Interervention strategies to reduce musculoskeletal injuries associated with handling patients: a systematic review

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Intervention strategies to reduce musculoskeletal injuries associated with handling patients: a systematic review

S Hignett

Aims: To report, analyse, and discuss the results of a systematic review looking at intervention strategies to reduce the risk factors associated with patient handling activities.

Methods: A search strategy was devised to seek out research between 1960 and 2001. Inclusion/exclusion criteria limited the entry of papers into the review process. A checklist was selected and modified to include a wide range of study designs. Inter-rater reliability was established between six reviewers before the main review process commenced. Each paper was read by two reviewers and given a quality rating score, with any conflicts being resolved by a third reviewer. Papers were grouped by category: multifactor, single factor, and technique training based interventions.

Results: A total of 2796 papers were found, of which 880 were appraised. Sixty three papers relating to interventions are reported in this paper. The results are reported as summary statements with the associated evidence level (strong, moderate, limited, or poor).

Conclusion: There is strong evidence that interventions predominantly based on technique training have no impact on working practices or injury rates. Multifactor interventions, based on a risk assessment programme, are most likely to be successful in reducing risk factors related to patient handling activities. The seven most commonly used strategies are identified and it is suggested that these could be used to form the basis of a generic intervention programme, with additional local priorities identified through the risk assessment process. Health care providers should review their policies and procedures in light of these findings.

Main messages

- An international systematic review found 63 papers relating to intervention strategies to reduce the risk of musculoskeletal injuries associated with patient handling.
- There is strong evidence that interventions for patient handling based on technique training have no impact on working practices or injury rates.
- Multifactor interventions, based on a risk assessment programme, are most likely to be successful in reducing risk factors associated with patient handling activities.
- Seven strategies are suggested for inclusion in a generic intervention programme.

Policy implications

- Health care providers should review their policies and procedures in light of this systematic review.
- Interventions predominantly based on technique training are unlikely to be successful in reducing musculoskeletal injuries, so an alternative strategy should be considered.
search which resulted in 30 papers being translated from Chinese, Danish, Dutch, French, German, Italian, Japanese, Norwegian, Portuguese, Slovakian, and Spanish.

The data extraction/critical appraisal tool used was developed by Downs and Black for randomised and non-randomised studies of health care interventions. This has four sections:

1. General structure of paper to include 10 questions about the aims, sampling, method (description of intervention), outcome measures, confounders, findings, analysis, and discussion of adverse events.
2. External validity is appraised using three questions about the representativeness of the sample and context of the study.
3. Internal validity (bias) includes seven questions to look at the quality of the method, adequacy of the sample, and the study design.
4. Internal validity (confounding, selection bias) has six questions looking at the quality of the method, adequacy of the sample, and the study design.

Before the review process started an inter-reliability study was carried out with the six reviewers. This resulted in an overall intra-class correlation (pairwise) of 0.95.

Each paper was sent to two reviewers following a screening process to ensure that reviewers did not receive their own publications. If the difference in the quality rating scores exceeded an established limit the paper was sent to a third reviewer for conflict resolution. Owing to the heterogeneity of the study types, interventions, settings, participants, outcome measures, and comparison groups a quantitative analysis (meta-analysis) was not appropriate.

The findings of the 63 papers (table 2) have been grouped into three categories for the summary evidence statements.

1. Multifactor interventions.
3. Technique training based interventions.

Any conflicting and negative evidence has been included in the evidence statement for categories (1) and (2). Category (3) is subdivided into three further subgroupings to present negative, mixed, and positive evidence.

### RESULTS

The findings of the 63 papers (table 2) have been grouped into three categories for the summary evidence statements.

1. Multifactor interventions.
3. Technique training based interventions.

A decision was taken to present the data in this category as two groups to look at the role of risk assessment as part of an intervention strategy. This will be reviewed in the discussion.

