job satisfaction</td>
<td>Morale</td>
</tr>
<tr>
<td>6</td>
<td>Bed blocking Discharge management from outlook of patient and organisation Appropriate PH discharge planning</td>
<td>Bed blocking</td>
</tr>
<tr>
<td>8</td>
<td>Compliance as an organisational issue as it leads to complaints and claims</td>
<td>Compliance</td>
</tr>
<tr>
<td>9</td>
<td>Compliance with policies procedures Organisational culture versus individual behaviour CNST</td>
<td>Policy procedures Compliance Audit</td>
</tr>
<tr>
<td>12</td>
<td>Staff Incident and accident records, good record of problems</td>
<td>Accident reports</td>
</tr>
<tr>
<td>14</td>
<td>Management culture/ working culture and reporting or not reporting</td>
<td>Culture</td>
</tr>
<tr>
<td>15</td>
<td>Job satisfaction and staff feeling valued</td>
<td>Psychosocial factors</td>
</tr>
<tr>
<td>16</td>
<td>Treatment services for injured staff, Numbers of referrals</td>
<td>MSD levels</td>
</tr>
<tr>
<td>18</td>
<td>Return to Work assessments Fatigue at work and subjective assessments of workload</td>
<td>MSD levels Psychosocial factors</td>
</tr>
<tr>
<td>19</td>
<td>Workload even across staff Workload relative to patient dependencies Staffing or understaffing based on workload</td>
<td>Workload</td>
</tr>
<tr>
<td>Page</td>
<td>Content</td>
<td>Outcome Theme</td>
</tr>
<tr>
<td>------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>20</td>
<td>Perception of workload, forces and posture</td>
<td>Perception of workload</td>
</tr>
<tr>
<td>21</td>
<td>‘Organisational socialisation so training by itself is never going to work’&lt;br&gt;On site supervision&lt;br&gt;Enforcement of best practice</td>
<td>Best practice</td>
</tr>
<tr>
<td>25</td>
<td>Measure compliance by organisation</td>
<td>Compliance</td>
</tr>
<tr>
<td>26</td>
<td>Competent and compliant for best practice</td>
<td>Compliance</td>
</tr>
<tr>
<td>26</td>
<td>Patient</td>
<td>Patient injuries</td>
</tr>
<tr>
<td>26</td>
<td>Complaints from patients</td>
<td>Patient injuries</td>
</tr>
<tr>
<td>27</td>
<td>Fracture to a patient’s arm from PH</td>
<td>Patient injuries</td>
</tr>
<tr>
<td>29</td>
<td>‘Patient handling is a staff issue not a patient issue’</td>
<td>Organisational perception</td>
</tr>
<tr>
<td>29</td>
<td>Tissue viability measures&lt;br&gt;Infection control outcomes&lt;br&gt;Patient independence</td>
<td></td>
</tr>
<tr>
<td>35-40</td>
<td>Task performance&lt;br&gt;Management styles in organisations and the level of support given to PH. PH a core skill but largely ignored.</td>
<td>Management responsibility</td>
</tr>
<tr>
<td>41</td>
<td>Time taken to complete PH tasks.</td>
<td>Time taken</td>
</tr>
<tr>
<td>42</td>
<td>Supervision as route to compliance via observation</td>
<td>Compliance</td>
</tr>
</tbody>
</table>

**UKLT – UK Long Term Health**

<table>
<thead>
<tr>
<th>Page</th>
<th>Content</th>
<th>Outcome Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Organisations&lt;br&gt;Completion of risk assessments&lt;br&gt;Competence through observations&lt;br&gt;Consideration that organisations don’t want outcomes&lt;br&gt;Difficult to get sickness outcomes from organisations&lt;br&gt;Need causes of MSD</td>
<td>Risk assessment Competence Culture MSD records MSD causes MSD records</td>
</tr>
<tr>
<td>3</td>
<td>Bradford Factor as measure of sickness absence</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Set trigger point and interview all staff higher than trigger</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>MSD costs, staff salaries and replacement costs, claims costs</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>MSD costs for recruitment and re-training Costs difficult to use as embedded deep in the organisation</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Prosecution by enforcing authority HSE</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Complaints</td>
<td></td>
</tr>
<tr>
<td>10-11</td>
<td>Morale and positive communication/feedback</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Psychological factors recorded by staff survey How do staff feel about the workplace</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Feeling valued, positive psychological environment</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Staff Fatigue</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Subjective assessment of effort (Borg) and workload</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>MSD health status recorded by occupational health services In UK occupational health seen as treatment service, not management of problems, not improving health</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Some PHA record levels of MS health as part of training sessions. Are they fit to do the course and are they fit to work</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Links between occupational health data and MS health</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Reluctant to attend occupational health as links with hiring and firing</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Numbers of referrals to physio treatment services</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Compliance by observation Compliance measured against handling plan Could complete handling plan audit to include RA, PHRA and PHP</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Staff confidence with PH methods</td>
<td></td>
</tr>
</tbody>
</table>

MSD costs, MSD costs, MSD costs, MSD costs, Complaints, Morale, Psychological factors, Psychosocial factors, Well being, Fatigue, MSD, Workload/Psychosocial, MSD level, MSD, MSD, Occ health, MSD numbers, Compliance, Audit, Morale
<table>
<thead>
<tr>
<th>Page</th>
<th>Text</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>Staff observations on wards and experimenter effect</td>
<td>Compliance</td>
</tr>
<tr>
<td>23</td>
<td>Audit and observation in home care situations</td>
<td>Compliance</td>
</tr>
<tr>
<td>23-24</td>
<td>How do organisations deal with non-compliance</td>
<td>Compliance</td>
</tr>
<tr>
<td>25</td>
<td>Competency by observation, measured with effective movement</td>
<td>Competence</td>
</tr>
<tr>
<td>26</td>
<td>Difficult to record and score staff attitude</td>
<td>Attitude</td>
</tr>
<tr>
<td>27</td>
<td>Patient Damage to patient, bruising, lacerations, falls</td>
<td>Patient injuries</td>
</tr>
<tr>
<td>28</td>
<td>Patient condition measured by independence and mobilisation</td>
<td>Patient condition</td>
</tr>
<tr>
<td>29</td>
<td>Recording dependency levels</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Relationship between level of dependency and demands on staff time and numbers and the ability to keep patient in certain areas for care</td>
<td>Workload/staffing levels</td>
</tr>
<tr>
<td>33</td>
<td>Dignity in care tasks</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>Essence of care programme and quality of care measures</td>
<td>Quality of care</td>
</tr>
<tr>
<td>38</td>
<td>Consistency of movement leads to confidence from patient</td>
<td>Patient perception</td>
</tr>
<tr>
<td>39</td>
<td>Compliance and communication leads to consistency of PH</td>
<td>Consistency</td>
</tr>
<tr>
<td>40</td>
<td>Reduction in numbers of accidents</td>
<td>Incident numbers</td>
</tr>
<tr>
<td>41</td>
<td>Efficiency is a difficult quality to measure</td>
<td>Workload</td>
</tr>
<tr>
<td>42</td>
<td>Decreased effort</td>
<td>Workload</td>
</tr>
<tr>
<td>43</td>
<td>Remove or change methods of completing tasks, number of lifts, number of transfers</td>
<td>Workload</td>
</tr>
<tr>
<td>44-49</td>
<td>‘Custom and practice’. How does it effect culture and behaviour</td>
<td>Safety culture</td>
</tr>
<tr>
<td>50</td>
<td>Safety culture and links with morale</td>
<td>Morale</td>
</tr>
<tr>
<td>Page</td>
<td>Content</td>
<td>Outcome Theme</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>---------------</td>
</tr>
<tr>
<td>1</td>
<td>Organisation</td>
<td>MSD absence</td>
</tr>
<tr>
<td></td>
<td>MSD sickness absence as main outcome potentially difficult</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Lack of specific MSD data in many organisations</td>
<td>MSD</td>
</tr>
<tr>
<td></td>
<td>Some countries get good data but then don’t use it</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2-4 years to see effects of interventions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Due to difficulties MSD not high on list of outcomes</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Ability of MSD numbers to work as a measure. Need to consider functionality or workability</td>
<td>MSD</td>
</tr>
<tr>
<td></td>
<td>Productivity as a measure</td>
<td>Productivity</td>
</tr>
<tr>
<td>4</td>
<td>Use health surveillance to measure MS health status</td>
<td>MS Health</td>
</tr>
<tr>
<td></td>
<td>Include capacity versus incapacity</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>MSD absence is very important as links with costs and cost benefit</td>
<td>MS costs</td>
</tr>
<tr>
<td></td>
<td>Could consider work available per staff member</td>
<td>MS measure</td>
</tr>
<tr>
<td>6</td>
<td>Government audits</td>
<td>Audit</td>
</tr>
<tr>
<td>7</td>
<td>Maintain staff health, job satisfaction and improve morale</td>
<td>Psychosocial factors</td>
</tr>
<tr>
<td></td>
<td>Large under-reporting of accidents</td>
<td>Accidents</td>
</tr>
<tr>
<td>8</td>
<td>Quality of care. Includes accidents, claims, PH problems</td>
<td>Quality of care</td>
</tr>
<tr>
<td></td>
<td>Cost benefit analysis is important measure but difficult to calculate</td>
<td>Costs</td>
</tr>
<tr>
<td>9</td>
<td>Quality of care calculated by incontinence accidents, pressure sore score, immobilising patients, discharge of patients, patient satisfaction (Holland)</td>
<td>Quality of care</td>
</tr>
<tr>
<td>10</td>
<td>Is quality of care different for each different ward area or type of care</td>
<td>Quality of care</td>
</tr>
<tr>
<td>11</td>
<td>Quality of care targets have an effect on workload</td>
<td>Quality of care</td>
</tr>
<tr>
<td>11</td>
<td>Patient perception of PH should be bad mechanical equals bad manual</td>
<td>Patient perception</td>
</tr>
</tbody>
</table>
12 (Finland) Manual methods used to improve patient movement
Increases number of patients treated actively

13 Pressure sores

Staff

14 Measures for outstanding risk exposure
(Holland) Risk review system government sponsored

Nordic questionnaires

17 It is a big problem to compare our studies because we all have different scoring systems

17 MSD numbers and insurance company data

18 Skills and knowledge in staff

18-19 Competence and compliance as positive feedback. Needs to be local (Ergo-coach). Will be linked with safety culture as improves compliance and equipment use.

20 Task performance
Compliance measured buy changes in practice due to the intervention

Staff numbers important for quality of many measures

EXPB – Expert Boston

<table>
<thead>
<tr>
<th>Page</th>
<th>Content</th>
<th>Outcome Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Organisation (Bel/Ger/Port) Not able to measure MSD sickness absence due to legislation / government</td>
<td>MSD not recorded</td>
</tr>
<tr>
<td>1-2</td>
<td>Recording of MSD and causes (US and Australia)</td>
<td>MSD levels</td>
</tr>
<tr>
<td>2</td>
<td>Organisational safety culture</td>
<td>Safety culture</td>
</tr>
<tr>
<td></td>
<td>Measure MSD by Nordic questionnaire (Ger)</td>
<td>MSD levels</td>
</tr>
<tr>
<td></td>
<td>Belgium 1/12 sick pay from hospital before government pays</td>
<td>Costs of MSD</td>
</tr>
</tbody>
</table>
| 3 | Cost benefit analysis most important cost vs intervention  
Claims and compensation  
Costs to government linked to drive to create prevention programme  
E.g. Aus, Observed the other drivers of change to get an intervention to work and calculate values of intervention.  
Retirement and recruitment costs, training costs for new staff | Costs of MSD |
| 4 | Young workers leave early (Port) | MSD costs |
| 4 | Assessing healthcare quality | Audit and quality |
| 5 | Government based audits and risk reduction systems | |
| 6 | Staff  
Accidents, incidents, number of MSD, comfort or discomfort can all measure staff health with range of tools: questionnaires, surveys, VAS  
Used accident analysis in training or staff  
‘Subjective assessment of work gives good value of risks’  
How the people felt about the work. | MS health or injuries |
| 9 | Psychological factors and assessment  
Worker assessment of workload and hazards  
Measures of force, postures etc as research to develop best practice | Psychological risks  
Staff perception  
Physical measures |
| 10 | Concepts of worker satisfaction and complaints  
Government legislation for worker health | Psychosocial measures  
Legislation |
| 11 | Physical measures very powerful, decrease time, effort, forces. | Physical measures |
| 11-12 | Productivity for staff numbers | Productivity |
| 12 | Patient  
Quality of care | Quality of care |
<p>| 12 | Patient damaged by skin tears, skin care, falls, clothing changes, linen changes from incontinence accidents | Patient condition |
| 13 | Link between falls and PH | Patient injuries |</p>
<table>
<thead>
<tr>
<th>Page</th>
<th>Content</th>
<th>Outcome Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Organisation</strong>&lt;br&gt;MSD injury affects the ward process and has a relationship with recruitment&lt;br&gt;Low levels of MSD can affect whether people want to work in an area or not&lt;br&gt;Good risk management and risk controls decrease workload and the staff notice the difference&lt;br&gt;Finland in a bad position with recruitment so use interventions as a positive image&lt;br&gt;Senior Nurse was involved in PH assessment, control and communication.&lt;br&gt;Co-operation and improved communication</td>
<td>MSD&lt;br&gt;MSD&lt;br&gt;Risk and workload&lt;br&gt;Positive image&lt;br&gt;Commitment&lt;br&gt;Communication</td>
</tr>
<tr>
<td>2</td>
<td>‘With discussion and involvement staff consider being cared for, able to participate in training and join in with ergonomics project’&lt;br&gt;Well being at work indicates need to draw attention to work load&lt;br&gt;Various processes surrounding management</td>
<td>Well-being&lt;br&gt;Unable to separate psych and physical&lt;br&gt;Organisational</td>
</tr>
<tr>
<td>3-4</td>
<td>Management commitment to systems and employee commitment is vital. Put courses on and staff do not attend.</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Very low ratio of staff to patients, problems with recruitment and retention</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Costs; personnel, staff expenses, overtime, occ health and treatment costs. Annual reports from personnel include absence costs and expense details</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Risk assessment discussion; Different processes and levels included in risk assessment Regular follow up Economics review</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Difficult to collect accurate data Have used MAPO in FIOH intervention study</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Staff Accident reporting and recording</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Increase in accident reporting after intervention. Role of occ health and safety</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Length of periods of sickness absence Assessment system rates worker as 1-10 less than 5 unable to work Relationship between MSD absence and aging Difficult to measure changes in absence over short term probably over 2 years</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Detailed description of how analysis of workload is compared to ‘fitness and health’</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Physical exposure measures; video-recording and analysis, heart rate, posture, physical fitness, personal experiences, Patient transfer skills. Experience in group of using assessment tool (SOPMAS).</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 15 | Provision of equipment across hospital wards and departments  
Need to record use of equipment  
Use does not imply safe behaviour record mis-use, non-use, lack of space for appropriate use |
| 16 | Patient  
Safety and comfort  
Improve functional capacity of patient  
E.g. Physio staff in neuro-ward will not accept poor levels of handling as it affects the patient rehab  
Could patient handling affect the length of stay? |
| 17 | Quality of care. E.g. one hospital developing manual for quality of care in elderly care. PH is part of the manual.  
Patient functionality or capacity indicators based on diagnosed illness  
Patient injuries, patient accidents and falls |
| 19 | Task performance  
Quality of movement for transfer, smoothness of transfer  
Consistency assists patient to be involved in transfer  
Use of PHRA and PHP by the bed  
Documented and on daily report but nobody follows them  
One example is mobility card that travels with patient |
| 20 | Suggestion to use observations of techniques to plan training, make specific for each area  
Management support for improving practice; meetings, head nurses, training, skills development group, positive management attitude  
Note: group freely discussed interventions and needed to be guided to consider outcomes and measures. Some OM and OMT discussions lead by Facilitator and FIOH studies. |
<table>
<thead>
<tr>
<th>Page</th>
<th>Content</th>
<th>Outcome Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Example of audit for management system King’s Fund system is used</td>
<td>Audit</td>
</tr>
<tr>
<td>2</td>
<td>Involvement of senior management in PH issues</td>
<td>Organisational culture</td>
</tr>
<tr>
<td></td>
<td>Various systems in place for managing risk; dynamic elements, local risk manager, quality cabinet (working group), risk register, ISO18001, IQ4397</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>MSD is not a priority in system even though last year MSD was very high</td>
<td>Priority</td>
</tr>
<tr>
<td>3</td>
<td>Health surveillance</td>
<td>MS health</td>
</tr>
<tr>
<td>4</td>
<td>Have measured some reductions in sick leave</td>
<td>MSD absence</td>
</tr>
<tr>
<td>4</td>
<td>Accident causation, loads, patients, equipment Recording does not split accidents and incidents Time delay of MSD effect after the incident hinders recording</td>
<td>Accident recording</td>
</tr>
<tr>
<td>5</td>
<td>One system has a classification system to link with worker compensation Important to classify cause and type of MS accident</td>
<td>Accident recording</td>
</tr>
<tr>
<td>Staff</td>
<td></td>
<td>Accident recording</td>
</tr>
<tr>
<td>6</td>
<td>Observation of PH behaviour</td>
<td>Competence</td>
</tr>
<tr>
<td></td>
<td>Description of safe behaviour</td>
<td>Behaviour</td>
</tr>
<tr>
<td>7</td>
<td>Insurance companies have a critical role in MSD Discussion relating to why safe behaviour is not seen in healthcare. Require policy, procedure, strategy, official visits, audit</td>
<td>Insurance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Safety culture</td>
</tr>
<tr>
<td>8</td>
<td>Problems with safety culture from nurse education Overload of work and lack of equipment provision Recording and registering MSD</td>
<td>Safety culture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Safety culture</td>
</tr>
<tr>
<td>9</td>
<td>Difficult to prove the cause of MSD</td>
<td>MSD numbers</td>
</tr>
<tr>
<td>10</td>
<td>Grade patients on levels of dependence Ratio of staff to level of dependence</td>
<td>Workload</td>
</tr>
</tbody>
</table>
11 Create staff numbers based on musculoskeletal demand?

12 Hospitals may require government guidance via Risk Management Commission

12 Observed differences between physiotherapists and nurses

13 Leadership and management role is important in safety culture

Patient / Staff

13 Organisation is much more likely to consider patient satisfaction rather than staff satisfaction; complaints, discharge questionnaires, patient falls. Is this all part of quality of care

14 Government system for falls evaluation

Quality of care measures; falls, pressure ulcers, comfort and quality

15 Is quality of care considered to be a negative reporting system

17 Culture of responsibility and hierarchy, managers, supervisors and staff

18 Measuring physical capability

19 Discussion of poor equipment provision esp. beds

20-22 Return to work procedures for adapting work plus processes for replacement staff

<table>
<thead>
<tr>
<th>Page</th>
<th>Content</th>
<th>Outcome Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td><strong>Organisation</strong>&lt;br&gt;Considered the decrease spend on new equipment as a positive outcome</td>
<td><strong>Spend on equipment</strong></td>
</tr>
</tbody>
</table>

**It – Italy Group**

<table>
<thead>
<tr>
<th>Page</th>
<th>Content</th>
<th>Outcome Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td><strong>Organisation</strong>&lt;br&gt;Note: Due to the prevalence of medics in the group many of the participants will have undertaken MSD epidemiology studies, intervention studies and published.</td>
<td><strong>Spend on equipment</strong></td>
</tr>
<tr>
<td>Costs included:</td>
<td>Cost benefits</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------</td>
<td>--------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Health – MSD-Lost work time</td>
<td>Insurance for MSD</td>
<td></td>
</tr>
<tr>
<td>Requests for transfers</td>
<td>Incident reporting</td>
<td></td>
</tr>
<tr>
<td>Requests for part-time work</td>
<td>Investigating accidents</td>
<td></td>
</tr>
<tr>
<td>Measure against expenses, training, equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Insurance covers the first episode of back pain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>or injury only</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investigating accidents and incidents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitoring MSD by causation and identifying MSD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>from PH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Government involvement in health planning,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>resources and process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Require long term investment to get good results</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organisation of hospitals use, occ health, risk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>managers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Require finance to set up interventions, ward trials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>with post intervention observations. Usually very</td>
<td></td>
<td></td>
</tr>
<tr>
<td>long process 10 years, with long term network of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>people</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Staff</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAPO scores to show risk exposure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Injury rates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assessment of training via observation. Consider</td>
<td></td>
<td></td>
</tr>
<tr>
<td>that improved handling = improved quality of care</td>
<td></td>
<td></td>
</tr>
<tr>
<td>and reduced MSD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 (Refocused the group on outcomes and outcome</td>
<td></td>
<td></td>
</tr>
<tr>
<td>measures)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Injury rates via health surveillance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-11 Complications of getting illness and injury</td>
<td></td>
<td></td>
</tr>
<tr>
<td>causes in Italian system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Discussion relating to data collection in MAPO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provision of suitable numbers and type of equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 Discussion of PHRA and PHP indicating sound</td>
<td></td>
<td></td>
</tr>
<tr>
<td>solutions and equipment provision</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 Skills for problem solving</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Skills with aids</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of times the hoists are used</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------</td>
<td>---</td>
</tr>
<tr>
<td>15</td>
<td>Patient</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Comfort, privacy, number of lifts</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Falls, damage to patient, injuries from inadequate handling</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Patient satisfaction, refusal to accept equipment / consent. ? as a direct result of PH</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Record of complaints and injuries to patients</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Assessment of method and equipment use (staff)</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Safety culture as a measure of organisational behaviour</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Compliance with documented PHRA and PHP</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Patient perception</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Patient injuries</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Patient perception</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Complaints</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Competence</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Culture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compliance</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX F

Focus Group Results (Voting)
<table>
<thead>
<tr>
<th>Theme</th>
<th>Definitions/ measures</th>
<th>Exp</th>
<th>It</th>
<th>Po</th>
<th>Fi</th>
<th>UK</th>
<th>EU</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accidents</td>
<td>Accident figures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Incident numbers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Near miss</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Absence or staff health</td>
<td>Sickness absence</td>
<td>16</td>
<td>12</td>
<td>4</td>
<td>17</td>
<td>16</td>
<td>49</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>• Severity</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Length of Illness</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Replacement staff costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>• Recruitment costs</td>
<td>2</td>
<td>1</td>
<td></td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Turnover</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Loss of experience</td>
<td>2</td>
<td>1</td>
<td></td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Review occupational health interventions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Return to work</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Job displacement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Alternative work</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Moving or leaving</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Decreasing hours</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increased productivity</td>
<td>2</td>
<td>1</td>
<td></td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Decrease sickness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Decreased turnover</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improved well being</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Financial costs</td>
<td>Financial costs</td>
<td>10</td>
<td>5</td>
<td>6</td>
<td></td>
<td>11</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Decreased litigation</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff ratios for care delivery</td>
<td>Improved environment to deliver care</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Planning services on patient dependencies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Staff numbers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Ratio of staff to patients</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Team work</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Less time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Less staff</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Task analysis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Amount of work</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Length of shift</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Shift times</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Training skills and compliance</td>
<td>Compliance</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td>5</td>
<td></td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Number of people trained</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td>5</td>
<td></td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>• Lack of training</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td>5</td>
<td></td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>• Quality of training</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td>5</td>
<td></td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Improved co-operation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Behaviour</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Expert local group(on site)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Risk management tools</td>
<td>Number of risk assessments</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Risk assessment improved</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>3</td>
<td></td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Risk management system</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Policy</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>• Roles and responsibility</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>3</td>
<td></td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Participation in risk assessment</td>
<td>7</td>
<td>20</td>
<td>1</td>
<td></td>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Evaluating risks</td>
<td>7</td>
<td>20</td>
<td>1</td>
<td></td>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provision of equipment</td>
<td>Optimisation of equipment</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td>5</td>
<td></td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>• Number of aids MAPO</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td>5</td>
<td></td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>• Work environment</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td>5</td>
<td></td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>• Workspace</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td>5</td>
<td></td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>• Furniture</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td>5</td>
<td></td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Provide and maintain appropriate equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Satisfaction and image</td>
<td>Patient complaints</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Staff morale</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Staff satisfaction</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Patient satisfaction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Image in public</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Others</td>
<td>Communication</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Delayed discharge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Commitment (Management)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Humanisation of care</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14</td>
</tr>
</tbody>
</table>

Total Scores For Organisational Outcomes
<table>
<thead>
<tr>
<th>Theme</th>
<th>Definitions/ measures</th>
<th>Exp</th>
<th>It</th>
<th>Po</th>
<th>Fi</th>
<th>UK</th>
<th>EU</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incidents and accidents</td>
<td>Number of Incidents</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of accidents</td>
<td>3</td>
<td>12</td>
<td>5</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>MSD measures</td>
<td>Injuries and Sick leave</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discomfort</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Treatment services for staff</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Referral to Occupational Physician</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fatigue</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Occupational health data</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stress Index</td>
<td>11</td>
<td>10</td>
<td>8</td>
<td>4</td>
<td>26</td>
<td>48</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>Amount of diseases and injuries</td>
<td>10</td>
<td>8</td>
<td>4</td>
<td>26</td>
<td>48</td>
<td>59</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Low back injuries</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Changes in health</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Personal effect</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Workability Index</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increased physical capacity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Strength</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Endurance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Work capacity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Job rotation</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Staff not fit for jobs</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Substitution of staff to replace illness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposure measures</td>
<td>Decreased Effort Movement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Workload</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physical measures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Heart rate,</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• EMG</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Postures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Force</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Loads</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discomfort</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Risk index from patient handling (MAPO)</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compliance competence</td>
<td>Training figures(current)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>and use of equipment</td>
<td>Knowledge and skill level - competence</td>
<td>4</td>
<td>7</td>
<td>11</td>
<td>4</td>
<td>8</td>
<td>30</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>Handling culture</td>
<td>5</td>
<td>11</td>
<td>4</td>
<td>8</td>
<td>30</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compliance</td>
<td>5</td>
<td>7</td>
<td>6</td>
<td>6</td>
<td>19</td>
<td>8</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>• Are people using safe methods</td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>6</td>
<td>8</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Less risky postures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Using equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Use of aids</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Supervision of handling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improved communication</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improved confidence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Supervision</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Comply with training</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interviews with staff involved</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychological well-being</td>
<td>Staff feel valued</td>
<td>4</td>
<td>1</td>
<td>6</td>
<td>2</td>
<td>21</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Job satisfaction- Morale</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Psychological stress</td>
<td>3</td>
<td>1</td>
<td>6</td>
<td>2</td>
<td>21</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>• Well-being</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>Policy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Provision of equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Lack of equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Availability of physiotherapy for staff</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Skills mix</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Risk assessment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Communicate risks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Training</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<p>| Totals Scores For Staff Outcomes |     |     |    |    |    |    |     |</p>
<table>
<thead>
<tr>
<th>Theme</th>
<th>Definitions/ measures</th>
<th>Exp</th>
<th>It</th>
<th>Po</th>
<th>Fi</th>
<th>UK</th>
<th>EU</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patient injuries</strong></td>
<td>Injuries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Shear/friction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pressure care</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Injuries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bruising</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Laceration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Falls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Infection control</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Safety</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of manual lifts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reported to unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Patient accidents</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Patient perception</strong></td>
<td>Comfort</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Decreased pain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Less fear, more trust</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Privacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Patient satisfaction</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Decreased complaints</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Patient accepts/refuses hoist</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Patient condition</strong></td>
<td>Patient condition</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Length of stay</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Discharge</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Re-admission</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Recovery time</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Improved independence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increased control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Health plan (Care-plan)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Level of participation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Functional diagnosis tools</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Quality of care</strong></td>
<td>Standardisation of care</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Consistency</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Confidence in the care</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Quality of care</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Audit/feedback</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Attitude of staff</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Meeting patient objectives</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Care and actions delivered on time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clinical assessment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Legal numbers of staff</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Decreased quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Totals Scores for Patient Outcomes
<table>
<thead>
<tr>
<th>Theme</th>
<th>Definitions/ measures</th>
<th>Exp</th>
<th>It</th>
<th>Po</th>
<th>Fi</th>
<th>UK</th>
<th>EU</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Compliance with safe methods</strong></td>
<td>Appropriate use of equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Competence/skills Efficiency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Time taken</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Movement quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compliance with methods</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Agreed method for assisting the patient</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quality of movement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Smooth</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Co-ordinated</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use of equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Small aids</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Hoists and slings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work postures adopted</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Training</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Equipment available</strong></td>
<td>Equipment available</td>
<td>9</td>
<td>5</td>
<td>5</td>
<td>21</td>
<td>40</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ergonomie of rooms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bathroom/WC appropriate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Space /furniture</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Architectural obstacles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Provision of aids</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of staff</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Documentation</strong></td>
<td>Documentation/Plans</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Good management system</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Support in workplace</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Care-plans</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td>Use of ergonomics tools</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Safety</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Speed/ Decrease time taken</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Better relationship between staff and patients</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Totals Scores for Task Outcomes**

<table>
<thead>
<tr>
<th>Theme</th>
<th>Definitions/ measures</th>
<th>Exp</th>
<th>It</th>
<th>Po</th>
<th>Fi</th>
<th>UK</th>
<th>EU</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Staff time on wards</strong></td>
<td>Equipment increases time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Supervisory levels</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Environments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Custom and practice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Professional skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work motivation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Safety culture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Risk awareness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Psychosocial factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Movement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Avoidance of hazards</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Accessible equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Storage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fitness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Relaxation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Lifestyle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>6</td>
<td>13</td>
<td>26</td>
<td>26</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Totals Scores For Other Recorded Findings**
APPENDIX G

Development of the IET
Selection of tools for 12 sections
### Section 1 Safety Culture

<table>
<thead>
<tr>
<th>Paper No</th>
<th>Date</th>
<th>Author</th>
<th>Outcome</th>
<th>Outcomes measures</th>
<th>Beneficiary</th>
<th>Ranked outcome list 1-12</th>
<th>Intervention Strategy</th>
<th>QR score %</th>
<th>PR score</th>
<th>Robson score</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
<td>1990</td>
<td>Connolly</td>
<td>Staff use of equipment</td>
<td>Questionnaire survey on attitudes and use of eqpt</td>
<td>Staff</td>
<td>1</td>
<td>?</td>
<td>?</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>241</td>
<td>2006</td>
<td>Knibbe</td>
<td>Staff competence Org</td>
<td>Prevention strategies /Compliance Policy mirror</td>
<td>Org</td>
<td>1</td>
<td>74</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>210</td>
<td>2006</td>
<td>Nelson</td>
<td>Staff perception</td>
<td>Perceived support of organisation (Culture)</td>
<td>Staff</td>
<td>1</td>
<td>70</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>230</td>
<td>2007</td>
<td>Hignett</td>
<td>Staff competence Org</td>
<td>Safety Culture PHOQS</td>
<td>Org</td>
<td>1</td>
<td>67</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>155</td>
<td>1997</td>
<td>McGuire</td>
<td>Staff perception</td>
<td>Manager knowledge and attitude</td>
<td>Staff</td>
<td>1</td>
<td>64</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>153</td>
<td>1997</td>
<td>Menckel</td>
<td>Incident/Accident</td>
<td>Number reports completed</td>
<td>Org</td>
<td>1</td>
<td>63</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>1998</td>
<td>Alexander</td>
<td>Staff perception</td>
<td>Semi structured interviews of managers</td>
<td>Staff</td>
<td>1</td>
<td>50</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>116</td>
<td>2000</td>
<td>Wood</td>
<td>Risk assessment</td>
<td>Accuracy of risk assessments/mobility</td>
<td>Staff</td>
<td>1</td>
<td>46</td>
<td>3.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>79</td>
<td>1997</td>
<td>Goodridge</td>
<td>Audit performance</td>
<td>Compliance with audit</td>
<td>Staff</td>
<td>1</td>
<td>44</td>
<td>3.5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>117</td>
<td>1987</td>
<td>Johnston</td>
<td>Risk assessment</td>
<td>Risk assessment process and info</td>
<td>Staff</td>
<td>1</td>
<td>43</td>
<td>3.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>229</td>
<td></td>
<td>Weinel</td>
<td>Staff injuries</td>
<td>Injuries</td>
<td>Staff</td>
<td>1</td>
<td>37</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>2000</td>
<td>Dietz</td>
<td>Staff perception</td>
<td>Staff perceptions - semi struct interview</td>
<td>Staff</td>
<td>1</td>
<td>5</td>
<td>33</td>
<td>3.5</td>
<td>2</td>
</tr>
<tr>
<td>56</td>
<td>2000</td>
<td>Dietz</td>
<td>Risk assessment</td>
<td>Documentation review</td>
<td>Org</td>
<td>1</td>
<td>33</td>
<td>3.5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>1998</td>
<td>Monaghan</td>
<td>Staff perception</td>
<td>Staff attitude</td>
<td>Staff</td>
<td>1</td>
<td>31</td>
<td>2.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>1981</td>
<td>Daws</td>
<td>Staff perception</td>
<td>Questionnaire on attitudes on eqpt, training etc</td>
<td>Staff</td>
<td>1</td>
<td>31</td>
<td>2.5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>224</td>
<td>2006</td>
<td>Pinder</td>
<td>Staff perception</td>
<td>Perceptions of Management systems (safety culture?)</td>
<td>Org</td>
<td>1</td>
<td>NR</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Section 2. MS Health Measures

<table>
<thead>
<tr>
<th>Paper No</th>
<th>Date</th>
<th>Author</th>
<th>Outcome</th>
<th>Outcomes measures</th>
<th>Beneficiary</th>
<th>Ranked outcome list</th>
<th>Intervention Strategy</th>
<th>QR score %</th>
<th>PR score</th>
<th>Robson score</th>
</tr>
</thead>
<tbody>
<tr>
<td>103</td>
<td>1988</td>
<td>Skarplik</td>
<td>Staff injuries</td>
<td>Back Injury and pain</td>
<td>Staff 2</td>
<td>2 5 10</td>
<td>po</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>263</td>
<td>2005</td>
<td>Chokhar</td>
<td>Staff injuries</td>
<td>MS injury rate</td>
<td>Staff 2</td>
<td>2 5 18</td>
<td>91</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>311</td>
<td>2008</td>
<td>Warming</td>
<td>Staff injuries</td>
<td>Back pain injuries</td>
<td>Staff 2</td>
<td>2 5 18</td>
<td>89</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>311</td>
<td>2008</td>
<td>Warming</td>
<td>Staff injuries</td>
<td>Severity of back pain</td>
<td>Staff 2</td>
<td>2 5 18</td>
<td>89</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>260</td>
<td>2004</td>
<td>Cohen</td>
<td>Staff injuries</td>
<td>Injury rate</td>
<td>Staff 2</td>
<td></td>
<td>82</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>276</td>
<td>2007</td>
<td>Craib</td>
<td>Staff injuries</td>
<td>Injury rates</td>
<td>Staff 2</td>
<td>1 2 5</td>
<td>81</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>1999</td>
<td>Fanello</td>
<td>Staff injuries</td>
<td>Semi structured questionnaire for LBP</td>
<td>Staff 2</td>
<td>5</td>
<td>80</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>175</td>
<td>1996</td>
<td>Knibbe</td>
<td>Staff injuries</td>
<td>Back Pain Questionnaire</td>
<td>Staff 2</td>
<td></td>
<td>77</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>81</td>
<td>1997</td>
<td>Lagerstrom</td>
<td>Staff injuries</td>
<td>Prevalence of MSD</td>
<td>Staff 2</td>
<td></td>
<td>76</td>
<td>3.5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>196</td>
<td>1975</td>
<td>Dehlin</td>
<td>Staff injuries</td>
<td>Back Pain.</td>
<td>Staff 2</td>
<td></td>
<td>75</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>201</td>
<td>1998</td>
<td>Botha</td>
<td>Staff injuries</td>
<td>Back Pain questionnaire</td>
<td>Staff 2</td>
<td></td>
<td>75</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>241</td>
<td>2006</td>
<td>Knibbe</td>
<td>Staff injuries</td>
<td>LBP</td>
<td>Staff 2</td>
<td></td>
<td>74</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>1994</td>
<td>Harber</td>
<td>Staff injuries</td>
<td>LBP</td>
<td>Staff 2</td>
<td>5</td>
<td>73</td>
<td>4.5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>256</td>
<td>2006</td>
<td>Engkvist</td>
<td>Staff injuries</td>
<td>Pain Discomfort</td>
<td>Staff 2</td>
<td></td>
<td>73</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>256</td>
<td>2006</td>
<td>Engkvist</td>
<td>Staff injuries</td>
<td>Injury rates</td>
<td>Staff 2</td>
<td></td>
<td>73</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>152</td>
<td>1999</td>
<td>Marras</td>
<td>Staff injuries</td>
<td>Low back disorder model</td>
<td>Staff 2</td>
<td></td>
<td>72</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>210</td>
<td>2006</td>
<td>Nelson</td>
<td>Staff injuries</td>
<td>Injury rate</td>
<td>Staff 2</td>
<td>1 2 10</td>
<td>70</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>211</td>
<td>2003</td>
<td>Smedley</td>
<td>Staff injuries</td>
<td>Low back pain</td>
<td>Staff 2</td>
<td>2 7 10</td>
<td>70</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>1997</td>
<td>Best</td>
<td>Staff injuries</td>
<td>Back pain Questionnaire</td>
<td>Staff 2</td>
<td>5</td>
<td>70</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>1998</td>
<td>Caska</td>
<td>Staff injuries</td>
<td>Injury rates</td>
<td>Staff 2</td>
<td>17</td>
<td>69</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>223</td>
<td>2003</td>
<td>Trinkoff</td>
<td>Staff injuries</td>
<td>MSD prevalence (Nordic)</td>
<td>Yes 2</td>
<td>5 2 17</td>
<td>68</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>73</td>
<td>1994</td>
<td>Garg</td>
<td>Staff injuries</td>
<td>Injury Rate</td>
<td>Staff 2</td>
<td></td>
<td>67</td>
<td>4.5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>251</td>
<td>2003</td>
<td>Passfield</td>
<td>Staff injuries</td>
<td>Injury Rate</td>
<td>Staff 2</td>
<td>10</td>
<td>67</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>254</td>
<td>2001</td>
<td>Yassi</td>
<td>Staff injuries</td>
<td>Pain/discomfort</td>
<td>Staff 2</td>
<td></td>
<td>67</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>1997</td>
<td>Furber</td>
<td>Staff injuries</td>
<td>Injury rates</td>
<td>Staff 2</td>
<td></td>
<td>66</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>174</td>
<td>1996</td>
<td>Lusted</td>
<td>Staff injuries</td>
<td>Injuries</td>
<td>Staff 2</td>
<td></td>
<td>66</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>174</td>
<td>1996</td>
<td>Lusted</td>
<td>Staff injuries</td>
<td>Nordic Pain Questionnaire</td>
<td>Staff 2</td>
<td>1 2 4</td>
<td>65</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>149</td>
<td>1991</td>
<td>Nyran</td>
<td>Staff injuries</td>
<td>Injury Rates</td>
<td>Staff 2</td>
<td>5</td>
<td>65</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>134</td>
<td>1993</td>
<td>Scopa</td>
<td>Staff injuries</td>
<td>Compliance with WRBME</td>
<td>Staff 2</td>
<td>5</td>
<td>65</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>86</td>
<td>1992</td>
<td>Garg</td>
<td>Staff injuries</td>
<td>Injury rates</td>
<td>Staff 2</td>
<td></td>
<td>63</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>213</td>
<td>2005</td>
<td>Fujushiro</td>
<td>Staff injuries</td>
<td>MSD Rate</td>
<td>Staff 2</td>
<td>1 2</td>
<td>63</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>228</td>
<td>2002</td>
<td>Ronald</td>
<td>Staff injuries</td>
<td>MSD rates per 10 000 hours</td>
<td>Staff 2</td>
<td>2</td>
<td>63</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>199</td>
<td>1993</td>
<td>Charney</td>
<td>Staff injuries</td>
<td>Injury Rates for Staff</td>
<td>Staff 2</td>
<td>17</td>
<td>61</td>
<td>3.5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>294</td>
<td>2005</td>
<td>Hartvigsen</td>
<td>Staff injuries</td>
<td>Back pain</td>
<td>Staff 2</td>
<td>5</td>
<td>59</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>1993</td>
<td>Helsing</td>
<td>Staff injuries</td>
<td>Back Pain</td>
<td>Staff 2</td>
<td></td>
<td>58</td>
<td>3.5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>132</td>
<td>2000</td>
<td>Knapik</td>
<td>Staff injuries</td>
<td>Pain or discomfort</td>
<td>Staff 2</td>
<td></td>
<td>57</td>
<td>4.5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>68</td>
<td>1995</td>
<td>Garb</td>
<td>Staff injuries</td>
<td>Injury rates</td>
<td>Staff 2</td>
<td></td>
<td>56</td>
<td>3.5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>163</td>
<td>1987</td>
<td>Wood</td>
<td>Staff injuries</td>
<td>Injuries</td>
<td>Staff 2</td>
<td>5 8</td>
<td>56</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>226</td>
<td>2002</td>
<td>Crumpton</td>
<td>Staff injuries</td>
<td>back pain MSD (SF36)</td>
<td>Staff 2</td>
<td>3</td>
<td>56</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>2000</td>
<td>Bewpton</td>
<td>Staff injuries</td>
<td>Injury data for participants</td>
<td>Staff 2</td>
<td></td>
<td>55</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>Author</td>
<td>Category</td>
<td>Title</td>
<td>Study Type</td>
<td>Sample Size</td>
<td>Units</td>
<td>Staff Injuries</td>
<td>Injury Rates</td>
<td>Back Pain</td>
<td>Red. LBP</td>
</tr>
<tr>
<td>------</td>
<td>--------</td>
<td>----------</td>
<td>-------</td>
<td>------------</td>
<td>-------------</td>
<td>-------</td>
<td>----------------</td>
<td>-------------</td>
<td>-----------</td>
<td>---------</td>
</tr>
<tr>
<td>1994</td>
<td>Addington</td>
<td>Staff injuries</td>
<td>Total back injuries reported</td>
<td></td>
<td></td>
<td></td>
<td>Staff</td>
<td>2</td>
<td>5</td>
<td>22</td>
</tr>
<tr>
<td>1991</td>
<td>Charney</td>
<td>Staff injuries</td>
<td>Injury Rates for Staff</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>Santoro</td>
<td>Staff injuries</td>
<td>Reduction in staff injuries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>Victorina</td>
<td>Organizational</td>
<td>Nurse claims</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td>Daws</td>
<td>Staff injuries</td>
<td>Injury Data</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>Garg</td>
<td>Staff absence</td>
<td>Number injuries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>Head</td>
<td>Staff injuries</td>
<td>Injuries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>Evanoff</td>
<td>Staff injuries</td>
<td>Injury rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>Murphy</td>
<td>Staff injuries</td>
<td>MSD symptoms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>Bar-Niv</td>
<td>Staff injuries</td>
<td>MSD (nordic)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td>Raistrick</td>
<td>Staff injuries</td>
<td>% back injuries per population</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>Backers</td>
<td>Staff injuries</td>
<td>Injury rates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>Flint</td>
<td>Incident/Accident</td>
<td>Incidence rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>Yeung</td>
<td>Staff injuries</td>
<td>MSD Outcome</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>Pinder</td>
<td>Staff injuries</td>
<td>MSD profiles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

414
<table>
<thead>
<tr>
<th>Paper No</th>
<th>Date</th>
<th>Author</th>
<th>Outcome</th>
<th>Outcomes measures</th>
<th>Beneficiary</th>
<th>Ranked outcome 1-12</th>
<th>Intervention Strategy</th>
<th>QR score %</th>
<th>PR score</th>
<th>Robson score</th>
</tr>
</thead>
<tbody>
<tr>
<td>162</td>
<td>1987</td>
<td>Wachs</td>
<td>Staff competence</td>
<td>Compliance with standards</td>
<td>Staff</td>
<td>3</td>
<td>5</td>
<td>86</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>42</td>
<td>2001</td>
<td>Daynard</td>
<td>Staff competence</td>
<td>Compliance with methods taught</td>
<td>Staff</td>
<td>3</td>
<td>1 2 5 9 10 13 15 23 24</td>
<td>73</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>256</td>
<td>2006</td>
<td>Engkvist</td>
<td>Staff use of equipment</td>
<td>Use of Equipment</td>
<td>Staff</td>
<td>3</td>
<td>70 5 2</td>
<td>70</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>210</td>
<td>2006</td>
<td>Nelson</td>
<td>Staff competence</td>
<td>Self reported unsafe acts (compliance)</td>
<td>Staff</td>
<td>3</td>
<td>70 5 2</td>
<td>70</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>211</td>
<td>2003</td>
<td>Smedley</td>
<td>Staff competence</td>
<td>Number of unassisted transfers (compliance)</td>
<td>Staff</td>
<td>3</td>
<td>70 5 2</td>
<td>70</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>255</td>
<td>2002</td>
<td>Johnsson</td>
<td>Staff competence</td>
<td>Method assessment (Compliance)</td>
<td>Staff</td>
<td>3 5 18 68 4 3</td>
<td>68 4 3</td>
<td>68</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>69</td>
<td>1993</td>
<td>Feldstein</td>
<td>Staff injuries</td>
<td>Back pain</td>
<td>Staff</td>
<td>3 5 18 68 4 3</td>
<td>68 4 3</td>
<td>68</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>222</td>
<td>2003</td>
<td>Swain</td>
<td>Staff competence</td>
<td>Compliance Questionnaire</td>
<td>No</td>
<td>3</td>
<td>5 68 5 2</td>
<td>68</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>223</td>
<td>2004</td>
<td>Swain</td>
<td>Staff knowledge skill</td>
<td>Knowledge</td>
<td>No</td>
<td>3</td>
<td>68 5 2</td>
<td>68</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>230</td>
<td>2007</td>
<td>Hignett</td>
<td>Staff knowledge skill</td>
<td>Skill understanding/Verbal protocol</td>
<td>Staff</td>
<td>3</td>
<td>67 5 2</td>
<td>67</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>277</td>
<td>2007</td>
<td>Reid</td>
<td>Staff perception</td>
<td>Survey response</td>
<td>Staff</td>
<td>3 5 18 68 4 3</td>
<td>68 4 3</td>
<td>68</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>32</td>
<td>1993</td>
<td>Switzer</td>
<td>Staff competence</td>
<td>Observations of practice</td>
<td>Staff</td>
<td>3</td>
<td>62 4.5 2</td>
<td>62</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>328</td>
<td>1997</td>
<td>Engels</td>
<td>Staff competence</td>
<td>Errors</td>
<td>Staff</td>
<td>3</td>
<td>5 59 3 2</td>
<td>59</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>180</td>
<td>1993</td>
<td>Hellsing</td>
<td>Staff competence</td>
<td>Observed compliance with teaching</td>
<td>Staff</td>
<td>3</td>
<td>58 3.5 2</td>
<td>58</td>
<td>3.5</td>
<td>2</td>
</tr>
<tr>
<td>64</td>
<td>1996</td>
<td>Foster</td>
<td>PH techniques</td>
<td>Self reported changes in practice</td>
<td>Staff</td>
<td>3 5 57 2.5 2</td>
<td>57 2.5 2</td>
<td>57</td>
<td>2.5</td>
<td>2</td>
</tr>
<tr>
<td>209</td>
<td>1988</td>
<td>Owen</td>
<td>Staff use of equipment</td>
<td>Use of equipment for tasks</td>
<td>Staff</td>
<td>3</td>
<td>57 4 2</td>
<td>57</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>68</td>
<td>1995</td>
<td>Garb</td>
<td>Staff knowledge skill</td>
<td>Awareness and knowledge of the staff</td>
<td>Staff</td>
<td>3</td>
<td>56 3.5 2</td>
<td>56</td>
<td>3.5</td>
<td>2</td>
</tr>
<tr>
<td>63</td>
<td>1987</td>
<td>Troup</td>
<td>Staff competence</td>
<td>Task performance by the staff</td>
<td>Staff</td>
<td>3 5 54 3 2</td>
<td>54 3 2</td>
<td>54</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>96</td>
<td>1995</td>
<td>Luntley</td>
<td>Staff knowledge skill</td>
<td>Staff Knowledge of transfers</td>
<td>Staff</td>
<td>3</td>
<td>52 4 2</td>
<td>52</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>247</td>
<td>2006</td>
<td>Hye-Krudson</td>
<td>Staff competence</td>
<td>Compliance/ skill (Warming tool)</td>
<td>Staff</td>
<td>3 5 52 2 2</td>
<td>52 2 2</td>
<td>52</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>55</td>
<td>2000</td>
<td>Lynch</td>
<td>PH techniques</td>
<td>Changes in Work practice/method</td>
<td>Task</td>
<td>3 5 50 3.5 2</td>
<td>50 3.5 2</td>
<td>50</td>
<td>3.5</td>
<td>2</td>
</tr>
<tr>
<td>55</td>
<td>2000</td>
<td>Lynch</td>
<td>Staff knowledge skill</td>
<td>Self reported knowledge</td>
<td>Staff</td>
<td>3 5 50 3.5 2</td>
<td>50 3.5 2</td>
<td>50</td>
<td>3.5</td>
<td>2</td>
</tr>
<tr>
<td>55</td>
<td>2000</td>
<td>Lynch</td>
<td>Staff competence</td>
<td>Observed practice</td>
<td>Staff</td>
<td>3 5 50 3.5 2</td>
<td>50 3.5 2</td>
<td>50</td>
<td>3.5</td>
<td>2</td>
</tr>
<tr>
<td>94</td>
<td>1993</td>
<td>Oddy</td>
<td>PH techniques</td>
<td>Elimination of drag lift</td>
<td>Staff</td>
<td>3 6 10 13 50 3.5 2</td>
<td>50 3.5 2</td>
<td>50</td>
<td>3.5</td>
<td>2</td>
</tr>
<tr>
<td>293</td>
<td>2006</td>
<td>Michaelis</td>
<td>Staff competence</td>
<td>Competence/ completed new methods</td>
<td>Staff</td>
<td>3 5 7 8 23 48 3 2</td>
<td>48 3 2</td>
<td>48</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>ID</td>
<td>Year</td>
<td>Author</td>
<td>Staff competence</td>
<td>Checklist</td>
<td>Staff</td>
<td>5</td>
<td>46</td>
<td>3.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>------</td>
<td>-----------</td>
<td>------------------</td>
<td>-----------</td>
<td>--------</td>
<td>---</td>
<td>----</td>
<td>-----</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>116</td>
<td>2000</td>
<td>Wood</td>
<td>Staff knowledge skill</td>
<td>Staff skill</td>
<td>Staff</td>
<td>3</td>
<td>5</td>
<td>46</td>
<td>3.5</td>
<td>2</td>
</tr>
<tr>
<td>19</td>
<td>1998</td>
<td>Engels</td>
<td>Staff competence</td>
<td>Checklist for performance of staff</td>
<td>Staff</td>
<td>3</td>
<td>44</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>165</td>
<td>1988</td>
<td>Videman</td>
<td>Staff knowledge skill</td>
<td>Skill assessment</td>
<td>Staff</td>
<td>3</td>
<td>5</td>
<td>41</td>
<td>3.5</td>
<td>2</td>
</tr>
<tr>
<td>219</td>
<td>1998</td>
<td>Nicholls</td>
<td>Staff competence</td>
<td>Observation checklist</td>
<td>Staff</td>
<td>3</td>
<td>5</td>
<td>41</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>207</td>
<td>1986</td>
<td>Alavosius</td>
<td>Staff competence</td>
<td>% tasks performed safely</td>
<td>Staff</td>
<td>3</td>
<td>5</td>
<td>8</td>
<td>39</td>
<td>3</td>
</tr>
<tr>
<td>100</td>
<td>1985</td>
<td>Rodgers</td>
<td>Staff competence</td>
<td>Hazardous lifts observed</td>
<td>Staff</td>
<td>3</td>
<td>38</td>
<td>3.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>214</td>
<td>2006</td>
<td>Tamminen Peter</td>
<td>Staff competence</td>
<td>Staff competence SOPMAS</td>
<td>Staff</td>
<td>3</td>
<td>5</td>
<td>7</td>
<td>37</td>
<td>2</td>
</tr>
<tr>
<td>324</td>
<td>2004</td>
<td>Guthrie</td>
<td>Staff competence</td>
<td>Compliance</td>
<td>Staff</td>
<td>3</td>
<td>37</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>2000</td>
<td>Dietz</td>
<td>Staff competence</td>
<td>Staff performance</td>
<td>Staff</td>
<td>3</td>
<td>33</td>
<td>3.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>1998</td>
<td>Monaghan</td>
<td>Staff knowledge skill</td>
<td>Staff knowledge of policy and equipment</td>
<td>Staff</td>
<td>3</td>
<td>31</td>
<td>2.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>1999</td>
<td>Paternoster</td>
<td>Staff competence</td>
<td>Level of correctness of completed task</td>
<td>Staff</td>
<td>3</td>
<td>5</td>
<td>18</td>
<td>31</td>
<td>2</td>
</tr>
<tr>
<td>62</td>
<td>1989</td>
<td>Tuffnell</td>
<td>PH techniques</td>
<td>Changes in method completed</td>
<td>Staff</td>
<td>3</td>
<td>5</td>
<td>10</td>
<td>29.5</td>
<td>1.5</td>
</tr>
<tr>
<td>304</td>
<td>2003</td>
<td>Connelly</td>
<td>Staff competence</td>
<td>Competence assessment (observ)</td>
<td>Staff</td>
<td>3</td>
<td>27</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>309</td>
<td>2008</td>
<td>Alexander</td>
<td>Training numbers</td>
<td>Training numbers in hoist skills</td>
<td>Org</td>
<td>3</td>
<td>5</td>
<td>27</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>309</td>
<td>2008</td>
<td>Alexander</td>
<td>Staff knowledge skill</td>
<td>Number incorrect answers</td>
<td>Staff</td>
<td>3</td>
<td>5</td>
<td>27</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>218</td>
<td>2006</td>
<td>Proteau</td>
<td>Staff competence</td>
<td>Ratio lift to slide (Compliance)</td>
<td>Staff</td>
<td>3</td>
<td>15</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Paper No</td>
<td>Date</td>
<td>Author</td>
<td>Outcome</td>
<td>Outcomes measures</td>
<td>Beneficiary</td>
<td>Ranked outcome list 1-2</td>
<td>Intervention Strategy</td>
<td>QL score %</td>
<td>PR score</td>
<td>Robson score</td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
<td>----------</td>
<td>--------------</td>
<td>------------------------------------------</td>
<td>-------------</td>
<td>-------------------------</td>
<td>-----------------------</td>
<td>------------</td>
<td>----------</td>
<td>--------------</td>
</tr>
<tr>
<td>263</td>
<td>2005</td>
<td>Chhokar</td>
<td>Staff absence</td>
<td>Time lost per injury rate</td>
<td>Org 4</td>
<td>82 5 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>260</td>
<td>2004</td>
<td>Cohen</td>
<td>Staff absence</td>
<td>Lost days per FTE</td>
<td>Org 4</td>
<td>82 5 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>277</td>
<td>2008</td>
<td>Craib</td>
<td>Staff absence</td>
<td>Lost time injuries</td>
<td>Org 4</td>
<td>81 5 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>1999</td>
<td>Fanello</td>
<td>Staff absence</td>
<td>Semi structured questionnaire for Absence</td>
<td>Org 4</td>
<td>80 5 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>241</td>
<td>2006</td>
<td>Knibbe</td>
<td>Staff absence</td>
<td>Sick leave</td>
<td>Org 4</td>
<td>74 5 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>256</td>
<td>2006</td>
<td>Engkvist</td>
<td>Staff absence</td>
<td>Time lost</td>
<td>Org 4</td>
<td>73 3 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>87</td>
<td>1997</td>
<td>Charney</td>
<td>Staff absence</td>
<td>Lost time from injuries</td>
<td>Org 4</td>
<td>17 72 4 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>1997</td>
<td>Best</td>
<td>Staff absence</td>
<td>Sickness absence</td>
<td>Org 4</td>
<td>70 3 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>210</td>
<td>2006</td>
<td>Nelson</td>
<td>Staff absence</td>
<td>Lost days and modified days</td>
<td>Org 4</td>
<td>70 5 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>243</td>
<td>2006</td>
<td>Knibbe</td>
<td>Staff absence</td>
<td>Absence</td>
<td>Org 4</td>
<td>5 23 68 4 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>149</td>
<td>1991</td>
<td>Nyran</td>
<td>Financial</td>
<td>Lost Time Claims</td>
<td>Org 4</td>
<td>65 4 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>213</td>
<td>2005</td>
<td>Fujishiro</td>
<td>Staff absence</td>
<td>Days lost</td>
<td>Org 4</td>
<td>63 4 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>265</td>
<td>2005</td>
<td>Engst</td>
<td>Financial</td>
<td>Injury Costs</td>
<td>Org 4</td>
<td>59 4 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>296</td>
<td>2004</td>
<td>Collins</td>
<td>Staff absence</td>
<td>Lost work days</td>
<td>Org 4</td>
<td>59 5 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>82</td>
<td>1999</td>
<td>Evanoff</td>
<td>Staff absence</td>
<td>Lost time injuries</td>
<td>Org 4</td>
<td>58 5 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>140</td>
<td>1998</td>
<td>Pohjonen</td>
<td>Staff injuries</td>
<td>Work ability index</td>
<td>Staff 4</td>
<td>58 4 5 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>163</td>
<td>1987</td>
<td>Wood</td>
<td>Staff absence</td>
<td>Lost time</td>
<td>Org 4</td>
<td>56 4 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>248</td>
<td>2006</td>
<td>Charnay</td>
<td>Staff absence</td>
<td>Lost time</td>
<td>Org 4</td>
<td>52 4 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>1999</td>
<td>Torri</td>
<td>Staff injuries</td>
<td>Health surveillance</td>
<td>Staff 4</td>
<td>50 4 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>1999</td>
<td>Torri</td>
<td>Staff absence</td>
<td>Sickness absence</td>
<td>Org 4</td>
<td>50 4 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>217</td>
<td>2006</td>
<td>Mughal</td>
<td>Staff injuries</td>
<td>Injury data No claims</td>
<td>Org 4</td>
<td>48 4 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>217</td>
<td>2006</td>
<td>Mughal</td>
<td>Staff absence</td>
<td>Days lost</td>
<td>Org 4</td>
<td>48 4 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>293</td>
<td>2006</td>
<td>Michaels</td>
<td>Staff absence</td>
<td>Sickness absence</td>
<td>Org 4</td>
<td>48 3 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>299</td>
<td>2001</td>
<td>Best</td>
<td>Financial</td>
<td>Claims</td>
<td>Org 4</td>
<td>1 2 5 8 10 15</td>
<td></td>
<td>46 2 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>226</td>
<td>2004</td>
<td>Hefti</td>
<td>Staff absence</td>
<td>Days lost</td>
<td>Org 4</td>
<td>44 4 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>268</td>
<td>2002</td>
<td>O'Reilly</td>
<td>Staff absence</td>
<td>Lost work days</td>
<td>Org 4</td>
<td>44 3 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1996</td>
<td>Gray</td>
<td>Staff knowledge</td>
<td>skill</td>
<td>Staff 4</td>
<td>5 43 2 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1996</td>
<td>Gray</td>
<td>Psychological</td>
<td>Well-being</td>
<td>Staff satisfaction</td>
<td>Staff 4</td>
<td>43 2 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>245</td>
<td>2001</td>
<td>Pearce</td>
<td>Staff absence</td>
<td>Lost time</td>
<td>Org 4</td>
<td>12 20 42 4 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1998</td>
<td>Peers</td>
<td>Staff absence</td>
<td>Lost time from injuries,</td>
<td>Org 4</td>
<td>5 10 13 15 20</td>
<td></td>
<td>37 3 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1998</td>
<td>Peers</td>
<td>Staff absence</td>
<td>Lost time from recurrence,</td>
<td>Org 4</td>
<td>37 3 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1998</td>
<td>Peers</td>
<td>Modified Work</td>
<td>modified work from new injuries</td>
<td>Org 4</td>
<td>37 3 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1998</td>
<td>Peers</td>
<td>Modified Work</td>
<td>modified work due to recurrence</td>
<td>Org 4</td>
<td>37 3 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>1994</td>
<td>Addington</td>
<td>Staff absence</td>
<td>Musculoskeletal sickness absence</td>
<td>Org 4</td>
<td>37 3 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>1996</td>
<td>Entwistle</td>
<td>Staff absence</td>
<td>Sickness absence</td>
<td>Org 4</td>
<td>2 5 10 13 22</td>
<td></td>
<td>35 3 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper No</td>
<td>Date</td>
<td>Author</td>
<td>Outcome</td>
<td>Outcomes measures</td>
<td>Beneficiary</td>
<td>Ranked outcome list 1-12</td>
<td>Intervention Strategy</td>
<td>QR score %</td>
<td>PR score</td>
<td>Robson score</td>
</tr>
<tr>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>------------------------</td>
<td>------------------------------------</td>
<td>-------------</td>
<td>--------------------------</td>
<td>-----------------------</td>
<td>------------</td>
<td>----------</td>
<td>--------------</td>
</tr>
<tr>
<td>242</td>
<td>2008</td>
<td>Nelson</td>
<td>Quality of care</td>
<td>Quality of care RAI tool p37</td>
<td>Patient</td>
<td>1, 2, 10, 13, 15, 23</td>
<td></td>
<td>59</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>26</td>
<td>1996</td>
<td>Tracey</td>
<td>Incident/Accident</td>
<td>Staff incidents</td>
<td>Staff</td>
<td>po</td>
<td></td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>188</td>
<td>2004</td>
<td>Engst</td>
<td>Incident/Accident</td>
<td>PH incidents</td>
<td>Staff</td>
<td></td>
<td></td>
<td>63</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>153</td>
<td>1997</td>
<td>Menckel</td>
<td>Incident/Accident</td>
<td>Accident reports and feedback</td>
<td>Org</td>
<td>1, 2, 5, 8</td>
<td></td>
<td>63</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>284</td>
<td>2003</td>
<td>Griffiths</td>
<td>Incident/Accident</td>
<td>MH Incidents</td>
<td>Org</td>
<td>5, 15, 23</td>
<td></td>
<td>22</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

Section 5 Quality of Care

Section 6 Incidents and Accidents
<table>
<thead>
<tr>
<th>Paper No</th>
<th>Date</th>
<th>Author</th>
<th>Outcome</th>
<th>Outcomes measures</th>
<th>Beneficiary</th>
<th>Ranked outcome list 1-12</th>
<th>Intervention Strategy</th>
<th>QR score %</th>
<th>PR score</th>
<th>Robson score</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>1986</td>
<td>Mckellar</td>
<td>Staff perception</td>
<td>Informal interview</td>
<td>Staff</td>
<td>7</td>
<td>po</td>
<td>3.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>306</td>
<td>2007</td>
<td>Kindblom-Rising</td>
<td>Staff perception</td>
<td>Risk perception after training</td>
<td>Staff</td>
<td>7</td>
<td>5</td>
<td>85</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>211</td>
<td>2003</td>
<td>Smedley</td>
<td>Psychological well-being</td>
<td>Psychosocial stress</td>
<td>Staff</td>
<td>7</td>
<td>70</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>210</td>
<td>2006</td>
<td>Nelson</td>
<td>Psychological well-being</td>
<td>Job satisfaction</td>
<td>Staff</td>
<td>7</td>
<td>70</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>210</td>
<td>2006</td>
<td>Nelson</td>
<td>Staff perception</td>
<td>perceived effectiveness of intervention</td>
<td>Staff</td>
<td>7</td>
<td>70</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>237</td>
<td>2005</td>
<td>Santaguidia</td>
<td>Staff perception</td>
<td>Ranking of preference</td>
<td>Staff</td>
<td>7</td>
<td>67</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>190</td>
<td>2006</td>
<td>Engst</td>
<td>Staff perception</td>
<td>Perception of MSD risk</td>
<td>Staff</td>
<td>7</td>
<td>63</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>240</td>
<td>2006</td>
<td>Millar</td>
<td>Staff perception</td>
<td>Comfort</td>
<td>Staff</td>
<td>7</td>
<td>59</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>82</td>
<td>1999</td>
<td>Evanoff</td>
<td>Psychological Well-being</td>
<td>Psycho social stressors</td>
<td>Staff</td>
<td>7</td>
<td>58</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>1999</td>
<td>Hignet</td>
<td>Staff perception</td>
<td>Subjective assessment questionnaire</td>
<td>Staff</td>
<td>7</td>
<td>57</td>
<td>4.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1994</td>
<td>Holliday</td>
<td>Staff perception</td>
<td>Comfort score for staff</td>
<td>Staff</td>
<td>7</td>
<td>50</td>
<td>4.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>217</td>
<td>1994</td>
<td>Mughal</td>
<td>Staff perception</td>
<td>Subjective staff</td>
<td>Staff</td>
<td>7</td>
<td>48</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>246</td>
<td>2007</td>
<td>Wardell</td>
<td>Staff perception</td>
<td>Staff perception</td>
<td>Staff</td>
<td>7</td>
<td>1, 2, 5, 10, 23</td>
<td>44</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>321</td>
<td>2007</td>
<td>Kneafsey</td>
<td>Staff perception</td>
<td>Confidence of staff post training</td>
<td>Staff</td>
<td>7</td>
<td>5</td>
<td>41</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>324</td>
<td>2004</td>
<td>Guthrie</td>
<td>Psychological well-being</td>
<td>Staff satisfaction</td>
<td>Staff</td>
<td>7</td>
<td>37</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>308</td>
<td>2008</td>
<td>Bar-Niv</td>
<td>Psychological well-being</td>
<td>Psychosocial stress questionnaire</td>
<td>Staff</td>
<td>7</td>
<td>26</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1995</td>
<td>Scott</td>
<td>Staff perception</td>
<td>Questionnaire of staff perceptions of hazards and interventions</td>
<td>Staff</td>
<td>7</td>
<td>8</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>224</td>
<td>2006</td>
<td>Pinder</td>
<td>Staff perception</td>
<td>Perceptions of work risks</td>
<td>Staff</td>
<td>7</td>
<td>NR</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>108</td>
<td>1991</td>
<td>Waldenstrom</td>
<td>Patient result</td>
<td>Obstetric outcomes</td>
<td>Patient</td>
<td>8</td>
<td>93</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>
### Section 9 Patient Perception

<table>
<thead>
<tr>
<th>Paper No</th>
<th>Date</th>
<th>Author</th>
<th>Outcome</th>
<th>Outcomes measures</th>
<th>Beneficiary</th>
<th>Ranked outcome list 1-12</th>
<th>QR score %</th>
<th>PR score %</th>
<th>Robson score</th>
</tr>
</thead>
<tbody>
<tr>
<td>107</td>
<td>1999</td>
<td>Owen</td>
<td>Patient perception</td>
<td>Patient comfort and security</td>
<td>Patient</td>
<td>9</td>
<td>po</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>108</td>
<td>1991</td>
<td>Waldenstrom</td>
<td>Relative perception</td>
<td>Mothers experience</td>
<td>Patient</td>
<td>9</td>
<td>93</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>108</td>
<td>1991</td>
<td>Waldenstrom</td>
<td>Relative perception</td>
<td>Fathers experience</td>
<td>Relative</td>
<td>9</td>
<td>93</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>200</td>
<td>1998</td>
<td>Conneeley</td>
<td>Patient perception</td>
<td>Patient perspective</td>
<td>Patient</td>
<td>9</td>
<td>92</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>227</td>
<td>2004</td>
<td>Kjellberg</td>
<td>Patient perception</td>
<td>Patient Perception</td>
<td>Patient</td>
<td>9</td>
<td>89</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>184</td>
<td>1991</td>
<td>Garg</td>
<td>Patient perception</td>
<td>Patient comfort</td>
<td>Patient</td>
<td>9</td>
<td>80</td>
<td>4.5</td>
<td>2</td>
</tr>
<tr>
<td>184</td>
<td>1991</td>
<td>Garg</td>
<td>Patient perception</td>
<td>Patient security</td>
<td>Patient</td>
<td>9</td>
<td>80</td>
<td>4.5</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>1996</td>
<td>Gingher</td>
<td>Patient perception</td>
<td>Impact of resident from staff view</td>
<td>Patient</td>
<td>9</td>
<td>78</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>72</td>
<td>1999</td>
<td>Owen</td>
<td>Patient perception</td>
<td>Patient Perception Security and comfort</td>
<td>Patient</td>
<td>9</td>
<td>76</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>66</td>
<td>1997</td>
<td>Best</td>
<td>Patient perception</td>
<td>Patient comfort</td>
<td>Patient</td>
<td>9</td>
<td>70</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>255</td>
<td>2002</td>
<td>Johnsson</td>
<td>Patient perception</td>
<td>Patient comfort</td>
<td>Staff</td>
<td>9</td>
<td>70</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>73</td>
<td>1994</td>
<td>Garg</td>
<td>Patient perception</td>
<td>Patient Comfort/security</td>
<td>Patient</td>
<td>9</td>
<td>67</td>
<td>4.5</td>
<td>2</td>
</tr>
<tr>
<td>237</td>
<td>2005</td>
<td>Santaguida</td>
<td>Patient perception</td>
<td>Ranking of preference</td>
<td>Patient</td>
<td>9</td>
<td>67</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>188</td>
<td>2004</td>
<td>Engst</td>
<td>Patient result</td>
<td>Resident agitation</td>
<td>Patient</td>
<td>9</td>
<td>63</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>236</td>
<td>2005</td>
<td>Ruszala</td>
<td>Staff perception</td>
<td>Subjective performance rating</td>
<td>Patient</td>
<td>9</td>
<td>63</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>49</td>
<td>1999</td>
<td>Owen</td>
<td>Patient perception</td>
<td>Patient comfort</td>
<td>Patient</td>
<td>9</td>
<td>59</td>
<td>4.5</td>
<td>2</td>
</tr>
<tr>
<td>49</td>
<td>1999</td>
<td>Owen</td>
<td>Patient perception</td>
<td>Patient security</td>
<td>Patient</td>
<td>9</td>
<td>59</td>
<td>4.5</td>
<td>2</td>
</tr>
<tr>
<td>271</td>
<td>2006</td>
<td>Baptiste</td>
<td>Patient perception</td>
<td>Patient safety</td>
<td>Patient</td>
<td>9</td>
<td>59</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>74</td>
<td>1993</td>
<td>Benevolo</td>
<td>Patient perception</td>
<td>Patient comfort/safety perception</td>
<td>Patient</td>
<td>9</td>
<td>57</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>298</td>
<td>2006</td>
<td>Pellino</td>
<td>Patient perception</td>
<td>Patient comfort</td>
<td>Patient</td>
<td>9</td>
<td>55</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>158</td>
<td>1996</td>
<td>McGuire</td>
<td>Patient perception</td>
<td>Patient perception</td>
<td>Patient</td>
<td>9</td>
<td>54</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>159</td>
<td>2000</td>
<td>Zhuang</td>
<td>Patient perception</td>
<td>Patient comfort</td>
<td>Patient</td>
<td>9</td>
<td>54</td>
<td>4.5</td>
<td>2</td>
</tr>
<tr>
<td>159</td>
<td>2000</td>
<td>Zhuang</td>
<td>Patient perception</td>
<td>Patient security</td>
<td>Patient</td>
<td>9</td>
<td>54</td>
<td>4.5</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>1994</td>
<td>Holliday</td>
<td>Patient perception</td>
<td>Comfort score for patient</td>
<td>Patient</td>
<td>9</td>
<td>50</td>
<td>4.5</td>
<td>2</td>
</tr>
<tr>
<td>143</td>
<td>1994</td>
<td>Owen</td>
<td>Patient perception</td>
<td>Patient subjective ratings</td>
<td>Patient</td>
<td>9</td>
<td>50</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Year</td>
<td>Author</td>
<td>Type</td>
<td>Title</td>
<td>Participants</td>
<td>Rating</td>
<td>Scale</td>
<td>Result</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-----------------</td>
<td>-----------------------</td>
<td>--------------------------------------</td>
<td>--------------</td>
<td>--------</td>
<td>-------</td>
<td>--------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>McGuire</td>
<td>Patient perception</td>
<td>Clients attitudes to equipment</td>
<td>Patient</td>
<td>9</td>
<td>50</td>
<td>3.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>Garg</td>
<td>Patient perception</td>
<td>Patient comfort</td>
<td>Patient</td>
<td>9</td>
<td>48</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>Garg</td>
<td>Patient perception</td>
<td>Patient security</td>
<td>Patient</td>
<td>9</td>
<td>48</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>Garg</td>
<td>Patient perception</td>
<td>Patient comfort</td>
<td>Patient</td>
<td>9</td>
<td>48</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>Garg</td>
<td>Patient perception</td>
<td>Patient security</td>
<td>Patient</td>
<td>9</td>
<td>48</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>Garg</td>
<td>Patient perception</td>
<td>Patient comfort</td>
<td>Patient</td>
<td>9</td>
<td>48</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>Garg</td>
<td>Patient perception</td>
<td>Patient security</td>
<td>Patient</td>
<td>9</td>
<td>48</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>Garg</td>
<td>Patient perception</td>
<td>Subjective Patient safety</td>
<td>Patient</td>
<td>9</td>
<td>48</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>Heacock</td>
<td>Patient perception</td>
<td>Patient perspective</td>
<td>Patient</td>
<td>9</td>
<td>48</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>Owen</td>
<td>Patient perception</td>
<td>Patient security</td>
<td>Patient</td>
<td>9</td>
<td>2</td>
<td>5</td>
<td>13</td>
<td>41</td>
</tr>
<tr>
<td>2002</td>
<td>Owen</td>
<td>Patient perception</td>
<td>Patient comfort</td>
<td>Patient</td>
<td>9</td>
<td>41</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>Fray</td>
<td>Patient perception</td>
<td>Patient comfort</td>
<td>Patient</td>
<td>9</td>
<td>41</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>Le Bon</td>
<td>Patient perception</td>
<td>User trial data</td>
<td>Patient</td>
<td>9</td>
<td>41</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>Tamminen Peter</td>
<td>Patient perception</td>
<td>Patient satisfaction</td>
<td>Patient</td>
<td>9</td>
<td>37</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>Guthrie</td>
<td>Patient perception</td>
<td>Patient satisfaction</td>
<td>Patient</td>
<td>9</td>
<td>37</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>Wright A</td>
<td>Patient perception</td>
<td>Questionnaire Patient control</td>
<td>Staff</td>
<td>9</td>
<td>35</td>
<td>2.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>Entwistle</td>
<td>Patient perception</td>
<td>Patient comfort</td>
<td>Patient</td>
<td>9</td>
<td>35</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>Murphy</td>
<td>Patient perception</td>
<td>Patient subjective ratings</td>
<td>Patient</td>
<td>9</td>
<td>26</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
## Section 10 MSD Exposure Measures

<table>
<thead>
<tr>
<th>Paper No</th>
<th>Date</th>
<th>Author</th>
<th>Outcome</th>
<th>Outcomes measures</th>
<th>Beneficiary</th>
<th>Ranked outcome list</th>
<th>Intervention Strategy</th>
<th>QR score %</th>
<th>PR score</th>
<th>Robson score</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>1997</td>
<td>Quintana</td>
<td>Physical workload</td>
<td>RWL NIOSH</td>
<td>Staff</td>
<td>10</td>
<td>po</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>103</td>
<td>1988</td>
<td>Skarpil</td>
<td>Staff perception</td>
<td>Risk Factors identified by staff</td>
<td>Staff</td>
<td>10</td>
<td>po</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>107</td>
<td>1999</td>
<td>Owen</td>
<td>Staff perception</td>
<td>Perceived Exertion</td>
<td>Staff</td>
<td>10</td>
<td>po</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>282</td>
<td>2000</td>
<td>Logan</td>
<td>Carer perception</td>
<td>Subjective views of carers</td>
<td>Staff</td>
<td>10</td>
<td>PO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>2001</td>
<td>Engkvist</td>
<td>Physical workload</td>
<td>MSD Risk factors</td>
<td>Staff</td>
<td>10</td>
<td>2</td>
<td>5</td>
<td>100</td>
<td>5</td>
</tr>
<tr>
<td>126</td>
<td>1996</td>
<td>Hignett</td>
<td>Staff perception</td>
<td>Subjective appraisal of risk factors</td>
<td>Staff</td>
<td>10</td>
<td>96</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>108</td>
<td>1991</td>
<td>Waldenstrom</td>
<td>Physical workload</td>
<td>Nurses postures</td>
<td>Staff</td>
<td>10</td>
<td>93</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>130</td>
<td>1999</td>
<td>Knibbe</td>
<td>Physical workload</td>
<td>Log of pre and post task numbers</td>
<td>Staff</td>
<td>10</td>
<td>2</td>
<td>83</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>135</td>
<td>1995</td>
<td>Smedley</td>
<td>Physical workload</td>
<td>Risk factors for Nurses</td>
<td>Staff</td>
<td>10</td>
<td>82</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>144</td>
<td>1992</td>
<td>Owen</td>
<td>Staff perception</td>
<td>Subjective ratings of the staff</td>
<td>Staff</td>
<td>10</td>
<td>82</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>144</td>
<td>1992</td>
<td>Owen</td>
<td>Staff perception</td>
<td>Ranking of tasks</td>
<td>Staff</td>
<td>10</td>
<td>82</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>260</td>
<td>2004</td>
<td>Cohen</td>
<td>Number of staff</td>
<td>Resident to staff ratio</td>
<td>Staff</td>
<td>10</td>
<td>82</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>261</td>
<td>2005</td>
<td>Cohen</td>
<td>Number of staff</td>
<td>Res dependency to staff ratio</td>
<td>Staff</td>
<td>10</td>
<td>82</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>2001</td>
<td>Daynard</td>
<td>Physical workload</td>
<td>Biomechanical loading for peak force</td>
<td>Staff</td>
<td>10</td>
<td>2</td>
<td>5</td>
<td>81</td>
<td>5</td>
</tr>
<tr>
<td>42</td>
<td>2001</td>
<td>Daynard</td>
<td>Physical workload</td>
<td>Biomechanical loading over time</td>
<td>Staff</td>
<td>10</td>
<td>81</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>184</td>
<td>1991</td>
<td>Garg</td>
<td>Physical workload</td>
<td>Spinal Loading</td>
<td>Staff</td>
<td>10</td>
<td>80</td>
<td>4.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>184</td>
<td>1991</td>
<td>Garg</td>
<td>Staff perception</td>
<td>Subjective opinion of tasks effort</td>
<td>Staff</td>
<td>10</td>
<td>80</td>
<td>4.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1996</td>
<td>Gingher</td>
<td>Staff perception</td>
<td>Effect on staff, Questionnaire</td>
<td>Staff</td>
<td>10</td>
<td>78</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>136</td>
<td>1983</td>
<td>Scholey</td>
<td>Physical workload</td>
<td>Intra-abdominal pressures</td>
<td>Staff</td>
<td>10</td>
<td>78</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>274</td>
<td>2007</td>
<td>Lavender</td>
<td>Physical workload</td>
<td>EMG</td>
<td>Staff</td>
<td>10</td>
<td>78</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>274</td>
<td>2007</td>
<td>Lavender</td>
<td>Staff perception</td>
<td>RPE</td>
<td>Staff</td>
<td>10</td>
<td>78</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>275</td>
<td>2007</td>
<td>Lavender</td>
<td>Physical workload</td>
<td>EMG</td>
<td>Staff</td>
<td>10</td>
<td>78</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>275</td>
<td>2007</td>
<td>Lavender</td>
<td>Staff perception</td>
<td>Physical workload</td>
<td>Biomechanical load</td>
<td>Staff</td>
<td>10</td>
<td>78</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>310</td>
<td>2008</td>
<td>Skotte</td>
<td>Physical workload</td>
<td>Biomechanical load</td>
<td>Staff</td>
<td>10</td>
<td>2</td>
<td>7</td>
<td>78</td>
<td>5</td>
</tr>
<tr>
<td>175</td>
<td>1996</td>
<td>Knibbe</td>
<td>Physical workload</td>
<td>Task Exposure</td>
<td>Staff</td>
<td>10</td>
<td>77</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>2000</td>
<td>Elford</td>
<td>Physical workload</td>
<td>Movement velocity and acceleration</td>
<td>Staff</td>
<td>10</td>
<td>76</td>
<td>3</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>46</td>
<td>2000</td>
<td>Elford</td>
<td>Physical workload</td>
<td>Spinal stressors from LMM data</td>
<td>Staff</td>
<td>10</td>
<td>76</td>
<td>3</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>46</td>
<td>2000</td>
<td>Elford</td>
<td>Staff perception</td>
<td>Rating of preference of the subjects</td>
<td>Staff</td>
<td>10</td>
<td>76</td>
<td>3</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>72</td>
<td>1999</td>
<td>Owen</td>
<td>Staff perception</td>
<td>Staff perception RPE</td>
<td>Staff</td>
<td>10</td>
<td>76</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>76</td>
<td>1998</td>
<td>Hampton</td>
<td>Staff perception</td>
<td>Staff perceptions from questionnaire</td>
<td>Staff</td>
<td>10</td>
<td>76</td>
<td>3</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>201</td>
<td>1998</td>
<td>Botha</td>
<td>Staff perception</td>
<td>Subjective problem identification</td>
<td>Staff</td>
<td>10</td>
<td>75</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>241</td>
<td>2006</td>
<td>Knibbe</td>
<td>Physical workload</td>
<td>Exposure to hazards</td>
<td>Staff</td>
<td>10</td>
<td>10</td>
<td>25</td>
<td>74</td>
<td>5</td>
</tr>
<tr>
<td>256</td>
<td>2006</td>
<td>Engkvist</td>
<td>Staff perception</td>
<td>RPE/fatigue</td>
<td>Staff</td>
<td>10</td>
<td>73</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>323</td>
<td>2004</td>
<td>Kothiyal</td>
<td>Physical workload</td>
<td>Muscle effort</td>
<td>Staff</td>
<td>10</td>
<td>2</td>
<td>73</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>323</td>
<td>2004</td>
<td>Kothiyal</td>
<td>Staff perception</td>
<td>Physical workload</td>
<td>RPE</td>
<td>Staff</td>
<td>10</td>
<td>73</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>152</td>
<td>1999</td>
<td>Marras</td>
<td>Physical workload</td>
<td>Biomechanical load model</td>
<td>Staff</td>
<td>10</td>
<td>72</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>1994</td>
<td>De Looze</td>
<td>Physical workload</td>
<td>Biomechanical exposure to hazard</td>
<td>Staff</td>
<td>10</td>
<td>2</td>
<td>72</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>139</td>
<td>1993</td>
<td>Robertson</td>
<td>Physical workload</td>
<td>Forces in lifting</td>
<td>Staff</td>
<td>10</td>
<td>71</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>1997</td>
<td>Best</td>
<td>Physical workload</td>
<td>Handling behaviour OWAS</td>
<td>Staff</td>
<td>10</td>
<td>70</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>137</td>
<td>1989</td>
<td>St-Vincent</td>
<td>Physical workload</td>
<td>Observation tool for posture movement</td>
<td>Staff</td>
<td>10</td>
<td>5</td>
<td>70</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>255</td>
<td>2002</td>
<td>Johnsson</td>
<td>Staff perception</td>
<td>RPE</td>
<td>Staff</td>
<td>10</td>
<td>70</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>278</td>
<td>2007</td>
<td>Cornish</td>
<td>Staff perception</td>
<td>Subjective evaluation</td>
<td>Staff</td>
<td>10</td>
<td>5</td>
<td>69</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>73</td>
<td>1994</td>
<td>Garg</td>
<td>Physical workload</td>
<td>Biomechanical Model</td>
<td>Staff</td>
<td>10</td>
<td>67</td>
<td>4</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>73</td>
<td>1994</td>
<td>Garg</td>
<td>Staff perception</td>
<td>Perceived Stress</td>
<td>Staff</td>
<td>10</td>
<td>67</td>
<td>4</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>73</td>
<td>1994</td>
<td>Garg</td>
<td>Staff perception</td>
<td>Acceptability Rate Staff perception</td>
<td>Staff</td>
<td>10</td>
<td>67</td>
<td>4</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>105</td>
<td>1997</td>
<td>Ulin</td>
<td>Physical workload</td>
<td>Biomechanical model</td>
<td>Staff</td>
<td>10</td>
<td>67</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>105</td>
<td>1997</td>
<td>Ulin</td>
<td>Staff perception</td>
<td>RPE</td>
<td>Staff</td>
<td>10</td>
<td>67</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>230</td>
<td>2007</td>
<td>Hignett</td>
<td>Physical workload</td>
<td>Posture REBA</td>
<td>Staff</td>
<td>10</td>
<td>67</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>231</td>
<td>2007</td>
<td>Lavender</td>
<td>Physical workload</td>
<td>EMG</td>
<td>Staff</td>
<td>10</td>
<td>2</td>
<td>67</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>231</td>
<td>2007</td>
<td>Lavender</td>
<td>Physical workload</td>
<td>Biomechanical LMM2</td>
<td>Staff</td>
<td>10</td>
<td>67</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>237</td>
<td>2005</td>
<td>Santaguida</td>
<td>Physical workload</td>
<td>Biomechanical strain</td>
<td>Staff</td>
<td>10</td>
<td>2</td>
<td>67</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>237</td>
<td>2005</td>
<td>Santaguida</td>
<td>Staff perception</td>
<td>RPE</td>
<td>Staff</td>
<td>10</td>
<td>67</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>244</td>
<td>2006</td>
<td>Hess</td>
<td>Staff perception</td>
<td>RPE Borg</td>
<td>Staff</td>
<td>10</td>
<td>2</td>
<td>7</td>
<td>67</td>
<td>3</td>
</tr>
<tr>
<td>244</td>
<td>2006</td>
<td>Hess</td>
<td>Physical workload</td>
<td>Biomechanical load</td>
<td>Staff</td>
<td>10</td>
<td>67</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>252</td>
<td>2002</td>
<td>Skotte</td>
<td>Physical workload</td>
<td>Biomechanical model</td>
<td>Staff</td>
<td>10</td>
<td>7</td>
<td>67</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>252</td>
<td>2002</td>
<td>Skotte</td>
<td>Physical workload</td>
<td>Muscle force</td>
<td>Staff</td>
<td>10</td>
<td>67</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>252</td>
<td>2002</td>
<td>Skotte</td>
<td>Staff perception</td>
<td>RPE</td>
<td>Staff</td>
<td>10</td>
<td>67</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>253</td>
<td>2004</td>
<td>Hye- Knudson</td>
<td>Physical workload</td>
<td>Lumbar Motion</td>
<td>Staff</td>
<td>10</td>
<td>7</td>
<td>67</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Year</td>
<td>Author</td>
<td>Measure Type</td>
<td>Staff Perception</td>
<td>Score</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>--------</td>
<td>--------------</td>
<td>-----------------</td>
<td>-------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>Hye-Knudson</td>
<td>Physical workload</td>
<td>EMG</td>
<td>Staff 10 67 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>Yassi</td>
<td>Physical workload</td>
<td>Number lifts observed</td>
<td>Staff 2 5 10 67 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>Yassi</td>
<td>Staff perception</td>
<td>Subjective assessment of work effects</td>
<td>Staff 10 67 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>Hui</td>
<td>Staff perception</td>
<td>Subjective assessment of severity of task</td>
<td>Staff 10 66 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>Hui</td>
<td>Physical workload</td>
<td>Physical demands over a shift</td>
<td>Staff 10 66 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>Hui</td>
<td>Staff injuries</td>
<td>Back Muscle fatigue</td>
<td>Staff 10 66 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>Lusted</td>
<td>Physical workload</td>
<td>Heart Rate</td>
<td>Staff 10 66 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>Lusted</td>
<td>Staff perception</td>
<td>Subjective feedback</td>
<td>Staff 10 66 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>Jackson</td>
<td>Physical workload</td>
<td>Postures over a shift</td>
<td>Staff 10 66 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>Looze</td>
<td>Physical workload</td>
<td>Spinal Loading</td>
<td>Staff 10 66 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>Yassi</td>
<td>Physical workload</td>
<td>Number lifts observed</td>
<td>Staff 2 5 10 67 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>Jackson</td>
<td>Staff perception</td>
<td>Subjective assessment of work effects</td>
<td>Staff 10 67 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>Looze</td>
<td>Physical workload</td>
<td>Subjective assessment of severity of task</td>
<td>Staff 10 66 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>Looze</td>
<td>Physical workload</td>
<td>Physical demands over a shift</td>
<td>Staff 10 66 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>Jackson</td>
<td>Physical workload</td>
<td>Back Muscle fatigue</td>
<td>Staff 10 66 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>Lusted</td>
<td>Physical workload</td>
<td>Heart Rate</td>
<td>Staff 10 66 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>Lusted</td>
<td>Staff perception</td>
<td>Subjective feedback</td>
<td>Staff 10 66 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>Jackson</td>
<td>Physical workload</td>
<td>Postures over a shift</td>
<td>Staff 10 66 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>Looze</td>
<td>Physical workload</td>
<td>Spinal Loading</td>
<td>Staff 10 66 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>Ballard</td>
<td>Staff perception</td>
<td>Risk Factors for Nurses</td>
<td>Staff 10 66 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>Varcin-Coad</td>
<td>Physical workload</td>
<td>Biomechanical model</td>
<td>Staff 10 65 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>Schibye</td>
<td>Physical workload</td>
<td>Biomechanical model</td>
<td>Staff 10 65 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>Ljungberg</td>
<td>Physical workload</td>
<td>HR / VO2</td>
<td>Staff 10 2 6 7 65 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>Ljungberg</td>
<td>Staff perception</td>
<td>RPE</td>
<td>Staff 10 65 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>Ljungberg</td>
<td>Physical workload</td>
<td>Lift force</td>
<td>Staff 10 65 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>Ljungberg</td>
<td>Physical workload</td>
<td>Lift exposure/freq</td>
<td>Staff 10 65 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>Ljungberg</td>
<td>Physical workload</td>
<td>Postures</td>
<td>Staff 10 65 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>Doormaal</td>
<td>Physical workload</td>
<td>Posture</td>
<td>Staff 10 64 3.5 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>Doormaal</td>
<td>Staff perception</td>
<td>Questionnaire of perceptions</td>
<td>Staff 10 64 3.5 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>Doormaal</td>
<td>Physical workload</td>
<td>Force measures</td>
<td>Staff 10 64 3.5 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>Nevala</td>
<td>Physical workload</td>
<td>EMG</td>
<td>Staff 10 2 64 2 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>Nevala</td>
<td>Staff perception</td>
<td>Perceived strain</td>
<td>Staff 10 64 2 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td>Gagnon</td>
<td>Physical workload</td>
<td>Biomechanical</td>
<td>Staff 10 63 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>Lavender</td>
<td>Physical workload</td>
<td>Biomechanical model</td>
<td>Staff 10 63 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>Garg</td>
<td>Physical workload</td>
<td>Biomechanical model</td>
<td>Staff 10 1 2 5 63 5 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>Garg</td>
<td>Staff perception</td>
<td>RPE</td>
<td>Staff 10 63 5 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>Winkelmolen</td>
<td>Physical workload</td>
<td>Work posture</td>
<td>Staff 10 63 4.5 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>Winkelmolen</td>
<td>Physical workload</td>
<td>Biomechanical loading</td>
<td>Staff 10 63 4.5 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>Winkelmolen</td>
<td>Staff perception</td>
<td>Perceived effort</td>
<td>Staff 10 63 4.5 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>Engst</td>
<td>Physical workload</td>
<td>MSD exposure score</td>
<td>Staff 10 63 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1975</td>
<td>Dehlin</td>
<td>Physical workload</td>
<td>Force plate measures for lift burden</td>
<td>Staff 10 63 3 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>Ruszala</td>
<td>Staff perception</td>
<td>RPE</td>
<td>Staff 10 63 5 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>Ruszala</td>
<td>Physical workload</td>
<td>Posture REBA</td>
<td>Staff 10 63 5 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>Authors</td>
<td>Method</td>
<td>Proposals</td>
<td>Sample Size</td>
<td>Force</td>
<td>Mean</td>
<td>SD</td>
<td>CI Width</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>--------</td>
<td>-----------</td>
<td>-------------</td>
<td>-------</td>
<td>------</td>
<td>----</td>
<td>----------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>Schibye</td>
<td>Staff perception</td>
<td>Biomechanical loads</td>
<td>Staff</td>
<td>10</td>
<td>7</td>
<td>63</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>Schibye</td>
<td>Staff perception</td>
<td>Perceived exertion</td>
<td>Staff</td>
<td>10</td>
<td>63</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>Switzer</td>
<td>Staff perception</td>
<td>Structured Interviews of staff</td>
<td>Staff</td>
<td>10</td>
<td>62</td>
<td>4.5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>Lavender</td>
<td>Physical workload</td>
<td>Observational data from LMM goniometer</td>
<td>Staff</td>
<td>10</td>
<td>61</td>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>Lavender</td>
<td>Physical workload</td>
<td>Biomechanical modelling of spinal stress</td>
<td>Staff</td>
<td>10</td>
<td>61</td>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>Caboor</td>
<td>Physical workload</td>
<td>Postures of staff</td>
<td>Staff</td>
<td>10</td>
<td>61</td>
<td>3.5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>Caboor</td>
<td>Physical workload</td>
<td>EMG</td>
<td>Staff</td>
<td>10</td>
<td>61</td>
<td>3.5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>Caboor</td>
<td>Staff perception</td>
<td>RPE</td>
<td>Staff</td>
<td>10</td>
<td>61</td>
<td>3.5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>Lavender</td>
<td>Physical workload</td>
<td>Posture analysis by Lumbar motion mtr</td>
<td>Staff</td>
<td>10</td>
<td>59</td>
<td>4.5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>Lavender</td>
<td>Physical workload</td>
<td>Forces applied</td>
<td>Staff</td>
<td>10</td>
<td>59</td>
<td>4.5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>Owen</td>
<td>Staff perception</td>
<td>Rate of perceived exertion</td>
<td>Staff</td>
<td>10</td>
<td>59</td>
<td>4.5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>Nussbaum</td>
<td>Staff perception</td>
<td>RPE</td>
<td>Staff</td>
<td>10</td>
<td>59</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>Nussbaum</td>
<td>Physical workload</td>
<td>Postures</td>
<td>Staff</td>
<td>10</td>
<td>59</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>Stubbs</td>
<td>Physical workload</td>
<td>Intra-abdominal Pressure 2nd test</td>
<td>Staff</td>
<td>10</td>
<td>59</td>
<td>4.5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>Zhuang</td>
<td>Physical workload</td>
<td>Work posture</td>
<td>Staff</td>
<td>10</td>
<td>59</td>
<td>4.5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>Zhuang</td>
<td>Physical workload</td>
<td>Forces</td>
<td>Staff</td>
<td>10</td>
<td>59</td>
<td>4.5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>Millar</td>
<td>Staff perception</td>
<td>Risk perception</td>
<td>Staff</td>
<td>10</td>
<td>59</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>Jordan</td>
<td>Physical workload</td>
<td>Biomechanical</td>
<td>Staff</td>
<td>10</td>
<td>59</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>Engst</td>
<td>Staff perception</td>
<td>Risk Perception</td>
<td>Staff</td>
<td>10</td>
<td>59</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>Engst</td>
<td>Staff perception</td>
<td>Comfort</td>
<td>Staff</td>
<td>10</td>
<td>59</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>Baptiste</td>
<td>Staff perception</td>
<td>Comfort</td>
<td>Staff</td>
<td>10</td>
<td>59</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>Baptiste</td>
<td>Staff perception</td>
<td>Perceived injury risk</td>
<td>Staff</td>
<td>10</td>
<td>59</td>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>Evanoff</td>
<td>Staff injuries</td>
<td>MSD Risk factors</td>
<td>Staff</td>
<td>10</td>
<td>58</td>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>Pohjonen</td>
<td>Physical workload</td>
<td>Posture owas</td>
<td>Staff</td>
<td>10</td>
<td>58</td>
<td>4.5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>Pohjonen</td>
<td>Physical workload</td>
<td>Heart rate</td>
<td>Staff</td>
<td>10</td>
<td>58</td>
<td>4.5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1986</td>
<td>Gagnon</td>
<td>Physical workload</td>
<td>Biomechanical model</td>
<td>Staff</td>
<td>10</td>
<td>57</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1986</td>
<td>Gagnon</td>
<td>Physical workload</td>
<td>Complex biomechanical data and models</td>
<td>Staff</td>
<td>10</td>
<td>57</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>Edlund</td>
<td>Patient result</td>
<td>Angular measures for sitting position in sling and after move</td>
<td>Task</td>
<td>10</td>
<td>57</td>
<td>4.5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>Benevolo</td>
<td>Staff perception</td>
<td>Safety and comfort of staff perception</td>
<td>Staff</td>
<td>10</td>
<td>57</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>Benevolo</td>
<td>Staff perception</td>
<td>Ranking of staff preference/choice</td>
<td>Staff</td>
<td>10</td>
<td>57</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>Roth</td>
<td>Staff perception</td>
<td>RPE</td>
<td>Staff</td>
<td>10</td>
<td>57</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>Roth</td>
<td>Staff perception</td>
<td>Rating for preference of method</td>
<td>Staff</td>
<td>10</td>
<td>57</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>Thompson</td>
<td>Physical workload</td>
<td>Postures both owas and reba</td>
<td>Staff</td>
<td>10</td>
<td>57</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study ID</td>
<td>Year</td>
<td>Author(s)</td>
<td>Type</td>
<td>Measure</td>
<td>Respondent</td>
<td>Sample Size</td>
<td>Mean RPE</td>
<td>SEM</td>
<td>CI95%</td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>------</td>
<td>-----------</td>
<td>------</td>
<td>---------</td>
<td>------------</td>
<td>-------------</td>
<td>----------</td>
<td>-----</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>132</td>
<td>2000</td>
<td>Knapik</td>
<td>Physical workload</td>
<td>Physiological response</td>
<td>Staff</td>
<td>10</td>
<td>57</td>
<td>4.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>132</td>
<td>2000</td>
<td>Knapik</td>
<td>Staff perception</td>
<td>RPE</td>
<td>Staff</td>
<td>10</td>
<td>57</td>
<td>4.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>186</td>
<td>1987</td>
<td>Gagnon</td>
<td>Physical workload</td>
<td>Spinal Loading</td>
<td>Staff</td>
<td>10</td>
<td>57</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>186</td>
<td>1987</td>
<td>Gagnon</td>
<td>Physical workload</td>
<td>Muscle activity</td>
<td>Staff</td>
<td>10</td>
<td>57</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>209</td>
<td>1988</td>
<td>Owen</td>
<td>Staff perception</td>
<td>Perceived benefits</td>
<td>Staff</td>
<td>10</td>
<td>57</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>291</td>
<td>2006</td>
<td>Gray</td>
<td>Physical workload</td>
<td>EMG</td>
<td>Staff</td>
<td>10</td>
<td>57</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>91</td>
<td>1995</td>
<td>Knibbe</td>
<td>Physical workload</td>
<td>Postures Owas</td>
<td>Staff</td>
<td>10</td>
<td>56</td>
<td>4.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>226</td>
<td>2002</td>
<td>Crumpton</td>
<td>Physical workload</td>
<td>Risk exposure (study) meter</td>
<td>Staff</td>
<td>10</td>
<td>56</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>266</td>
<td>2005</td>
<td>McGill</td>
<td>Physical workload</td>
<td>EMG</td>
<td>Staff</td>
<td>10</td>
<td>56</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>266</td>
<td>2005</td>
<td>McGill</td>
<td>Physical workload</td>
<td>Body movement</td>
<td>Staff</td>
<td>10</td>
<td>56</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>266</td>
<td>2005</td>
<td>McGill</td>
<td>Physical workload</td>
<td>L5/S1 loads</td>
<td>Staff</td>
<td>10</td>
<td>56</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>298</td>
<td>2006</td>
<td>Pellino</td>
<td>Time for task</td>
<td>Time taken</td>
<td>Staff</td>
<td>10</td>
<td>55</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>121</td>
<td>2000</td>
<td>Massad</td>
<td>Physical workload</td>
<td>Accident causation measures</td>
<td>Staff</td>
<td>10</td>
<td>55</td>
<td>3.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>138</td>
<td>1983</td>
<td>Stubbs</td>
<td>Physical workload</td>
<td>Intra-abdominal pressures</td>
<td>Staff</td>
<td>10</td>
<td>55</td>
<td>4.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>138</td>
<td>1983</td>
<td>Stubbs</td>
<td>Staff perception</td>
<td>Nurse Comfort</td>
<td>Staff</td>
<td>10</td>
<td>55</td>
<td>4.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>181</td>
<td>1992</td>
<td>Garg</td>
<td>Staff perception</td>
<td>Perceived exertion</td>
<td>Staff</td>
<td>10</td>
<td>55</td>
<td>4.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>181</td>
<td>1992</td>
<td>Garg</td>
<td>Physical workload</td>
<td>Spinal loading</td>
<td>Staff</td>
<td>10</td>
<td>55</td>
<td>4.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>181</td>
<td>1992</td>
<td>Garg</td>
<td>Physical workload</td>
<td>Trunk angles</td>
<td>Staff</td>
<td>10</td>
<td>55</td>
<td>4.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>298</td>
<td>2006</td>
<td>Pellino</td>
<td>Staff perception</td>
<td>Perceived exertion</td>
<td>Staff</td>
<td>10</td>
<td>55</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>159</td>
<td>2000</td>
<td>Zhuang</td>
<td>Staff perception</td>
<td>Subjective Forces</td>
<td>Staff</td>
<td>10</td>
<td>54</td>
<td>4.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>88</td>
<td>1993</td>
<td>Lindbeck</td>
<td>Physical workload</td>
<td>Biomechanical forces</td>
<td>Staff</td>
<td>10</td>
<td>52</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>88</td>
<td>1993</td>
<td>Lindbeck</td>
<td>Staff perception</td>
<td>RPE</td>
<td>Staff</td>
<td>10</td>
<td>52</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>96</td>
<td>1995</td>
<td>Luntley</td>
<td>Physical workload</td>
<td>Staff postures during tasks</td>
<td>Staff</td>
<td>10</td>
<td>52</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>262</td>
<td>2004</td>
<td>Keir</td>
<td>Physical workload</td>
<td>EMG</td>
<td>Staff</td>
<td>10</td>
<td>52</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1994</td>
<td>Holliday</td>
<td>Staff perception</td>
<td>RPE staff</td>
<td>Staff</td>
<td>10</td>
<td>52</td>
<td>4.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>1998</td>
<td>Alexander</td>
<td>Staff perception</td>
<td>Quantitative survey of risk perceptions</td>
<td>Staff</td>
<td>10</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>50</td>
<td>1999</td>
<td>Torri</td>
<td>Physical workload</td>
<td>Risk exposure measurement</td>
<td>Staff</td>
<td>10</td>
<td>2</td>
<td>5</td>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td>143</td>
<td>1994</td>
<td>Owen</td>
<td>Staff perception</td>
<td>Subjective ratings of the staff</td>
<td>Staff</td>
<td>10</td>
<td>50</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>143</td>
<td>1994</td>
<td>Owen</td>
<td>Physical workload</td>
<td>Biomechanical model</td>
<td>Staff</td>
<td>10</td>
<td>50</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>151</td>
<td>1992</td>
<td>Miller</td>
<td>Carer perception</td>
<td>Questionnaire. Subjective responses of carers</td>
<td>Staff</td>
<td>10</td>
<td>5</td>
<td>50</td>
<td>3.5</td>
<td>2</td>
</tr>
<tr>
<td>167</td>
<td>1987</td>
<td>Takala</td>
<td>Staff perception</td>
<td>Subjective view on loads</td>
<td>Staff</td>
<td>10</td>
<td>50</td>
<td>3.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>167</td>
<td>1987</td>
<td>Takala</td>
<td>Physical workload</td>
<td>Postures</td>
<td>Staff</td>
<td>10</td>
<td>50</td>
<td>3.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>302</td>
<td>2001</td>
<td>Walls</td>
<td>Physical workload</td>
<td>Biomechanical relative risk</td>
<td>Staff</td>
<td>10</td>
<td>50</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>1995</td>
<td>Zelenka</td>
<td>Physical workload</td>
<td>Forces to transfer</td>
<td>Staff</td>
<td>10</td>
<td>48</td>
<td>3.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>141</td>
<td>1996</td>
<td>Petzall</td>
<td>Physical workload</td>
<td>Forces</td>
<td>Staff</td>
<td>10</td>
<td>48</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-----</td>
<td>-----------------------------------------------------------------</td>
<td>-----------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>183</td>
<td>1991</td>
<td>Garg</td>
<td>Physical workload</td>
<td>Staff</td>
<td>10</td>
<td>48 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>183</td>
<td>1991</td>
<td>Garg</td>
<td>Staff perception</td>
<td>Subjective opinion of tasks effort</td>
<td>Staff</td>
<td>10</td>
<td>48 4 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>185</td>
<td>1991</td>
<td>Garg</td>
<td>Physical workload</td>
<td>Spinal Loading</td>
<td>Staff</td>
<td>10</td>
<td>48 4 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>185</td>
<td>1991</td>
<td>Garg</td>
<td>Staff perception</td>
<td>Subjective opinion of tasks effort</td>
<td>Staff</td>
<td>10</td>
<td>48 4 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>221</td>
<td>2005</td>
<td>Ferreira</td>
<td>Physical workload</td>
<td>Biomechanical model</td>
<td>Yes</td>
<td>10</td>
<td>2 48 4 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>233</td>
<td>2004</td>
<td>Heacock</td>
<td>Staff perception</td>
<td>RPE for body regions</td>
<td>Staff</td>
<td>10</td>
<td>2 48 3 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>249</td>
<td>2002</td>
<td>Allen</td>
<td>Physical workload</td>
<td>L5/S1 compression</td>
<td>Staff</td>
<td>10</td>
<td>2 48 3 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>2003</td>
<td>Nelson</td>
<td>Staff perception</td>
<td>Comfort</td>
<td>Staff</td>
<td>10</td>
<td>2 48 4 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>2003</td>
<td>Nelson</td>
<td>Physical workload</td>
<td>Lumbar force moment</td>
<td>Staff</td>
<td>10</td>
<td>48 4 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>2003</td>
<td>Nelson</td>
<td>Physical workload</td>
<td>Muscle activity</td>
<td>Staff</td>
<td>10</td>
<td>48 4 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>2003</td>
<td>Nelson</td>
<td>Physical workload</td>
<td>External applied force</td>
<td>Staff</td>
<td>10</td>
<td>48 4 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>293</td>
<td>2006</td>
<td>Michaelis</td>
<td>Staff perception</td>
<td>Perceived work load</td>
<td>Staff</td>
<td>10</td>
<td>48 3 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>116</td>
<td>2000</td>
<td>Wood</td>
<td>Staff perception</td>
<td>Staff perceptions</td>
<td>Staff</td>
<td>10</td>
<td>46 3.5 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>170</td>
<td>1995</td>
<td>Laffin</td>
<td>Physical workload</td>
<td>Biomech Models</td>
<td>Staff</td>
<td>10</td>
<td>46 4 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>145</td>
<td>1987</td>
<td>Owen</td>
<td>Staff perception</td>
<td>Staff perception of risk factors</td>
<td>Staff</td>
<td>10</td>
<td>45 4 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>1998</td>
<td>Engels</td>
<td>Physical workload</td>
<td>OWAS posture scores</td>
<td>Staff</td>
<td>10</td>
<td>5 8 10 44 3 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>1998</td>
<td>Engels</td>
<td>Staff perception</td>
<td>Borg score for perceived exertion</td>
<td>Staff</td>
<td>10</td>
<td>44 3 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>89</td>
<td>1988</td>
<td>Gagnon</td>
<td>Physical workload</td>
<td>Biomechanical model</td>
<td>Staff</td>
<td>10</td>
<td>44 4 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>117</td>
<td>1987</td>
<td>Johnston</td>
<td>Staff perception</td>
<td>Perception of Risks</td>
<td>Staff</td>
<td>10</td>
<td>5 43 3.5 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>133</td>
<td>1995</td>
<td>Stevenson</td>
<td>Physical workload</td>
<td>Biomechanical model</td>
<td>Staff</td>
<td>10</td>
<td>43 3.5 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>166</td>
<td>1987</td>
<td>Torma-Krajewski</td>
<td>Physical workload</td>
<td>Spinal loading</td>
<td>Staff</td>
<td>10</td>
<td>43 2.5 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>1999</td>
<td>Griffith</td>
<td>Staff perception</td>
<td>Interviews to identify perceptions of workload and risk factors</td>
<td>Staff</td>
<td>10</td>
<td>5 42 3 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>102</td>
<td>1982</td>
<td>Scholey</td>
<td>Physical workload</td>
<td>Intra-abdominal pressures</td>
<td>Staff</td>
<td>10</td>
<td>41 4 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>165</td>
<td>1988</td>
<td>Videman</td>
<td>Staff perception</td>
<td>Subjective workload</td>
<td>Staff</td>
<td>10</td>
<td>41 3.5 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>168</td>
<td>1997</td>
<td>Le Bon</td>
<td>Equipment</td>
<td>Physical evaluation</td>
<td>Equip</td>
<td>10</td>
<td>41 3 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>264</td>
<td>2005</td>
<td>Anderson</td>
<td>Physical workload</td>
<td>Lumber load</td>
<td>Staff</td>
<td>10</td>
<td>41 2 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>269</td>
<td>2002</td>
<td>Silvia</td>
<td>Physical workload</td>
<td>Forces on spine</td>
<td>Staff</td>
<td>10</td>
<td>2 7 41 3 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>269</td>
<td>2002</td>
<td>Silvia</td>
<td>Staff perception</td>
<td>Subjective appraisal</td>
<td>Staff</td>
<td>10</td>
<td>41 3 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>270</td>
<td>1999</td>
<td>Bohannon</td>
<td>Physical workload</td>
<td>Forces to pull</td>
<td>Staff</td>
<td>10</td>
<td>2 7 41 4 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>280</td>
<td>2002</td>
<td>Owen</td>
<td>Staff perception</td>
<td>RPE shoulder</td>
<td>Staff</td>
<td>10</td>
<td>41 4 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>280</td>
<td>2002</td>
<td>Owen</td>
<td>Staff perception</td>
<td>RPE back</td>
<td>Staff</td>
<td>10</td>
<td>41 4 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>292</td>
<td>2006</td>
<td>Fray</td>
<td>Physical workload</td>
<td>Observed movement</td>
<td>Staff</td>
<td>10</td>
<td>2 41 3 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>292</td>
<td>2006</td>
<td>Fray</td>
<td>Staff perception</td>
<td>Carer comfort</td>
<td>Staff</td>
<td>10</td>
<td>41 3 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>1994</td>
<td>Lee</td>
<td>Staff perception</td>
<td>Risk factors questionnaire</td>
<td>Staff</td>
<td>10</td>
<td>39 3.5 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>1994</td>
<td>Lee</td>
<td>PH techniques</td>
<td>Model for Handling capacity</td>
<td>Staff</td>
<td>10</td>
<td>39 3.5 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>171</td>
<td>1995</td>
<td>Lee</td>
<td>Physical workload</td>
<td>Postures OWAS</td>
<td>Staff</td>
<td>10</td>
<td>39 3.5 2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

427
<table>
<thead>
<tr>
<th></th>
<th>Year</th>
<th>Author</th>
<th>Study Type</th>
<th>Outcome</th>
<th>Measure</th>
<th>Occupation</th>
<th>Score</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>171</td>
<td>1995</td>
<td>Lee</td>
<td>Physical workload</td>
<td>Biomechanical Force</td>
<td>Staff</td>
<td>10</td>
<td>39</td>
<td>3.5</td>
</tr>
<tr>
<td>207</td>
<td>1986</td>
<td>Alavosius</td>
<td>Staff perception</td>
<td>Subjective feedback of intervention</td>
<td>Staff</td>
<td>10</td>
<td>39</td>
<td>3</td>
</tr>
<tr>
<td>99</td>
<td>1985</td>
<td>Rodgers</td>
<td>Staff perception</td>
<td>Staff risk perception</td>
<td>Staff</td>
<td>10</td>
<td>5</td>
<td>38</td>
</tr>
<tr>
<td>214</td>
<td>2006</td>
<td>Tamminen, Peter</td>
<td>Physical workload</td>
<td>EMG</td>
<td>Staff</td>
<td>10</td>
<td>37</td>
<td>2</td>
</tr>
<tr>
<td>214</td>
<td>2006</td>
<td>Tamminen, Peter</td>
<td>Staff perception</td>
<td>RPE Borg</td>
<td>Staff</td>
<td>10</td>
<td>37</td>
<td>2</td>
</tr>
<tr>
<td>229</td>
<td>1996</td>
<td>Weinel</td>
<td>Staff perception</td>
<td>Subjective perceptions of hazards</td>
<td>Staff</td>
<td>10</td>
<td>36</td>
<td>4</td>
</tr>
<tr>
<td>169</td>
<td>1996</td>
<td>Love</td>
<td>Incident/Accident</td>
<td>Factors in accident</td>
<td>Staff</td>
<td>10</td>
<td>36</td>
<td>4</td>
</tr>
<tr>
<td>178</td>
<td>1987</td>
<td>Khalil</td>
<td>Physical workload</td>
<td>Biomechanical loading</td>
<td>Staff</td>
<td>10</td>
<td>36</td>
<td>3</td>
</tr>
<tr>
<td>23</td>
<td>1991</td>
<td>Wright A</td>
<td>Physical workload</td>
<td>EMG recordings for action</td>
<td>Staff</td>
<td>10</td>
<td>35</td>
<td>2.5</td>
</tr>
<tr>
<td>216</td>
<td>1987</td>
<td>Gagnon</td>
<td>Physical workload</td>
<td>Biomechanical models</td>
<td>Staff</td>
<td>10</td>
<td>35</td>
<td>4</td>
</tr>
<tr>
<td>216</td>
<td>1987</td>
<td>Gagnon</td>
<td>Physical workload</td>
<td>Muscle activity</td>
<td>Staff</td>
<td>10</td>
<td>35</td>
<td>4</td>
</tr>
<tr>
<td>113</td>
<td>2000</td>
<td>Pan</td>
<td>Physical workload</td>
<td>Low back biomechanics</td>
<td>Staff</td>
<td>10</td>
<td>33</td>
<td>3</td>
</tr>
<tr>
<td>113</td>
<td>2000</td>
<td>Pan</td>
<td>Staff perception</td>
<td>RPE</td>
<td>Staff</td>
<td>10</td>
<td>33</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>1995</td>
<td>Meyer</td>
<td>Staff perception</td>
<td>Questionnaires to staff using hoists</td>
<td>Equip</td>
<td>10</td>
<td>32</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>1995</td>
<td>Meyer</td>
<td>Staff perception</td>
<td>Practical evaluations in lab settings</td>
<td>Equip</td>
<td>10</td>
<td>32</td>
<td>4</td>
</tr>
<tr>
<td>33</td>
<td>1990</td>
<td>McGill</td>
<td>Physical workload</td>
<td>Biomechanical loading model</td>
<td>Staff</td>
<td>10</td>
<td>32</td>
<td>3.5</td>
</tr>
<tr>
<td>97</td>
<td>2000</td>
<td>Robertson</td>
<td>Physical workload</td>
<td>Forces to slide using slide sheets</td>
<td>Staff</td>
<td>10</td>
<td>32</td>
<td>3</td>
</tr>
<tr>
<td>109</td>
<td>2000</td>
<td>Kothiyal</td>
<td>Physical workload</td>
<td>Muscle activity EMG</td>
<td>Staff</td>
<td>10</td>
<td>32</td>
<td>4</td>
</tr>
<tr>
<td>109</td>
<td>2000</td>
<td>Kothiyal</td>
<td>Staff perception</td>
<td>RPE</td>
<td>Staff</td>
<td>10</td>
<td>32</td>
<td>4</td>
</tr>
<tr>
<td>114</td>
<td>2000</td>
<td>Kato</td>
<td>Time for task</td>
<td>Task efficiency</td>
<td>Task</td>
<td>10</td>
<td>32</td>
<td>2</td>
</tr>
<tr>
<td>92</td>
<td>1996</td>
<td>Green</td>
<td>Staff perception</td>
<td>Staff perceptions of risk factors</td>
<td>Staff</td>
<td>10</td>
<td>31</td>
<td>3</td>
</tr>
<tr>
<td>101</td>
<td>1979</td>
<td>Stubbs</td>
<td>Physical workload</td>
<td>Biomechanical load on staff</td>
<td>Staff</td>
<td>10</td>
<td>31</td>
<td>4</td>
</tr>
<tr>
<td>176</td>
<td>185</td>
<td>Kilborn</td>
<td>Physical workload</td>
<td>Forces on staff</td>
<td>Staff</td>
<td>10</td>
<td>26</td>
<td>7</td>
</tr>
<tr>
<td>297</td>
<td>2003</td>
<td>McFarlane</td>
<td>Physical workload</td>
<td>Force</td>
<td>Staff</td>
<td>10</td>
<td>2</td>
<td>27</td>
</tr>
<tr>
<td>304</td>
<td>2002</td>
<td>Connelly</td>
<td>Staff use of equipment</td>
<td>Ease of use</td>
<td>Staff</td>
<td>10</td>
<td>27</td>
<td>3</td>
</tr>
<tr>
<td>28</td>
<td>1997</td>
<td>Tracey</td>
<td>Physical workload</td>
<td>Forces to slide</td>
<td>Staff</td>
<td>10</td>
<td>26</td>
<td>3</td>
</tr>
<tr>
<td>289</td>
<td>2005</td>
<td>Murphy</td>
<td>Physical workload</td>
<td>Postures REBA</td>
<td>Staff</td>
<td>10</td>
<td>26</td>
<td>3</td>
</tr>
<tr>
<td>289</td>
<td>2005</td>
<td>Murphy</td>
<td>Physical workload</td>
<td>Number tasks observed</td>
<td>Staff</td>
<td>10</td>
<td>26</td>
<td>3</td>
</tr>
<tr>
<td>308</td>
<td>2008</td>
<td>Bar-Niv</td>
<td>Physical workload</td>
<td>Biomech load</td>
<td>Staff</td>
<td>10</td>
<td>58</td>
<td>26</td>
</tr>
<tr>
<td>18</td>
<td>1999</td>
<td>Bertollazzi</td>
<td>Physical workload</td>
<td>load per worker</td>
<td>Staff</td>
<td>10</td>
<td>25</td>
<td>2</td>
</tr>
<tr>
<td>287</td>
<td>2001</td>
<td>Spencer</td>
<td>Physical workload</td>
<td>Force</td>
<td>Staff</td>
<td>10</td>
<td>27</td>
<td>3</td>
</tr>
<tr>
<td>288</td>
<td>2002</td>
<td>Hunter</td>
<td>Physical workload</td>
<td>Force</td>
<td>Staff</td>
<td>10</td>
<td>27</td>
<td>3</td>
</tr>
<tr>
<td>288</td>
<td>2002</td>
<td>Hunter</td>
<td>Staff perception</td>
<td>RPE</td>
<td>Staff</td>
<td>10</td>
<td>23</td>
<td>3</td>
</tr>
<tr>
<td>129</td>
<td>1998</td>
<td>Collins</td>
<td>Physical workload</td>
<td>Biomechanics model Lumb Motion Mon</td>
<td>Staff</td>
<td>10</td>
<td>19</td>
<td>2</td>
</tr>
</tbody>
</table>
Section 12 Financial

<table>
<thead>
<tr>
<th>Paper No</th>
<th>Date</th>
<th>Author</th>
<th>Outcome</th>
<th>Outcomes measures</th>
<th>Beneficiary</th>
<th>Ranked outcome list 1-12</th>
<th>QR score %</th>
<th>PR score</th>
<th>Robson score</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>1998</td>
<td>Fazel</td>
<td>Financial</td>
<td>Financial evaluation</td>
<td>Org</td>
<td>12</td>
<td>po</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>263</td>
<td>2005</td>
<td>Chokhar</td>
<td>Financial</td>
<td>Costs</td>
<td>Org</td>
<td>12</td>
<td>91</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>87</td>
<td>1997</td>
<td>Charney</td>
<td>Financial</td>
<td>Compensation costs</td>
<td>Org</td>
<td>12</td>
<td>72</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>210</td>
<td>2006</td>
<td>Nelson</td>
<td>Financial</td>
<td>Cost benefit</td>
<td>Org</td>
<td>12</td>
<td>70</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>251</td>
<td>2003</td>
<td>Passfield</td>
<td>Financial</td>
<td>Costs</td>
<td>Org</td>
<td>12</td>
<td>67</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>199</td>
<td>1993</td>
<td>Charney</td>
<td>Financial</td>
<td>Financial impact</td>
<td>Org</td>
<td>12</td>
<td>61</td>
<td>3.5</td>
<td>3</td>
</tr>
<tr>
<td>240</td>
<td>2006</td>
<td>Millar</td>
<td>Financial</td>
<td>Injury costs</td>
<td>Org</td>
<td>12</td>
<td>59</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>296</td>
<td>2004</td>
<td>Collins</td>
<td>Financial</td>
<td>Workers compensation claims</td>
<td>Org</td>
<td>12</td>
<td>2 4 5 10 12</td>
<td>59</td>
<td>5</td>
</tr>
<tr>
<td>296</td>
<td>2004</td>
<td>Collins</td>
<td>Financial</td>
<td>Cost benefit analysis</td>
<td>Org</td>
<td>12</td>
<td>59</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>82</td>
<td>1999</td>
<td>Evanoff</td>
<td>Financial</td>
<td>Compensation costs</td>
<td>Org</td>
<td>12</td>
<td>58</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>250</td>
<td>2008</td>
<td>Charney</td>
<td>Financial</td>
<td>Costs</td>
<td>Org</td>
<td>12</td>
<td>52</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>227</td>
<td>2005</td>
<td>Hefti</td>
<td>Financial</td>
<td>Costs of injuries</td>
<td>Org</td>
<td>12</td>
<td>44</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>268</td>
<td>2003</td>
<td>O'Reilly</td>
<td>Financial</td>
<td>Costs</td>
<td>Org</td>
<td>12</td>
<td>44</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>313</td>
<td>2002</td>
<td>Spiegel</td>
<td>Financial</td>
<td>Costs</td>
<td>Org</td>
<td>12</td>
<td>44</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>198</td>
<td>1991</td>
<td>Charney</td>
<td>Financial</td>
<td>Financial impact</td>
<td>Org</td>
<td>12</td>
<td>37</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>324</td>
<td>2004</td>
<td>Guthrie</td>
<td>Financial</td>
<td>Costs</td>
<td>Org</td>
<td>12</td>
<td>37</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>1994</td>
<td>Santoro</td>
<td>Financial</td>
<td>Financial</td>
<td>Org</td>
<td>12</td>
<td>35</td>
<td>2.5</td>
<td>3</td>
</tr>
<tr>
<td>281</td>
<td>2006</td>
<td>Joseph</td>
<td>Financial</td>
<td>Costs</td>
<td>Org</td>
<td>12</td>
<td>33</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>303</td>
<td>2004</td>
<td>Victoria Aus</td>
<td>Financial</td>
<td>Cost benefit analysis</td>
<td>Org</td>
<td>12</td>
<td>33</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>232</td>
<td>2007</td>
<td>Morgan</td>
<td>Financial</td>
<td>Costs</td>
<td>Org</td>
<td>12</td>
<td>30</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>267</td>
<td>2004</td>
<td>Siguardsso</td>
<td>Financial</td>
<td>Costs</td>
<td>Org</td>
<td>12</td>
<td>2</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>31</td>
<td>1997</td>
<td>Quintana</td>
<td>Financial</td>
<td>Cost evaluation</td>
<td>Org</td>
<td>12</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
APPENDIX H

Accepted version of IET (Viii)
**Intervention Evaluation Tool (IET)**

The Intervention Evaluation Tool is a single measurement device for measuring how well the risks of patient handling are being managed within an organisation. Many tools have previously been created and used for measuring specific aspects of patient handling and the management of the aspects of risk. This process and score system will give a range of scores and a single overall IET score that will allow different areas from the same organisation to be compared and for different organisations to be compared. The structure of the IET has been developed by a partnership project completed by Loughborough University and ArjoHuntleigh ab Sweden.

The different areas for investigation have been developed from a series of studies in 4 European countries and a series of expert panels in Europe, the US and Australia. This resulted in a wide range of intended outcomes which were then ranked for importance. The 12 highest ranked outcomes are included in the IET.

The IET includes a set of data collection tools. These have been derived from a detailed literature review that identified tools used to measure outcomes in peer reviewed studies of patient handling interventions.

The outcomes included in the IET are:

<table>
<thead>
<tr>
<th>Preferred outcome</th>
<th>Quality Measured</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Safety culture</td>
<td>PHOQS documentation review for safety culture</td>
</tr>
<tr>
<td>2 MSD measures</td>
<td>Nordic MSD Questionnaire</td>
</tr>
<tr>
<td>3 Competence and compliance</td>
<td>Observational checklist and DINO</td>
</tr>
<tr>
<td>4 Absence or staff health</td>
<td>Sickness absence data Standardised data per population</td>
</tr>
<tr>
<td>5 Quality of care</td>
<td>Meeting the need of the patient and improving care delivery</td>
</tr>
<tr>
<td>6 Accident numbers</td>
<td>Standardised numbers of accidents Scale for level of non-reporting</td>
</tr>
<tr>
<td>7 Psychological well being</td>
<td>Job satisfaction and psychosocial stressors</td>
</tr>
<tr>
<td>8 Patient condition</td>
<td>Meeting the need of the patient and improving care delivery</td>
</tr>
<tr>
<td>9 Patient perception</td>
<td>Comfort Security/Fear</td>
</tr>
<tr>
<td>10 MSD exposure measures</td>
<td>Self reported exposure logs</td>
</tr>
<tr>
<td>11 Patient injuries</td>
<td>Avoidance of impairment</td>
</tr>
<tr>
<td>12 Financial</td>
<td>Calculation of costs and losses vs benefits</td>
</tr>
</tbody>
</table>
The IET Guidebook

The format of this document is to assist the information collection and the process of assessing a specific location to complete the IET and obtain:

a) Scores for each of the 12 outcome measures
b) A single value for the IET

These can be compared against other organisations, or parts of the same organisation, or be used over time to assess the progress of the management system.

The IET is a complex measure and requires the involvement of a number of different individuals to collect and co-ordinate the assessment:

The Observer: A person, external to the organisation being investigated, experienced in the management of patient handling systems who co-ordinates the IET process.

The Patient Handling Advisor: The most senior person responsible for patient handling inputs, advice and monitoring.

Senior Nurse: The person responsible for managing care delivery on the day of the assessment.

Local Patient Handling Advisor: A link worker, patient handling trainer, risk assessor or ergo-coach employed in the ward or unit.

Other people will be required to provide information, e.g. staff, patients, advocates and specialist staff from other parts of the organisation.

Part A: 12 outcome measurement tools

A long term study using patient handling specialists from several countries ranked the 12 most valued outcomes from a series of focus groups. Those 12 outcomes are listed in priority order with safety culture being the most important. A data collection system and scoring method has been devised for each of the 12 outcomes and is supported by guidance notes. The scoring system for calculating the total IET score is included.

Part B: Sets of data collection sheets

The collection of information to calculate the IET requires varied information from a range of sources. The collection process has been simplified to approach each participant once and collect all the information in a single visit. Each section includes guidance notes for data collection, definitions of terminology, inclusion and exclusion criteria

IET Summary Sheet.
A front sheet is required to collate the names and contact details for all the individuals collecting the data and general details about the ward or unit being assessed

Data Set 1. Organisational Review
The Observer (or Patient Handling Advisor) to collect information about, accidents incidents and the costs of MSD in the area being investigated. This will be gathered through the specialist advisors in the organisation e.g. HR,H&S, ward manager, handling advisors.

*Data Set 2. Safety Culture Audit*

The Observer will need to visit the chosen area and conduct a Patient Handling Safety Culture Audit (mostly section 1) which requires the area manager or senior healthcare person to show documentary evidence that a safe system of work is in place.

*Data Set 3. Patient Handling Transfer Observation*

The Observer (and or Patient Handling Advisor) is required to observe 10 patient transfers for a ward or unit with up to 50 beds with 24 hour occupancy. This number increases by a ratio of 10 observations to every 50 beds for each bed over 50. E.g. 70 beds =14 observations, 100 beds = 20 observations. The task observed will be scored for competence and compliance with the organisations safe systems of work. Part of the observation of the task requires some brief questions for the carer and the person being assisted. After each observation The Observer (and or PHA) will be required to distribute and collect a series of simple questionnaires as part of the assessment of patient transfers. For each transfer one member of the care team and one patient will complete a separate questionnaire. If the patient is unable to complete the form, it will be removed from the survey.

*Data Set 4. Ward/unit survey*

The final part of the data collection is to complete a staff and patient survey of the ward/unit. A Staff Questionnaire and a Patient Questionnaire collect data relating to the health and compliance status of the staff and the subjective experiences of the patients being assisted.
Scoring the IET

The data from all sheets in the survey are entered into an excel spreadsheet, scores for each section will be developed for comparison and the overall IET score. According to their ranking, each section will contribute in the following ratio.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Conversion factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Culture</td>
<td>12</td>
</tr>
<tr>
<td>MSD measures</td>
<td>11</td>
</tr>
<tr>
<td>Competence Compliance</td>
<td>10</td>
</tr>
<tr>
<td>Absence or staff health</td>
<td>9</td>
</tr>
<tr>
<td>Quality of care</td>
<td>8</td>
</tr>
<tr>
<td>Accident numbers</td>
<td>7</td>
</tr>
<tr>
<td>Psychological well being</td>
<td>6</td>
</tr>
<tr>
<td>Patient condition</td>
<td>5</td>
</tr>
<tr>
<td>Patient perception</td>
<td>4</td>
</tr>
<tr>
<td>MSD exposure measures</td>
<td>3</td>
</tr>
<tr>
<td>Patient injuries</td>
<td>2</td>
</tr>
<tr>
<td>Financial</td>
<td>1</td>
</tr>
<tr>
<td>Total score</td>
<td>78</td>
</tr>
</tbody>
</table>

Each section will be calculated as percentage performance scores and the conversion factors above will be used to calculate the IET as a percentage score out of the total score (78).
Section 1 Safety Culture

Collection method:
- Observer to interview unit manager or senior staff member for Questions 1-11.
- Question 12 to be given to manager, PHA, BCA, H&S advisor and staff

Number of forms completed:
- One interview document
- Repeated Question 12

General Information:
The data for safety culture will be collected mostly from an interview with the ward/unit manager.

Questions 1-10 overleaf constitute the main body of the audit. This tool is entirely based on the Patient Handling Observational Question Set (PHOQS) tool devised and evaluated by Hignett and Crumpton 2005. The scores can only be allowed if documented evidence is seen by the Observer. This is particularly relevant when discussing the communication based questions (9 and 10).

An additional question (11), the subjective appraisal of commitment is added as an average score from the total of the responses recorded.

The total from 35 is calculated as a percentage and included in the IET total score.

Calculation: Modified PHOQS Ratio (Safety Culture 1)

\[ \text{Modified PHOQS score:} \]
\[ = \text{PHOQS score} \times \text{Commitment average score} \]

\[ \text{Modified PHOQS Ratio} = \frac{\text{Modified PHOQS score}}{120} = \text{as%} \]
## Section 1 Safety Culture

<table>
<thead>
<tr>
<th>Question</th>
<th>Scoring Categories</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Have you had an internal manual handling audit within the last 2 years?</td>
<td>Yes 1</td>
<td></td>
</tr>
<tr>
<td>2  Was your last internal manual handling audit:</td>
<td>Only 1 score</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• A service provision audit (organisation)</td>
<td>Yes 2</td>
</tr>
<tr>
<td></td>
<td>• An equipment or training audit</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• Local monitoring and supervision</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• None</td>
<td>Yes 0</td>
</tr>
<tr>
<td>3  Do you have a general manual handling risk assessment system?</td>
<td>Only 1 score</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Is it:</td>
<td>Yes 2</td>
</tr>
<tr>
<td></td>
<td>• Organisation wide</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• Local Level</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• Task-specific</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• No risk assessment system</td>
<td>Yes 0</td>
</tr>
<tr>
<td>4  Are completed manual handling risk assessments held:</td>
<td>Only 1 score</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Centrally</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• Locally</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• Both</td>
<td>Yes 2</td>
</tr>
<tr>
<td></td>
<td>• No completed risk assessment system</td>
<td>Yes 0</td>
</tr>
<tr>
<td>5  Are manual handling risk assessments reviewed at least annually?</td>
<td>Only 1 score</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Yes if yes, go to question 6a</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• No</td>
<td>No 0</td>
</tr>
<tr>
<td>5a Is the review system:</td>
<td>Only 1 score</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Formal</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• Informal</td>
<td>Yes 0</td>
</tr>
<tr>
<td>6  Are patient mobility assessments held in:</td>
<td>Only 1 score</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Care plans</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• Separate forms</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• Both</td>
<td>Yes 1</td>
</tr>
<tr>
<td>7  Are patient mobility assessments held:</td>
<td>Only 1 score</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• With the patient</td>
<td>Yes 2</td>
</tr>
<tr>
<td></td>
<td>• Separately (if yes go to question 8a)</td>
<td>Yes 1</td>
</tr>
<tr>
<td>7a If they are held separately, is there a reason?</td>
<td>Yes 1</td>
<td></td>
</tr>
<tr>
<td>8  Do you have appointed manual handling supervisors?</td>
<td>Only 1 score</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• For all wards and departments</td>
<td>Yes 2</td>
</tr>
<tr>
<td></td>
<td>• For some wards and departments</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>• No</td>
<td>No 0</td>
</tr>
<tr>
<td>9  How is contact maintained with the manual handling supervisors and</td>
<td>Score 1 for each</td>
<td></td>
</tr>
<tr>
<td></td>
<td>their competence ensured?</td>
<td>Max 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Formal training sessions</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>Formal staff meetings</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>Informal meetings initiated by back care advisor</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>Informal meetings initiated by manual handling supervisor</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>Ad-hoc meetings</td>
<td>Yes 1</td>
</tr>
<tr>
<td>10</td>
<td>How do the manual handling supervisors maintain contact with the staff and ensure their competence?</td>
<td>Score 1 for each (Max 10)</td>
</tr>
<tr>
<td></td>
<td>Training records</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>Assessing the quality of patient mobility assessments</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>Entries in patient records/notes</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>Ward meetings/handover</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>Personal development plans</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>Problem-solving sessions/documenting supervision</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>Case conferences/multidisciplinary meetings</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>Electronic format training/training pack/workbook</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>Informal documentation</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>Other (e.g. memos)</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PHOQS Score (30)</td>
</tr>
<tr>
<td>11</td>
<td>In terms of personnel, time and financial commitment, how well do you think the Org/Dept/Area supports the patient handling programme.</td>
<td>++ 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Neutral 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-- 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Calculate average score)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total section score (120)</td>
</tr>
</tbody>
</table>
Section 2 MSD Injury rates. (Simplified Nordic MSD Questionnaire)

Collection method:
- All information collected by self-completed questionnaire given to staff in unit

Number of forms completed:
- Collect completed forms from 50% of the WTE numbers on the unit.
- The Observer must record the number of staff absent with MSD at the time of the survey and include numbers in the calculation

General information:
The Nordic MSD questionnaire is a familiar tool. The simple version, reporting only recent MSD's is being used to provide an overall picture of MSD.

The calculation for the IET records any MSD as a negative score and any inclusions will add to the total prevalence.

Any response in the column A scores 1, any score in the column B scores 2 and any response in the time off column, C, scores 3. The worst score in any body part section = 6. When completing the IET the worst scoring row in each form will be added to the total. Therefore if all staff have had some time off in the past 12 months they will record a 100% prevalence score (6).

Calculation: MSD Injury Rate (Section 2)

MSD Injury Rate =

\[
\frac{\text{Total score of worst row totals}}{\text{Number of forms included}} \div 6 = \text{as%}
\]
### Section 2  MSD Injury rates.

<table>
<thead>
<tr>
<th>A. Have you at any time during the last 12 months had trouble (such as ache, pain, discomfort, numbness) in:</th>
<th>B. Have you had trouble during the last 7 days?</th>
<th>C. During the last 12 months have you been prevented from carrying out your normal activities or job or been absent because of this trouble?</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck</td>
<td>Neck</td>
<td>Neck</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Shoulders</td>
<td>Shoulders</td>
<td>Shoulders (Both/Either)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Yes Right Sh Yes Left Sh Yes Both Sh</td>
<td>No</td>
<td>Yes Right Sh Yes Left Sh Yes Both Sh</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes Right Sh Yes Left Sh Yes Both Sh</td>
<td>No</td>
<td>Yes Right Sh Yes Left Sh Yes Both Sh</td>
</tr>
<tr>
<td>Elbows</td>
<td>Elbows</td>
<td>Elbows (Both/Either)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Yes Right Sh Yes Left Sh Yes Both Sh</td>
<td>No</td>
<td>Yes Right Sh Yes Left Sh Yes Both Sh</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes Right Sh Yes Left Sh Yes Both Sh</td>
<td>No</td>
<td>Yes Right Sh Yes Left Sh Yes Both Sh</td>
</tr>
<tr>
<td>Wrist or Hands</td>
<td>Wrist or Hands</td>
<td>Wrist/Hands(Both/Either)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Yes Right Sh Yes Left Sh Yes Both Sh</td>
<td>No</td>
<td>Yes Right Sh Yes Left Sh Yes Both Sh</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes Right Sh Yes Left Sh Yes Both Sh</td>
<td>No</td>
<td>Yes Right Sh Yes Left Sh Yes Both Sh</td>
</tr>
<tr>
<td>Upper Back</td>
<td>Upper Back</td>
<td>Upper Back</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Lower Back</td>
<td>Lower Back</td>
<td>Lower Back</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Hips Thighs or Buttocks</td>
<td>Hips Thighs or Buttocks</td>
<td>Hips Thighs or Buttocks</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Knees</td>
<td>Knees</td>
<td>Knees</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Ankles or Feet</td>
<td>Ankles or Feet</td>
<td>Ankles or Feet</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Worst line score**
Section 3 Competence and compliance (DINO)

Collection method:
- Observer (or Patient Handling Advisor) to watch a selected transfer make judgements on Questions 1-16
- It may be necessary to interview the Senior Nurse for Questions 17-18

Number of forms completed:
- The observed transfers will be selected on a convenience basis. Observations should be taken for 25% of the patients in the unit over a 24 hour period (32 Patients= 8 observations). A minimum of 5 transfers should be observed in any assessment.

General Information:
DINO gives a reliable method for assessing the basic competency of the staff in the completion of a single observed transfer.

The checklist gives a score for preparation, completion and result phases of the chosen transfer which allows for comparison between different units or hospitals. The additional questions relate more to the issue of compliance with identified practice or simply following the risk assessment or documented handling plan.

The calculation of the DINO score is a summed total from 16 points. This total is then modified by the two multiplier scores. The Adapted DINO is totalled for the final score below.

Calculation: Competence and Compliance (Adapted DINO Section 3)

Competence and Compliance Score =

\[ \text{Competence and Compliance Score} = \frac{\text{Sum of Adapted DINO Scores}}{\text{No. of Observations}} \]
## Section 3 Competence and compliance

<table>
<thead>
<tr>
<th>Items</th>
<th>Score System</th>
<th>Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Preparation phase</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Is the patient encouraged to cooperate appropriately?</td>
<td>0 1</td>
<td>No Yes</td>
</tr>
<tr>
<td>2. Is enough space prepared for the transfer?</td>
<td>0 1</td>
<td>No Yes</td>
</tr>
<tr>
<td>3. Wheelchair, and other objects that the patient is transferred between, positioned and locked away correctly?</td>
<td>0 1</td>
<td>No Yes</td>
</tr>
<tr>
<td>4. Is the height of the bed correct?</td>
<td>0 1</td>
<td>No Yes</td>
</tr>
<tr>
<td>5. Use of transferring aid(s)?</td>
<td>0 1</td>
<td>No Yes</td>
</tr>
<tr>
<td>6. Correct use of the transferring aid(s)?</td>
<td>0 1</td>
<td>No Yes</td>
</tr>
<tr>
<td>7. Are there enough staff?</td>
<td>0 1</td>
<td>No Yes</td>
</tr>
<tr>
<td><strong>Actual performance phase</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Good balance</td>
<td>0 1 2 3 4</td>
<td>0-4 0-1</td>
</tr>
<tr>
<td>9. Good coordination</td>
<td>0 1 2 3 4</td>
<td>0-4 0-1</td>
</tr>
<tr>
<td>10. Good movement economy</td>
<td>0 1 2 3 4</td>
<td>0-4 0-1</td>
</tr>
<tr>
<td>11. How is the load on the back and the shoulders?</td>
<td>0 1 2 3 4</td>
<td>0-4 0-1</td>
</tr>
<tr>
<td>12. To what extent are the criteria in communication and interaction with the patient fulfilled?</td>
<td>0 1 2 3 4</td>
<td>0-4 0-1</td>
</tr>
<tr>
<td>13. Is the patient allowed to participate according to her/his ability to perform voluntary movements?</td>
<td>0 1 2 3 4</td>
<td>0-4 0-1</td>
</tr>
<tr>
<td><strong>Result phase</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Does the transfer technique chosen by the nurse cause any pain to the patient?</td>
<td>0 1</td>
<td>Yes No</td>
</tr>
<tr>
<td>15. Does the transfer technique chosen by the nurse cause any feelings of fear or uncertainty in the patient?</td>
<td>0 1</td>
<td>Yes No</td>
</tr>
<tr>
<td>16. Is the patient in a functional position at the end of the transfer?</td>
<td>0 1</td>
<td>Yes No</td>
</tr>
<tr>
<td><strong>DINO Score</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(16)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>After the task has been completed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Does the ward/dept have a specific handling plan for the of transfer completed?</td>
<td>0 1</td>
<td>Yes then x 1 No then x 0.5</td>
</tr>
<tr>
<td>18. Did the action observed meet the specific handling plan fully?</td>
<td>0 1</td>
<td>Fully x 1, Mostly x 0.875 Reasonable x 0.75, Hardly at all x 0.625, Not at all x 0.5.</td>
</tr>
</tbody>
</table>
Section 4 Standardised MSD sickness absence score

Collection method:
- Observer (or Patient Handling Advisor) to interview senior nurse for all questions.
- Some data may not be accessible on the ward/unit and questions may need to be referred to HR, personnel or central data systems.

Number of forms completed:
- One interview document

General Information:
The ratio of recorded MSD sickness absence to the number of possible hours worked in the unit is represented in this section. The number of sickness absence days and reduced capacity days is recorded from the management systems and compared against the OSHA defined hours worked ratio. This needs additional information for the total hours delivered in the unit for 1 year against the total possible for 100 staff in 1 year. The resulting ratio gives a comparable value of lost time as a ratio of the hours worked.

Calculation:

a) Time lost [9] =

(Sum of the days lost [6]) + (25% of Days on reduced capacity [8])

b) Ratio score = Time lost [9] x OSHA Work Hours Factor

\[
\text{Time lost [9]} \times \frac{\text{Totals work for 100 staff} \ (100 \times [1] \times [2])}{\text{Total productive hours} \ ([3] \times 52)}
\]
Section 4 Standardised MSD sickness absence score

Total available hours for ward/unit:

Full weeks per year on standard contract ----------------------- [1]

Full hours per week on standard contract ----------------------- [2]

Actual hours worked per week on unit ----------------------- [3]

Number of W.T.E employed at present on ward/unit ----------------------- [4]

Number of days lost due to MSD:

Number of episodes of MSD caused by patient handling or physical care incidents. ----------------------- [5]

Total days lost because of above for previous 12 months ----------------------- [6]

Number of staff that have returned on reduced work capacity due to episodes of MSD ----------------------- [7]

Total days worked on reduced capacity for previous 12 months ----------------------- [8]
Section 5. Patient Handling Exposure Quality Measure

Collection method:
- Patient Handling Advisor to interview a number of patients who have been assisted to move.
- The questions will be delivered verbally and large print cards will be available for the Likert scales. Observer to record answers.
- It is acceptable to use a patient's advocate to assist in data collection where appropriate.

Number of forms completed:
- One score sheet document per patient
- 25% of patients that receive assistance with movement will be included in the survey. Every attempt will be made not to include the patients that are included in the observations. A minimum of 5 forms must be completed.

General Information:
This section aims to quantify the specific factors around the effect that patient handling may have on the perception of quality of care. To keep the data collection as straightforward as possible there are a minimal number of questions for the patient.

Where it is impossible to collect judgement from the patient population 100% compliance scores shall be inserted

The data and score for this section overlaps with the scores in section 8, 9 and 11. It contributes to the combination factor, 'Quality of Care' in the wider context of healthcare.

Calculation: Patient Handling Exposure Quality Measure (Section 5)

\[
\text{Patient Handling Exposure Quality Measure} = \frac{\text{Total scores form all forms}}{25 \times \text{No. of forms}} = \text{as } \% \n\]
### Section 5. Quality of Care Measure

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel secure when the staff assist me to move</td>
<td>Never Hardly Ever Sometimes Mostly Always</td>
<td></td>
</tr>
<tr>
<td>I feel comfortable when the staff assist me to move</td>
<td>Never Hardly Ever Sometimes Mostly Always</td>
<td></td>
</tr>
<tr>
<td>The staff talk to me and give me verbal information when they assist me to move</td>
<td>Never Hardly Ever Sometimes Mostly Always</td>
<td></td>
</tr>
<tr>
<td>The staff ask my permission before they assist me to move</td>
<td>Never Hardly Ever Sometimes Mostly Always</td>
<td></td>
</tr>
<tr>
<td>My personal needs and requirements for dignity and decency are met when I am assisted to move</td>
<td>Never Hardly Ever Sometimes Mostly Always</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Section 6 Patient handling staff accident numbers

Collection method:
- Observer to interview unit manager or Senior Nurse for Questions 1-2.
- Question 3-6 will be given to the staff as part of the questionnaire for them to complete 50% of working population.

Number of forms completed:
- One interview document
- Repeated answers to Question 3-6, from staff questionnaire

General Information:
The inclusion of incident numbers that have patient handling factors is unclear and complex. The score system includes scores for non-reporting by the unit manager and self reports of unsafe practice by the staff. The score should be negative for units with a lot of accidents and those with poor practice and poor reporting. There is a check question in the data [3] to detect if too many people report completing an incident form. In this case the data is erroneous and should be removed from the survey.

Calculation: Patient handling staff accident numbers (Section 6)

a) Number of reported PH incidents =
   Number reported [1] x Ratio of none reported [2]

b) Potential PH incidents =
   Sum of [4] + [5] + [6] for all participants

c) Incident score =
   \[
   \frac{\text{Reported PH incidents (a)} + \text{Potential PH incidents (b)}}{\text{Number WTE on unit}}
   \]

d) IET inclusion score = 1 - (c) as %

NB If total sum of 3 > [1] give 100% score or re-conduct survey?
Section 6  Patient handling accident numbers

Questions for incident reporting system (local manager):

How many PH incidents/accidents have been reported over last 12 months

---------------------------------- [1]

In your opinion are some PH incidents not reported especially if they do not result in an injury or damage to equipment?

What is the ratio of under-reporting of PH incidents 1 in -------------- [2]

Questions to staff as part of Questionnaire:

In the last 12 months have you reported a patient handling accident on the incident reporting system?

Yes  No

If yes how many

---------------------------------- [3]

In the last one month have you needed to use, or have you seen, a PH method that you considered to be dangerous?

Yes  Score 1
No  Score 0 [4]

In the last one month did you complete, or have you seen, a PH task without equipment when equipment was prescribed?

Yes  Score 1
No  Score 0 [5]

If either of the above was ‘yes’ did you report this as an incident?

Yes  Score -1
No  Score 0 [6]
Section 7 Psychological well being

Collection method:
- All information collected by self completed questionnaire given to staff in unit

Number of forms completed:
- The aim is to collect completed forms by 50% of the WTE numbers on the unit.
- The Observer must record the number of staff that are absent with MSD at the time of the survey and include those numbers in the calculation

General Information:
The link between psycho-social factors and the prevalence of MSD is well documented and one criticism of MSD risk factor studies is the omission of such factors. The scoring system for this section is defined by Bigos (1991) and uses questions 1-3 to give a score for job satisfaction, 4-10 scores for worker satisfaction and 11-13 scores for psycho-social factors. Questions 11-13 are scored in reverse to act as a check score in the data sheet. The calculation recovers the polarity to give positives as high scores for all sections. An average score as a percentage is included in the final IET score.

Calculation: Psychological well being
(Bigos model 1991)

a) Job Satisfaction = Total score / 9 / No participants
b) Work Satisfaction = Total score / 21 / No participants
c) Psycho-social factors = (9 – Total score) / 9 / No participants

Total inclusion score for IET = \( \frac{a) + b) + c)}{3} \) = as %
### Section 7 Psychological well being

<table>
<thead>
<tr>
<th>Question</th>
<th>Rating</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How satisfied are you with your job</td>
<td>1</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Almost always</td>
</tr>
<tr>
<td>2. How strongly would you recommend your job to someone else</td>
<td>1</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Almost always</td>
</tr>
<tr>
<td>3. If you were looking for a job now, how likely is it that you would decide to take this job again.</td>
<td>1</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Almost always</td>
</tr>
<tr>
<td>4. I am satisfied that I can turn to a fellow worker for help when something is troubling me</td>
<td>1</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Almost always</td>
</tr>
<tr>
<td>5. I am satisfied with the way my fellow workers talk things over with me and share problems with me</td>
<td>1</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Almost always</td>
</tr>
<tr>
<td>6. I am satisfied that my fellow workers accept and support my new ideas or thoughts</td>
<td>1</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Almost always</td>
</tr>
<tr>
<td>7. I am satisfied that my fellow workers respond to my emotions such as anger, sorrow or laughter</td>
<td>1</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Almost always</td>
</tr>
<tr>
<td>8. I am satisfied that my fellow workers and I share time together</td>
<td>1</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Almost always</td>
</tr>
<tr>
<td>9. I enjoy the tasks involved in my job</td>
<td>1</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Almost always</td>
</tr>
<tr>
<td>10. How well do you get along with your closest or immediate supervisor</td>
<td>1</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Almost always</td>
</tr>
<tr>
<td>11. How often are you faced with conflicting demands of colleagues who you work with</td>
<td>1</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Almost always</td>
</tr>
<tr>
<td>12. How often does your job leave you with too little time to get everything done</td>
<td>1</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Almost always</td>
</tr>
<tr>
<td>13. How often is your supervisor willing to listen to your work related problems</td>
<td>1</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Almost always</td>
</tr>
</tbody>
</table>

**Total**
Section 8 Patient Condition

Collection method:
- All information collected by self completed questionnaire given to staff in unit
- The Patient Handling Advisor may assist with specific information and questions if required

Number of forms completed:
- The aim is to collect completed forms by 50% of the WTE numbers on the unit.

General Information:
The EU study indicated that Patient Handling Specialists considered that high quality patient handling could improve the treatment and effectiveness of a care package. Quantifying that effect has been a challenge. This series of questions aims to identify any negative effects of poor patient handling systems. Each identified case of a negative effect reduces the score in the section. The consideration that the prevalence of pressure sores may also be a deterioration in the patient condition is included in Section 11.

Calculation: Patient Condition (Section 8)

Patient Condition Score = \[
\frac{\text{Total score from survey}}{16 \times \text{No of forms}} \times 100\%
\]
**Section 8 Patient condition**

The effective management of patient handling issues can assist in the delivery of high quality healthcare. Not having the suitable working environment may be a barrier to the implementation of best practice.

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has the lack of suitable equipment, space, environment, skills or knowledge ever interfered with a patients rehabilitation or maintenance programme</td>
<td>Never 4, Hardly Ever 3, Sometimes 2, Mostly 1, Always 0</td>
<td></td>
</tr>
<tr>
<td>Has the lack of suitable equipment, space, environment, skills or knowledge ever interfered with a patients hygiene or care activities</td>
<td>Never 4, Hardly Ever 3, Sometimes 2, Mostly 1, Always 0</td>
<td></td>
</tr>
<tr>
<td>Has the lack of suitable equipment, space, environment, skills or knowledge ever interfered with a patients discharge or transfer to another location.</td>
<td>Never 4, Hardly Ever 3, Sometimes 2, Mostly 1, Always 0</td>
<td></td>
</tr>
<tr>
<td>Has the lack of suitable equipment, space, environment, skills or knowledge ever interfered with a patients positioning or comfort</td>
<td>Never 4, Hardly Ever 3, Sometimes 2, Mostly 1, Always 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total (16)</strong></td>
<td></td>
</tr>
</tbody>
</table>
Section 9 Patient Perception

Collection method:
- This value is the simplest to collect and is recorded as part of the transfer observations completed by the Observer.
- After the observation the Observer questions the person that has been moved to rate safety and comfort on the bipolar likert scales.
- Question 3 is to be asked verbally of one of the staff completing the transfer

Number of forms completed:
- Little control can be expected over which transfers are observed but observations should be taken for 25% of the patients in the unit over a 24 hour period (32 Patients= 8 observations)

General Information:
The general views of staff and management relating to the quality of the services provided is accounted for in other sections. This section is related to the safety and comfort of any patients that are assisted in movement. After the transfer has been completed large font copies of the likert scales will be presented to the patient and the questions asked verbally.

The staff question is to ascertain whether the choice of transfer of the method of completion of the task is the root cause for any poor perception. This is to be used as a cross check for the section score

Calculation:

\[
\text{Total for IET inclusion} = \frac{\text{Sum of Scores from patient questions}}{\text{Number of participants}}
\]
## Section 9 Patient Perception

<table>
<thead>
<tr>
<th>Patient Perception</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you think the transfer you just experienced was safe and secure?</td>
<td></td>
</tr>
<tr>
<td>The transfer was:</td>
<td></td>
</tr>
<tr>
<td>-4  -3  -2  -1  0  +1  +2  +3  +4</td>
<td>Very unsafe  Very safe</td>
</tr>
<tr>
<td>Did you experience any additional discomfort because of the transfer?</td>
<td></td>
</tr>
<tr>
<td>The transfer was:</td>
<td></td>
</tr>
<tr>
<td>-4  -3  -2  -1  0  +1  +2  +3  +4</td>
<td>Very uncomfortable  Very comfortable</td>
</tr>
<tr>
<td>Did the staff attempt to maximise your privacy and dignity during the transfer?</td>
<td></td>
</tr>
<tr>
<td>-4  -3  -2  -1  0  +1  +2  +3  +4</td>
<td>Not at all  Maximum possible</td>
</tr>
<tr>
<td>In isolation staff view of their own actions during transfer:</td>
<td></td>
</tr>
<tr>
<td>Did you think that the transfer you just completed was performed well and according to your plan?</td>
<td></td>
</tr>
<tr>
<td>-4  -3  -2  -1  0  +1  +2  +3  +4</td>
<td>Very poor  Excellent</td>
</tr>
</tbody>
</table>
Section 10 MSD Risk Exposure Measure

Collection method:
- Observer to interview unit manager or senior staff member to review the patient handling load for a given 24 hour period
- Patient values to include patients admitted and discharged in the time frame.

Number of forms completed:
- One review document including a score for all patients over 24 hour period

General Information:
There have been many studies that attempt to measure the exposure to MSD risks. Mostly the measures are in the form of epidemiological reviews or hazard identification investigations. The findings of most of these studies agree that the number of handling tasks increases the chance of injury. 24 hour recordings of actual tasks are not possible in the context of this tool, therefore an estimation of handling demand is proposed based on the measurement of the following factors.

a) The patient condition rated on the Arjo Resident Gallery
b) The weight of the patient
c) The functional activities that require assistance from staff AND are being completed
d) The provision of suitable equipment to manage the risks of transfers
e) Other additional risks perceived by the staff on the unit

The Care Thermometer guidance for safe transfers is as follows:
Repositioning in bed – Hi/lo bed and sliding aids
Lateral transfers – Requires sliding aids
General transfers – Active or passive lifter where appropriate
Hygiene in sitting – Hi/lo hygiene chair
Shower in supine – Hi/lo shower trolley
Bathing – Hi/lo bath
Transfers to bath – Hi/lo seat or hi/lo trolley
Care on bed – Hi/lo bed
Compression stockings – Stocking applicator aid

The final section allows the staff on the unit to identify further complications for the handling activities based on their experience, additional risks will be scored for poor equipment, poor environment and lack of compliance of patient.

The measurement is calculated as two separate ratios that can be used as comparisons between units. The first is to measure the average handling demand per patient and the second for inclusion in the IET is the average handling demand per WTE staff member.
Calculation:

a) Average per patient [4] =
Total score [3] / Number of patients in 24 hours [1]

b) Average per staff WTE [5] =
Total score [3] / Total WTE in 24 hours [2]
### Section 10 MSD Exposure Measure

<table>
<thead>
<tr>
<th>Bed No</th>
<th>Arjo Gallery Score</th>
<th>Weight kgs</th>
<th>Tasks needing assistance (Equipment provided)</th>
<th>Other risks</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>100-140</td>
<td>Repositioning in bed</td>
<td>Lateral transfers</td>
<td>General transfers</td>
</tr>
<tr>
<td>1</td>
<td>A B C D E</td>
<td>100</td>
<td>140+ Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N</td>
<td>Add Risk</td>
<td>Add Risk</td>
</tr>
<tr>
<td>2</td>
<td>A B C D E</td>
<td>100</td>
<td>140 Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N</td>
<td>Add Risk</td>
<td>Add Risk</td>
</tr>
<tr>
<td>3</td>
<td>A B C D E</td>
<td>100</td>
<td>140 Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N</td>
<td>Add Risk</td>
<td>Add Risk</td>
</tr>
<tr>
<td>4</td>
<td>A B C D E</td>
<td>100</td>
<td>140 Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N</td>
<td>Add Risk</td>
<td>Add Risk</td>
</tr>
<tr>
<td>5</td>
<td>A B C D E</td>
<td>100</td>
<td>140 Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N</td>
<td>Add Risk</td>
<td>Add Risk</td>
</tr>
<tr>
<td>6</td>
<td>A B C D E</td>
<td>100</td>
<td>140 Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N</td>
<td>Add Risk</td>
<td>Add Risk</td>
</tr>
<tr>
<td>7</td>
<td>A B C D E</td>
<td>100</td>
<td>140 Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N</td>
<td>Add Risk</td>
<td>Add Risk</td>
</tr>
<tr>
<td>8</td>
<td>A B C D E</td>
<td>100</td>
<td>140 Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N</td>
<td>Add Risk</td>
<td>Add Risk</td>
</tr>
<tr>
<td>9</td>
<td>A B C D E</td>
<td>100</td>
<td>140 Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N</td>
<td>Add Risk</td>
<td>Add Risk</td>
</tr>
<tr>
<td>10</td>
<td>A B C D E</td>
<td>100</td>
<td>140 Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N</td>
<td>Add Risk</td>
<td>Add Risk</td>
</tr>
<tr>
<td>11</td>
<td>A B C D E</td>
<td>100</td>
<td>140 Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N</td>
<td>Add Risk</td>
<td>Add Risk</td>
</tr>
<tr>
<td>12</td>
<td>A B C D E</td>
<td>100</td>
<td>140 Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N</td>
<td>Add Risk</td>
<td>Add Risk</td>
</tr>
<tr>
<td>13</td>
<td>A B C D E</td>
<td>100</td>
<td>140 Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N</td>
<td>Add Risk</td>
<td>Add Risk</td>
</tr>
<tr>
<td>14</td>
<td>A B C D E</td>
<td>100</td>
<td>140 Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N</td>
<td>Add Risk</td>
<td>Add Risk</td>
</tr>
<tr>
<td>15</td>
<td>A B C D E</td>
<td>100</td>
<td>140 Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N</td>
<td>Add Risk</td>
<td>Add Risk</td>
</tr>
<tr>
<td>16</td>
<td>A B C D E</td>
<td>100</td>
<td>140 Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N</td>
<td>Add Risk</td>
<td>Add Risk</td>
</tr>
<tr>
<td>17</td>
<td>A B C D E</td>
<td>100</td>
<td>140 Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N</td>
<td>Add Risk</td>
<td>Add Risk</td>
</tr>
<tr>
<td>18</td>
<td>A B C D E</td>
<td>100</td>
<td>140 Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N Y N</td>
<td>Add Risk</td>
<td>Add Risk</td>
</tr>
</tbody>
</table>

**Scoring**  
+1 +2  0 +1  0 +1  0 +1  0 +1  0 +1  0 +1  0 +1 +1 +1 +1  Max =15
<table>
<thead>
<tr>
<th>Summary data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number of patients over 24hrs</td>
<td>------------------------------- [1]</td>
</tr>
<tr>
<td>Total WTE on PH duties for 24 hrs</td>
<td>------------------------------- [2]</td>
</tr>
<tr>
<td>Total score for Handling Need</td>
<td>------------------------------- [3]</td>
</tr>
<tr>
<td>Average patient score</td>
<td>------------------------------- [4]</td>
</tr>
<tr>
<td>Score per staff member</td>
<td>------------------------------- [5]</td>
</tr>
</tbody>
</table>
Section 11  Patient injuries

Collection method:
- Observer to interview unit manager or Senior Nurse for all questions
- It may be necessary to access some information from other sources if record keeping is not stored at a local level. E.g. Tissue viability nurse

Number of forms completed:
- One interview document

General Information:
The value of patient injuries can only be scored by actual records of incidents, accidents and known deterioration of conditions. The source of all patient injuries/incidents will be recorded in the usual accident reporting processes.

In modern healthcare where pressure relieving beds and surfaces is the norm it has been suggested that any deterioration in tissue viability scores could have a link with patient handling, patient positioning or improper use of profiling beds (Ref).

Calculation:

Patient Injury Score =

Number of reported incidents[1] + Acquired pressure ulcer score [2,3]

Annual patient injury score = [1] + (4 x [2])
Or = [1] + (12 x [3])

Ratio for inclusion in IET = \[
\frac{\text{Annual patient injury score}}{\text{Number of beds} \ [4]}
\]
Section 11  Patient Injuries

Number of incidents recorded that resulted in a patient injury?
E.g. Mobility, improper positioning, etc. For last 3 months

-------------------------------- [1]

Acquired pressure ulcer score:
for last 3 months

-------------------------------- [2]
or

for last 1 month

-------------------------------- [3]

Number of occupied beds in unit

-------------------------------- [4]
Section 12 Financial outcome

Collection method:
- Observer to interview unit manager or senior staff member for Questions 1-4.
- Data for the costs of the intervention could be found with the patient handling specialist, occupational health or HR

Number of forms completed:
- One interview document

General Information:
The data collected in this section may be difficult to locate in many organisations so there has been a multiplier calculation to find an average cost for the sickness absence calculated in Section 4.

The ratio of costs of MSD sickness absence and workers compensation, to the number of possible hours worked in the unit is represented in this section. The number of sickness absence days and reduced capacity days is recorded from the management systems and this is compared against the OSHA defined hours worked ratio. This needs additional information for the total hours delivered in the unit for 1 year against the total possible for 100 staff in 1 year. The resulting ratio gives a comparable value of financial losses as a ratio of the hours worked.

There are two methods for calculating the financial losses one as a benchmarking tool and one as an intervention measure.

Calculation:

a) Total costs [5] =


b) Ratio score = Total losses [5] x OSHA Work Hours Factor
(From Section 4)

Total losses [5] x Totals work for 100 staff (100 x [1] x [2])
Total productive hours ([3] x 52)

When using the IET as a benchmarking tool the costs of the intervention are not included in the calculation. When using the IET as a intervention assessment to calculate the improvement then the financial score will be calculated as improvement per unit cost.

Improvement IET = \[
\frac{\text{Losses before [5a] } - \text{Losses after [5b]}}{\text{Cost of intervention}}
\]
Section 12 Financial outcome

Losses to organisation over previous 12 months:

1) Losses to ward/department due to MSD sickness absence

If unable to locate, calculate number of days lost x average salary/210

Days lost \( \times \) Avge Salary \( / \) 210 =

2) Losses to ward/department due to staff on reduced capacity

If unable to locate, calculate

\( (\text{number of days on reduced capacity}/4) \times (\text{average salary}/210) \)

\( (\text{Days lost} \times \text{Avge Salary}) / 210 \) =

3) Losses due to compensation claims for MSD over last 12 months

= 

4) Estimated treatment costs for staff receiving MSD at work

= 

5) Estimated costs for patient claims resulting from manual handling

= 

6) Estimated healthcare costs resulting from manual handling

= 

Costs of Intervention:

What did the intervention cost in terms of extra resources?
(This value cannot include regular staff time e.g. training, supervision, as it is a regularly defined job role)

a) Equipment costs
b) Extra training costs
c) External staff costs
d) Other costs (specify)
**Section 13 Calculating the IET Score**

All the section scores will be calculated as ratios or as percentages and then will be added to the final score sheet.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Measure</th>
<th>Ratio Score [a]</th>
<th>Score [b]</th>
<th>Total [c] = [axb]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Culture</td>
<td>Modified PHOQS ratio</td>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>MSD measures</td>
<td>Proportion of staff with MSD</td>
<td></td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Competence Compliance</td>
<td>Average modified DINO score</td>
<td></td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Absence or staff health</td>
<td>Standardised lost work time</td>
<td></td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Quality of care</td>
<td>Average patient handling quality score</td>
<td></td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Accident numbers</td>
<td>Patient handling accidents per staff (wte)</td>
<td></td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Psychological well being</td>
<td>Average psycho-social well-being score</td>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Patient condition</td>
<td>Recorded impairments per patient per year</td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Patient perception</td>
<td>Average patient perception score</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MSD exposure measures</td>
<td>MSD exposure measure</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Patient injuries</td>
<td>Patient injury score per patient</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Financial</td>
<td>Standardised costs for MSD</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Totals score</td>
<td></td>
<td></td>
<td>78</td>
<td></td>
</tr>
</tbody>
</table>

The final part of the process is to calculate the total IET score as a benchmark value,

\[
\text{Total IET score} = \frac{\text{Total contributions}}{78}
\]
Part B

Data Collection
Data Collection Guidance and Documents

Data Set 1. Organisational Review
The Observer (Patient Handling Advisor) to collect information about, accidents incidents and the costs of MSD in the unit being investigated. This will be gathered through the specific people in the organisation e.g. HR, H&S, ward manager, handling advisors.

1.1 Front sheet
1.2 Staffing and patient handling workload
1.3 MSD and levels of sickness absence
1.4 Workload from patient dependencies
1.5 Patient handling management systems
1.6 Intervention costs

Data Set 2. Safety Culture Audit
The Observer (Patient Handling Advisor) will need to visit the chosen area and conduct a Patient Handling Safety Culture Audit which requires the area manager or senior healthcare person to show documented evidence that a safe system of work is in place.

2.1 Patient handling safety culture audit

Data Set 3. Patient Handling Transfer Observation
The Observer (Patient Handling Advisor) is required to observe a sample of patient handling transfers, 25% of the patients on the unit. E.g. 32 beds = 8 observed transfers. There should be a minimum of 5 transfers per survey. The task observed will be scored for competence and compliance with the organisations safe systems of work. Part of the observation of the task requires some brief questions for the carer and the person being assisted. For each transfer one member of the care team (3.3) and the patient (3.2) will complete a separate question set. If the patient is unable to complete due to their condition the form will be removed from the survey.

3.1 Patient handling transfer observation
3.2 Patient handling transfer observation – patient feedback
3.3 Patient handling transfer observation – staff feedback

Data Set 4. Ward/unit survey
The final part of the data collection is to complete a staff and patient survey of the ward/unit. A Staff Questionnaire and a Patient Questionnaire collect data relating to the health and compliance status of the staff and the subjective considerations of the patients being assisted.

4.1 Staff MSD survey
4.2 Staff well being survey
4.3 Patient handling survey
4.4 Patient survey
Data Set 1  Organisational Review

Instructions: Sections 1.1 to 1.6 are collected by the Observer in consultation with the senior nurse or the unit manager

Collection method:
- Observer (or Patient Handling Advisor) to interview senior nurse for all questions.
- Some data may not be accessible on the ward/unit and questions may need to be referred to HR, personnel or central data systems.

Number of forms completed:
- One interview document

1.1 Front sheet
Records the details of the unit, the normal working systems and the management processes that are in place to manage patient handling risks. This section identifies the regular workload and staffing numbers that should be in place in this location.

1.2 Staffing and patient handling workload
This section records the staff and patient numbers on the day of the survey and identifies incident and accident data.

1.3 MSD and levels of sickness absence
The numbers of staff reporting sickness absence because of MSD and those on reduced capacity. The costs from compensation claims are also identified in this section.

1.4 Workload from patient dependencies
All patients in the unit need to be assessed for the level of manual or mechanical assistance they received. This relates to the demand on the staff over a 24 hour period.

1.5 Patient handling management systems
This section is a management appraisal of whether there might be weaknesses in the systems that are provided.

1.6 Intervention costs
In most situations this assessment will be used as a moment in time survey to examine what systems and problems are identified. It is possible to use the tool to show how much change there has been with a specific intervention. If this has happened this section is used to record the intervention details.
### 1.1 Front Sheet for IET Assessment

<table>
<thead>
<tr>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name of Organisation</strong></td>
</tr>
<tr>
<td><strong>Location of Assessment</strong></td>
</tr>
<tr>
<td><strong>Description of Service</strong></td>
</tr>
<tr>
<td><strong>Contact Details for Location</strong></td>
</tr>
<tr>
<td><strong>Name of Unit Manager</strong></td>
</tr>
<tr>
<td><strong>Name of Senior Nurse (s)</strong></td>
</tr>
</tbody>
</table>

#### Workload Overview

<table>
<thead>
<tr>
<th>Number of Beds/Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Normal Hours for full week</strong></td>
</tr>
<tr>
<td><strong>Normal Staffing Levels for Care Tasks</strong></td>
</tr>
<tr>
<td><strong>Total WTE</strong></td>
</tr>
<tr>
<td>Early</td>
</tr>
<tr>
<td>Late</td>
</tr>
<tr>
<td>Night</td>
</tr>
</tbody>
</table>

#### Risk Management Structures

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Incident Reporting System</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Risk Management Audit System</strong></td>
<td></td>
</tr>
<tr>
<td><strong>OH or Stress Audit System</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Acquired Pressure Ulcer Monitoring</strong></td>
<td>Ward</td>
</tr>
</tbody>
</table>

#### Patient Handling Structures

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patient Handling Advisor</strong></td>
<td>Name Tel Years in post</td>
</tr>
<tr>
<td><strong>Patient Handling Training System</strong></td>
<td>Central External Cascade</td>
</tr>
<tr>
<td><strong>Link Worker System</strong></td>
<td>Yes / No</td>
</tr>
<tr>
<td><strong>Manual Handling Policy</strong></td>
<td>Yes / No</td>
</tr>
</tbody>
</table>

#### Additional Information:
Data Set 1 Organisational Review

Please answer the following as truthfully as possible. If data to answer the question is not available can you suggest someone we can approach to obtain the details.

1.2 Staffing and patient handling workload

You have given the normal shift patterns and staffing numbers in the overview. Could you confirm the workload and staffing for this week.

<table>
<thead>
<tr>
<th>Workload</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients on ward/unit today / 24 hours. (Include admissions/discharge)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Staffing Levels for Care Tasks This Week</th>
<th>Shift</th>
<th>Qualified</th>
<th>Non-Qual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total WTE</td>
<td>Early</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Late</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Night</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Actual hours worked this week

<table>
<thead>
<tr>
<th>Accident Reporting</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have access to accident and incident data?</td>
<td>Yes No</td>
</tr>
<tr>
<td>How many Patient Handling incidents/accidents have been reported over last 12 months that have involved an injury to staff?</td>
<td></td>
</tr>
<tr>
<td>In your opinion are some Patient Handling incidents not reported especially if they do not result in an injury or damage to equipment</td>
<td>Yes No</td>
</tr>
<tr>
<td>What is the ratio of under-reporting of PH incidents</td>
<td>1 in</td>
</tr>
<tr>
<td>Number of incidents recorded that resulted in a patient injury? E.g. Mobility, improper positioning, etc. For last 3 months:</td>
<td></td>
</tr>
<tr>
<td>What is the acquired pressure ulcer score: for last 3 months or for last 1 month</td>
<td></td>
</tr>
</tbody>
</table>
1.3 MSD rate and levels of sickness absence

<table>
<thead>
<tr>
<th>Sickness absence costs</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of episodes of MSD caused by patient handling or physical care incidents.</td>
<td></td>
</tr>
<tr>
<td>Total days lost because of above for previous 12 months</td>
<td></td>
</tr>
<tr>
<td>Number of staff that have returned on reduced work capacity due to episodes of MSD</td>
<td></td>
</tr>
<tr>
<td>Total days worked on reduced capacity for previous 12 months</td>
<td></td>
</tr>
<tr>
<td>Losses to ward/department due to MSD sickness absence</td>
<td></td>
</tr>
<tr>
<td>Losses to ward/department due to staff on reduced capacity</td>
<td></td>
</tr>
<tr>
<td>Losses due to compensation claims for MSD over last 12 months</td>
<td></td>
</tr>
<tr>
<td>Estimated treatment costs for staff receiving MSD at work</td>
<td></td>
</tr>
<tr>
<td>Estimated costs for patient claims resulting from manual handling</td>
<td></td>
</tr>
<tr>
<td>Estimated healthcare costs resulting from manual handling</td>
<td></td>
</tr>
</tbody>
</table>
1.4 Workload from patient dependencies

All patients in the unit need to be assessed for the level of manual or mechanical assistance they receive. This relates to the manual handling demand on the staff over a 24 hour period.

The score table 1.4 shows the different judgements that need to be made.

**Arjo Mobility Gallery**
Each patient should be categorised against the descriptions A-E. The descriptors of the patient types are found in table 1.

**Arjo Care Thermometer Safe Transfer Guidance**
According to the level of dependency (A-E) there is an expected level of equipment for each of the transfers noted. The levels of equipment required for each transfer or care task is found in Table 2.

Scores should be allocated under the following conditions:
- If the task is not part of the care package then leave blank
- Score no if the equipment level does not meet the information in the chart.
- Score yes if the equipment does meet the information in the chart

**Weight Factor**
Select the appropriate weight band if the patient is heavy

**Perceived Increased Risk**
The staff have an opportunity to identify any other factors that increase the physical demand on the staff with any patient.
<table>
<thead>
<tr>
<th>Mobility Class</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambulatory but may use a cane for support</td>
<td>-Ambulatory but may use a cane for support</td>
<td>-Uses walking frame or similar</td>
<td>-Sits in wheelchair</td>
<td>-Sits in wheelchair</td>
<td>-Passive</td>
</tr>
<tr>
<td>Independent, can clean and dress themselves</td>
<td>-Independent, can clean and dress themselves</td>
<td>-Can support themselves to some degree</td>
<td>-Can support themselves to some degree</td>
<td>-Can support themselves</td>
<td>-Might be almost completely bedridden</td>
</tr>
<tr>
<td>Can tire quickly</td>
<td>-Can tire quickly</td>
<td>-Dependent on carer present in demanding situations</td>
<td>-Has some trunk stability</td>
<td>-Cannot stand, is unable to bear weight even partially</td>
<td>-Often stiff contracted joints</td>
</tr>
<tr>
<td>Stimulation of abilities is very important</td>
<td>-Stimulation of abilities is very important</td>
<td>-Not physically demanding for carer</td>
<td>-Physically demanding for carer</td>
<td>-Dependent on carers in most situations</td>
<td>-Totally dependent</td>
</tr>
<tr>
<td>Uses walking frame or similar</td>
<td>Uses walking frame or similar</td>
<td>-Simulation of remaining abilities is very important</td>
<td>-Simulation of remaining abilities is very important</td>
<td>-Simulation of remaining abilities is very important</td>
<td>-Physically demanding for carer</td>
</tr>
<tr>
<td>Is the patient independent</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Is there a chance of overloading staff due to care tasks</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Is the patient active or actively contributing to the movement</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
</tr>
</tbody>
</table>
### Table 2. Arjo Care Thermometer Safe Transfer Guidance

<table>
<thead>
<tr>
<th>Task</th>
<th>Equipment required</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Repositioning in bed</td>
<td></td>
</tr>
<tr>
<td>Lateral transfers</td>
<td>Sliding material</td>
</tr>
<tr>
<td>General transfers</td>
<td></td>
</tr>
<tr>
<td>Hygiene tasks in sitting</td>
<td>Hi/lo hygiene chair</td>
</tr>
<tr>
<td>Showering in supine</td>
<td>Hi/lo shower trolley</td>
</tr>
<tr>
<td>Bathing</td>
<td>Hi/lo bath</td>
</tr>
<tr>
<td>Transfers to/from bath</td>
<td>Hi/lo seat</td>
</tr>
<tr>
<td>Care on bed &gt; 1 min</td>
<td>Hi/lo bed</td>
</tr>
<tr>
<td>Compression stockings</td>
<td>Stocking aid</td>
</tr>
</tbody>
</table>
### 1.4 Workload from patient dependencies

<table>
<thead>
<tr>
<th>Bed No</th>
<th>Arjo Gallery Score</th>
<th>Weight kgs</th>
<th>Tasks needing assistance (Equipment provided)</th>
<th>Other risks</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A      B     C</td>
<td>D     E</td>
<td>100-140</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>A      B     C</td>
<td>D     E</td>
<td>100-140</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A      B     C</td>
<td>D     E</td>
<td>100-140</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>A      B     C</td>
<td>D     E</td>
<td>100-140</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>A      B     C</td>
<td>D     E</td>
<td>100-140</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>A      B     C</td>
<td>D     E</td>
<td>100-140</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>A      B     C</td>
<td>D     E</td>
<td>100-140</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>A      B     C</td>
<td>D     E</td>
<td>100-140</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>A      B     C</td>
<td>D     E</td>
<td>100-140</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>A      B     C</td>
<td>D     E</td>
<td>100-140</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>A      B     C</td>
<td>D     E</td>
<td>100-140</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>A      B     C</td>
<td>D     E</td>
<td>100-140</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>A      B     C</td>
<td>D     E</td>
<td>100-140</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>A      B     C</td>
<td>D     E</td>
<td>100-140</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>A      B     C</td>
<td>D     E</td>
<td>100-140</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>A      B     C</td>
<td>D     E</td>
<td>100-140</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>A      B     C</td>
<td>D     E</td>
<td>100-140</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>A      B     C</td>
<td>D     E</td>
<td>100-140</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>A      B     C</td>
<td>D     E</td>
<td>100-140</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Tasks: Repositioning in bed, Lateral transfers, General transfers, Hygiene in sitting, Shower in supine, Bathing, Transfers to bath, Care on bed, Compression stockings, Poor / shortage equipment, Poor environment, Lack of patient compliance.
## 1.4 Workload from patient dependencies

<table>
<thead>
<tr>
<th>Bed No</th>
<th>Arjo Gallery Score</th>
<th>Weight kgs</th>
<th>Tasks needing assistance (Equipment provided)</th>
<th>Other risks</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>20</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>21</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>22</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>23</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>24</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>25</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>26</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>27</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>28</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>29</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>30</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>31</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>32</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>33</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>34</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>35</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>36</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
</tbody>
</table>
1.5 Patient Handling Management System

Given the patient dependencies and handling workload previously described could you answer the following by circling the appropriate answer

<table>
<thead>
<tr>
<th>Rating</th>
<th>Has the lack of suitable equipment, space, environment, skills or knowledge ever interfered with a patient's rehabilitation or maintenance programme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>Hardly Ever</td>
</tr>
<tr>
<td></td>
<td>Has the lack of suitable equipment, space, environment, skills or knowledge ever interfered with a patient's hygiene or care activities</td>
</tr>
<tr>
<td>Never</td>
<td>Hardly Ever</td>
</tr>
<tr>
<td></td>
<td>Has the lack of suitable equipment, space, environment, skills or knowledge ever interfered with a patient's discharge or transfer to another location.</td>
</tr>
<tr>
<td>Never</td>
<td>Hardly Ever</td>
</tr>
<tr>
<td></td>
<td>Has the lack of suitable equipment, space, environment, skills or knowledge ever interfered with a patient's positioning or comfort</td>
</tr>
<tr>
<td>Never</td>
<td>Hardly Ever</td>
</tr>
<tr>
<td></td>
<td>In terms of personnel, time and financial commitment, how well do you think the organisation, department and area support the patient handling programme.</td>
</tr>
<tr>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Excellent</td>
<td>Neutral</td>
</tr>
</tbody>
</table>

Any further considerations:
1.6 Cost of the intervention

If the assessment is being used to evaluate the effect of a specific intervention use this section to calculate the costs of the intervention.

Costs of Intervention:

What did the intervention cost in terms of extra resources? (This value cannot include regular staff time e.g. training, supervision, as it is a regularly defined job role)

Define the components of the intervention

- Equipment costs
- Extra training costs
- External staff costs
- Other costs (specify)
Data Set 2 - Patient Handling Safety Culture Audit

Collection method:
- Observer to interview unit manager or senior staff member.

Number of forms completed:
- One interview document

General Information:
The data for safety culture will be collected mostly from an interview with the ward/unit manager, the evidence of the systems for training and manual handling supervisors may be with the patient handling advisor or training department.

Questions 1-10 overleaf constitute the audit. Proof of the system being in place has to be seen and documented evidence should be provided. Examples of these would be policies, procedures, audit checklists or risk assessment documentation.
### 2.1 Patient Handling Safety Culture Audit

<table>
<thead>
<tr>
<th>Question</th>
<th>Scoring Categories</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Have you had an internal manual handling audit within the last 2 years?</td>
<td>Yes 1</td>
<td></td>
</tr>
<tr>
<td>2 Was your last internal manual handling audit:</td>
<td>Only 1 score</td>
<td></td>
</tr>
<tr>
<td>- A service provision audit (organisation)</td>
<td>Yes 2</td>
<td></td>
</tr>
<tr>
<td>- An equipment or training audit</td>
<td>Yes 1</td>
<td></td>
</tr>
<tr>
<td>- Local monitoring and supervision</td>
<td>Yes 1</td>
<td></td>
</tr>
<tr>
<td>- None</td>
<td>Yes 0</td>
<td></td>
</tr>
<tr>
<td>3 Do you have a general manual handling risk assessment system?</td>
<td>Only 1 score</td>
<td></td>
</tr>
<tr>
<td>Is it:</td>
<td>Only 1 score</td>
<td></td>
</tr>
<tr>
<td>- Organisation wide</td>
<td>Yes 2</td>
<td></td>
</tr>
<tr>
<td>- Local Level</td>
<td>Yes 1</td>
<td></td>
</tr>
<tr>
<td>- Task-specific</td>
<td>Yes 1</td>
<td></td>
</tr>
<tr>
<td>- No risk assessment system</td>
<td>Yes 0</td>
<td></td>
</tr>
<tr>
<td>4 Are completed manual handling risk assessments held:</td>
<td>Only 1 score</td>
<td></td>
</tr>
<tr>
<td>- Centrally</td>
<td>Yes 1</td>
<td></td>
</tr>
<tr>
<td>- Locally</td>
<td>Yes 1</td>
<td></td>
</tr>
<tr>
<td>- Both</td>
<td>Yes 2</td>
<td></td>
</tr>
<tr>
<td>- No completed risk assessment system</td>
<td>Yes 0</td>
<td></td>
</tr>
<tr>
<td>5 Are manual handling risk assessments reviewed at least annually?</td>
<td>Only 1 score</td>
<td></td>
</tr>
<tr>
<td>- Yes if yes, go to question 6a</td>
<td>Yes 1</td>
<td></td>
</tr>
<tr>
<td>- No</td>
<td>No  0</td>
<td></td>
</tr>
<tr>
<td>5a Is the review system:</td>
<td>Only 1 score</td>
<td></td>
</tr>
<tr>
<td>- Formal</td>
<td>Yes 1</td>
<td></td>
</tr>
<tr>
<td>- Informal</td>
<td>Yes 0</td>
<td></td>
</tr>
<tr>
<td>6 Are patient mobility assessments held in:</td>
<td>Only 1 score</td>
<td></td>
</tr>
<tr>
<td>- Care plans</td>
<td>Yes 1</td>
<td></td>
</tr>
<tr>
<td>- Separate forms</td>
<td>Yes 1</td>
<td></td>
</tr>
<tr>
<td>- Both</td>
<td>Yes 1</td>
<td></td>
</tr>
<tr>
<td>7 Are patient mobility assessments held:</td>
<td>Only 1 score</td>
<td></td>
</tr>
<tr>
<td>- With the patient</td>
<td>Yes 2</td>
<td></td>
</tr>
<tr>
<td>- Separately (if yes go to question 8a)</td>
<td>Yes 1</td>
<td></td>
</tr>
<tr>
<td>7a If they are held separately, is there a reason?</td>
<td>Only 1 score</td>
<td></td>
</tr>
<tr>
<td>8 Do you have appointed manual handling supervisors?</td>
<td>Only 1 score</td>
<td></td>
</tr>
<tr>
<td>- For all wards and departments</td>
<td>Yes 2</td>
<td></td>
</tr>
<tr>
<td>- For some wards and departments</td>
<td>Yes 1</td>
<td></td>
</tr>
<tr>
<td>- No</td>
<td>No  0</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>How is contact maintained with the manual handling supervisors and their competence ensured?</td>
<td>Score 1 for each (Max 5)</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>- Formal training sessions</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>- Formal staff meetings</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>- Informal meetings initiated by back care advisor</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>- Informal meetings initiated by manual handling supervisor</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>- Ad-hoc meetings</td>
<td>Yes 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>10</th>
<th>How do the manual handling supervisors maintain contact with the staff and ensure their competence?</th>
<th>Score 1 for each (Max 10)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Training records</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>- Assessing the quality of patient mobility assessments</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>- Entries in patient records/notes</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>- Ward meetings/handover</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>- Personal development plans</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>- Problem-solving sessions/documentated supervision</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>- Case conferences/multidisciplinary meetings</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>- Electronic format training/training pack/workbook</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>- Informal documentation</td>
<td>Yes 1</td>
</tr>
<tr>
<td></td>
<td>- Other (e.g. memos)</td>
<td>Yes 1</td>
</tr>
</tbody>
</table>

**PHOQS Score (30)**
Data Set 3 – Patient Handling Transfer Observation

Collection method:
- Observer (or Patient Handling Advisor) to watch a selected transfer and score Questions 1-16
- It may be necessary to interview the Senior Nurse for Questions 17-18

Number of forms completed:
- The observed transfers will be selected on a convenience basis. Observations should be taken for 25% of the patients in the unit over a 24 hour period (32 Patients= 8 observations). A minimum of 5 transfers should be observed in any assessment.

General Information:

3.1 Patient handling transfer observation
The checklist gives a score for preparation, completion and result phases of the chosen transfer which allows for comparison between different units or hospitals. The additional questions relate more to the issue of compliance with identified practice or simply following the risk assessment or documented handling plan.

The preparation phase questions (1-7) are yes/no answers and relate to the selection and use of equipment for the task and setting up the work environment.

The performance phase questions (8-13) are graded on a 5 points scale. The score from the assessment should be written in the 0-4 column on the right of the scales. It is acceptable to consider the questions as an interpretation of the movement principles and safe practice adopted at the survey venue.

The result phase is scored as yes/no questions.

After the task it is important to complete Q 17-18 to examine the management guidance in place for the task.

3.2 Patient handling transfer observation – patient feedback
After the observation the 3 patient feedback questions should be asked of the person being moved. If they are unable to answer then this data will be removed from the survey. Observers should record that the patient was unable to answer.

3.3 Patient handling transfer observation – staff feedback
After the task 3.3 should be given to one of the staff involved.

For each task there should be one completed version of 3.1, 3.2 and 3.3.
### 3.1 Patient Handling Transfer Observation

<table>
<thead>
<tr>
<th>Items</th>
<th>Score System</th>
<th>Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Preparation phase</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Is the patient encouraged to cooperate appropriately?</td>
<td>Score</td>
<td>0 1</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>2. Is enough space prepared for the transfer?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>3. Wheelchair, and other objects that the patient is transferred between, positioned and locked away correctly?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>4. Is the height of the bed correct?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>5. Use of transferring aid(s)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>6. Correct use of the transferring aid(s)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>7. Are there enough staff?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Actual performance phase</strong></td>
<td>Score</td>
<td>0-4 0-1</td>
</tr>
<tr>
<td>8. Good balance</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not at all</td>
<td>Totally</td>
</tr>
<tr>
<td>9. Good coordination</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not at all</td>
<td>Totally</td>
</tr>
<tr>
<td>10. Good movement economy</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not at all</td>
<td>Totally</td>
</tr>
<tr>
<td>11. How is the load on the back and the shoulders?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>12. To what extent are the criteria in communication and interaction with the patient fulfilled?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not at all</td>
<td>Totally</td>
</tr>
<tr>
<td>13. Is the patient allowed to participate according to her/his ability to perform voluntary movements?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not at all</td>
<td>Totally</td>
</tr>
<tr>
<td><strong>Result phase</strong></td>
<td>Score</td>
<td>0 1</td>
</tr>
<tr>
<td>14. Does the transfer technique chosen by the nurse cause any pain to the patient?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>15. Does the transfer technique chosen by the nurse cause any feelings of fear or uncertainty in the patient?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>16. Is the patient in a functional position at the end of the transfer?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>After the task has been completed.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Does the ward/dept have a specific handling plan for the transfer completed?</td>
<td>Yes then x 1, No then x 0.5</td>
<td>x</td>
</tr>
<tr>
<td>18. Did the action observed meet the specific handling plan fully?</td>
<td>Fully x 1, Mostly x 0.875 Reasonable x 0.75, Hardly at all x 0.625, Not at all x 0.5.</td>
<td>x</td>
</tr>
</tbody>
</table>

**DINO Score (16)**
### 3.2 Patient Handling Transfer Observation – Patient Feedback

**Do you think the transfer you just experienced was safe and secure**

<table>
<thead>
<tr>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very unsafe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Very safe</td>
</tr>
</tbody>
</table>

**Did you experience any additional discomfort because of the transfer?**

<table>
<thead>
<tr>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very uncomfortable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Very comfortable</td>
</tr>
</tbody>
</table>

**Did the staff attempt to maximise your privacy and dignity during the transfer**

<table>
<thead>
<tr>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Maximum possible</td>
</tr>
<tr>
<td>Very poor</td>
<td>-4</td>
<td>-3</td>
<td>-2</td>
<td>-1</td>
<td>0</td>
<td>+1</td>
<td>+2</td>
<td>+3</td>
</tr>
<tr>
<td>-----------</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>---</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
</tbody>
</table>

Did you think that the transfer you just completed was performed well and according to your plan?
Data Set 4 – Ward/Unit Survey

Data Collection:

4.1 Staff MSD survey
4.2 Staff well being survey
4.3 Patient handling survey

All 3 questionnaires are given to the staff as a single form and staff will complete all 3 sections before returning

Collection method:
- All information collected by self-completed questionnaire given to staff in unit

Number of forms completed:
- Collect completed forms from 50% of the WTE numbers on the unit.
- The Observer must record the number of staff absent with MSD at the time of the survey and include numbers in the calculation

4.4 Patient survey

Collection method:
- Patient Handling Advisor to interview a number of patients who have been assisted to move.
- The questions will be delivered verbally and large print cards will be available for the patient to view. The Observer to record the answers.
- It is acceptable to use a patient's advocate to assist in data collection where appropriate.

Number of forms completed:
- One score sheet document per patient
- 25% of patients that receive assistance with movement will be included in the survey. Every attempt will be made not to include the patients that are included in the observations. A minimum of 5 forms must be completed.
### 4.1 Staff MSD Survey

Please circle any information that applies to yourself in A, B and C.

<table>
<thead>
<tr>
<th>A. Have you at any time during the last 12 months had trouble (such as ache, pain, discomfort, numbness) in:</th>
<th>B. Have you had trouble during the last 7 days?</th>
<th>C. During the last 12 months have you been prevented from carrying out your normal activities or job or been absent because of this trouble?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck</td>
<td>Neck</td>
<td>Neck</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Shoulders (Both / Either)</td>
<td>Shoulders (Both / Either)</td>
<td>Shoulders (Both/ Either)</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Elbows (Both/Either)</td>
<td>Elbows (Both/Either)</td>
<td>Elbows (Both/Either)</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Wrist/Hands(Both/ Either)</td>
<td>Wrist/Hands(Both/Either)</td>
<td>Wrist/Hands(Both/Either)</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Upper Back</td>
<td>Upper Back</td>
<td>Upper Back</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Lower Back</td>
<td>Lower Back</td>
<td>Lower Back</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Hips Thighs or Buttocks</td>
<td>Hips Thighs or Buttocks</td>
<td>Hips Thighs or Buttocks</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Knees</td>
<td>Knees</td>
<td>Knees</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Ankles or Feet</td>
<td>Ankles or Feet</td>
<td>Ankles or Feet</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
### 4.2 Staff Well-Being Survey

Please circle the comment that applies to yourself in the rating column.

<table>
<thead>
<tr>
<th>Question</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How satisfied are you with your job</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>Almost always</td>
</tr>
<tr>
<td>2. How strongly would you recommend your job to someone else</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>Almost always</td>
</tr>
<tr>
<td>3. If you were looking for a job now, how likely is it that you would decide to take this job again.</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>Almost always</td>
</tr>
<tr>
<td>4. I am satisfied that I can turn to a fellow worker for help when something is troubling me</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>Almost always</td>
</tr>
<tr>
<td>5. I am satisfied with the way my fellow workers talk things over with me and share problems with me</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>Almost always</td>
</tr>
<tr>
<td>6. I am satisfied that my fellow workers accept and support my new ideas or thoughts</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>Almost always</td>
</tr>
<tr>
<td>7. I am satisfied that my fellow workers respond to my emotions such as anger, sorrow or laughter</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>Almost always</td>
</tr>
<tr>
<td>8. I am satisfied that my fellow workers and I share time together</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>Almost always</td>
</tr>
<tr>
<td>9. I enjoy the tasks involved in my job</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>Almost always</td>
</tr>
<tr>
<td>10. How well do you get along with your closest or immediate supervisor</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>Almost always</td>
</tr>
<tr>
<td>11. How often are you faced with conflicting demands of colleagues who you work with</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>Almost always</td>
</tr>
<tr>
<td>12. How often does your job leave you with too little time to get everything done</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>Almost always</td>
</tr>
<tr>
<td>13. How often is your supervisor willing to listen to your work related problems</td>
<td>Hardly at all</td>
</tr>
<tr>
<td></td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td>Almost always</td>
</tr>
</tbody>
</table>
### 4.3 Patient Handling Survey

Please circle the comment that applies to yourself in the rating column.

<table>
<thead>
<tr>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the last 12 months have you reported a patient handling accident on the incident reporting system?</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>If yes how many -----------</td>
</tr>
<tr>
<td>In the last one month have you needed to use, or have you seen, a PH method that you considered to be dangerous?</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>In the last one month did you complete, or have you seen, a PH task without equipment when equipment was prescribed?</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>If either of the above was ‘yes’ did you report this as an incident?</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>Has the lack of suitable equipment, space, environment, skills or knowledge ever interfered with a patients rehabilitation or maintenance programme</td>
</tr>
<tr>
<td>Never</td>
</tr>
<tr>
<td>Has the lack of suitable equipment, space, environment, skills or knowledge ever interfered with a patients hygiene or care activities</td>
</tr>
<tr>
<td>Never</td>
</tr>
<tr>
<td>Has the lack of suitable equipment, space, environment, skills or knowledge ever interfered with a patients discharge or transfer to another location.</td>
</tr>
<tr>
<td>Never</td>
</tr>
<tr>
<td>Has the lack of suitable equipment, space, environment, skills or knowledge ever interfered with a patients positioning or comfort</td>
</tr>
<tr>
<td>Never</td>
</tr>
<tr>
<td>In terms of personnel, time and financial commitment, how well do you think the Org/Dept/Area supports the patient handling programme.</td>
</tr>
<tr>
<td>++</td>
</tr>
<tr>
<td>Excellent</td>
</tr>
</tbody>
</table>
### 4.4 Patient Survey

Please circle the comment that applies to the patient response in the rating column.

<table>
<thead>
<tr>
<th>Question</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel secure when the staff assist me to move</td>
<td>Never  Hardly Ever</td>
</tr>
<tr>
<td>I feel comfortable when the staff assist me to move</td>
<td>Sometimes   Mostly</td>
</tr>
<tr>
<td>The staff talk to me and give me verbal information when they assist me to move</td>
<td>Always</td>
</tr>
<tr>
<td>The staff ask my permission before they assist me to move</td>
<td>Never  Hardly Ever</td>
</tr>
<tr>
<td>My personal needs and requirements for dignity and decency are met when I am assisted to move</td>
<td>Sometimes   Mostly</td>
</tr>
</tbody>
</table>
## IET Data Collection Checklist

<table>
<thead>
<tr>
<th>Data Collection Sheets</th>
<th>Number needed</th>
<th>Number collected</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data Set 1. Organisational Review</strong>&lt;br&gt; 1.1 Front sheet</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2 Staffing and patient handling workload</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3 MSD and levels of sickness absence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4 Workload from patient dependencies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5 Patient handling management systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.6 Intervention costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Data Set 2. Safety Culture Audit</strong>&lt;br&gt; 2.1 Patient handling safety culture audit</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Data Set 3. Patient Handling Transfer Observation</strong>&lt;br&gt; 3.1 Patient handling transfer observation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.2 Patient handling transfer observation – patient feedback</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.3 Patient handling transfer observation – staff feedback</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Data Set 4. Ward/unit survey</strong>&lt;br&gt; 4.1 Staff MSD survey</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.2 Staff well being survey</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.3 Patient handling survey</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.4 Patient survey</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX I

Data collected from IET trials
Pilot Visit
Meeting with Back Care Advisor, Derby Hospitals.
Points raised:
Is there a need for demographic information related to the staff groups that are completing the forms. E.g. HCA, Reg Nurses? Time in service?
Need to create simple one page guide for possible ‘Observers’.
Need to have specific routines for data collection in each set of data sheets. This should include numbers of participants, order of presentation, when how, who etc.
Final section to explain structure of scoring system 1-12 ratio scores and addition factors for final IET.

| 1. Safety Culture | Typo Scoring in Box 8
The structure of the PHOQS format is similar to the hospitals usual audit format. No problems identified.
The DIAG document differentiates this hospital to others. Should we add a question regarding organisational wide protocols for management of PH tasks. |
| 2. MSD measures | Previous studies in this hospital have used the Nordic. The front sheet of the form was very well completed by all participants. Problems were encountered in the joining of this form with other sections.
Scoring system needs thought, could be a % reduction for the interventions. Due to needing MSD and Psych forms be careful of time commitment.
Possible need for ½ workforce |
| 3. Competence |
**Compliance**
This hospital conducts observational audits as part of their performance review. Usual time length is ½ day. 10 observations would be possible in ½ day. |
| 4. Absence or staff health | Typo Last question fro.
Data for hospital might be held in HR. Local 1/12 or 3/12 might be held or known locally. Local manager would have worker numbers and times completed. |
| 5. Quality of care | As a combination factor with 8,9,11. Is it possible to request a range of scales to answer issues surrounding dignity, respect comfort and access to info and support from a group of patients with handling needs
- Never, sometimes, mostly, always |
| 6. Accident numbers | Local and central data for incidents reported.
Question over whether management or staff will be honest regarding the non reporting issues. There is likely to be a link with culture and compliance in dept as a whole.
Scoring system needs clarity. |
| 7. Psychological well being | Typo box 12 tool.
Psych info would have made a useful addition to |
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Patient condition</td>
<td>This measure is about how PH affects the care of the condition. Specific cases could be reviewed to assess whether the moving and handling and mobility requirements form PH are being completed. Does the MH improve the condition/care Or does it impair. Delayed discharge, slow rehab, waiting for assessment, waiting for equipment</td>
</tr>
<tr>
<td>10. MSD exposure measures</td>
<td>There was real reluctance to continue with the collection of logs over a long period of time. Compliance with over shift data is v poor and difficult to master. The QUIL staff should be ensuring that each patient is weighed so weight data should be available. Is it possible to have observer collect data regarding numbers and timings of task performance? More preferable to assess handling needs from patient profiles. This set of data measures What might the workload be? Based on patient profile.</td>
</tr>
<tr>
<td></td>
<td>Amount of patients on ward over 24hrs</td>
</tr>
<tr>
<td></td>
<td>How many tasks do they require assistance with (DIAG 8)</td>
</tr>
<tr>
<td></td>
<td>Weight/Size</td>
</tr>
<tr>
<td></td>
<td>Compliance/behaviour</td>
</tr>
<tr>
<td></td>
<td>Hoisting</td>
</tr>
<tr>
<td></td>
<td>Other factors re complexity of handling needs e.g. orthopaedic fixators, callipers, medical attachments. Consider score for not using appropriate methods or is it in compliance score Calculate score for each patient Calculate total/ratio for ward Divide by WTE on patient handling</td>
</tr>
<tr>
<td>11. Patient injuries</td>
<td>Three factors were identified that might be collectable PH incidents from records Mobility accidents eg falls from records Acquired TV/Pressure ulcer rates given that all patients are on PR bed surfaces, any recorded PU could be related to method position poor practice which can indicate</td>
</tr>
<tr>
<td>PH source.</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td></td>
</tr>
<tr>
<td><strong>12. Financial</strong></td>
<td>There was a question of whether this information would be available. The fall back score system was acceptable if true data was not available. Treatment costs needs full explanation as the model is based on an American model. In some services this might need to be scored as a percentage of services delivered e.g. fast track physio through HR/Occ Health provision. Need to explain the costs section clearly. Will need to have different scores for specific intervention model and benchmarking model.</td>
</tr>
</tbody>
</table>

**Other comments**