### Multifactor interventions

The evidence statement that *multifactor interventions based on risk assessment are successful* is supported with moderate evidence from four studies.

### Single factor interventions

The evidence statement that *single factor interventions based on the provision of equipment can be effective* is supported with moderate evidence from two studies.

### Interventions predominantly based on technique training

The evidence statement that *interventions based predominantly on technique training have no impact on working practices or injury rates* is supported with strong evidence from four studies. Eight additional studies give a moderate level of support. There are also five studies at the limited evidence level supporting this statement.

EXPERIMENTAL PROCEDURE

A total of 225 papers were included in the full project review, with the 63 papers relating to intervention strategies being reported in this paper.

### Experimental procedure

A total of 225 papers were included in the full project review, with the 63 papers relating to intervention strategies being reported in this paper.
### Table 2: Summary of interventions and critical appraisal (QR) scores

<table>
<thead>
<tr>
<th>Author</th>
<th>Intervention subjects (n)</th>
<th>Outcome measures</th>
<th>Results</th>
<th>QR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Addington (1994)</td>
<td>Operating room staff (n=7)</td>
<td>No. of reported back injuries</td>
<td>No decrease in injuries</td>
<td>37%</td>
</tr>
<tr>
<td>Aird (1988)</td>
<td>Hospital: 2, 5, 9, 12, 18, 20, 21</td>
<td>Lost time injury claims</td>
<td>Hospital: Back injuries reduced by (a) number (8.4%), (b) frequency (18.8%)</td>
<td>44%</td>
</tr>
<tr>
<td>Alavosius and Sulzer-Azaroff (1986)</td>
<td>Direct care staff (n=6)</td>
<td>No. of safe transfers</td>
<td>Reduction in no. of unsafe transfers from 13 to 4</td>
<td>39%</td>
</tr>
<tr>
<td>Alexander (1996)</td>
<td>Community nurses (n=42)</td>
<td>Relationship between implementation of recommendations and level of sickness absence</td>
<td>Significant relationship between implementation of recommendations and reduction in sickness absence</td>
<td>50%</td>
</tr>
<tr>
<td>Best (1997)</td>
<td>Nursing Home (n=3)</td>
<td>Postural analysis</td>
<td>All reduced but not significantly</td>
<td>70%</td>
</tr>
<tr>
<td>Billin (1998)</td>
<td>Nurses, Occupational Therapists, Physiotherapists (n=7)</td>
<td>Moving and handling injuries</td>
<td>Increase in injuries over 5 year period</td>
<td>54%</td>
</tr>
<tr>
<td>Caska et al (1998)</td>
<td>Medical ward (n=4)</td>
<td>Effectiveness of lifting team</td>
<td>Team completed 94% of scheduled and paged lifts</td>
<td>69%</td>
</tr>
<tr>
<td>Charney (1997)</td>
<td>Hospital staff (n=10 units)</td>
<td>Incident rates</td>
<td>Reduction in incident rates by 63% and lost work days by 90%</td>
<td>72%</td>
</tr>
<tr>
<td>Charney et al (1993)</td>
<td>Orderlies (n=2)</td>
<td>Accident rate</td>
<td>Year 2 data: No injuries or sick leave for lifting team</td>
<td>61%</td>
</tr>
<tr>
<td>Charney et al (1991)</td>
<td>Orderlies (n=2)</td>
<td>Accident rate</td>
<td>Year 1 data: Reduced from 39 to 2.4 cases (62%)</td>
<td>37%</td>
</tr>
<tr>
<td>Collins (1990)</td>
<td>Nurses (n=7)</td>
<td>Sickness absence</td>
<td>Reduced from 17 to 11 working days per claim</td>
<td>52%</td>
</tr>
<tr>
<td>Daws (1981)</td>
<td>Nurses (n=2000)</td>
<td>Injury rate</td>
<td>No change</td>
<td>31%</td>
</tr>
<tr>
<td>Daynard et al (2001)</td>
<td>Hospital staff (n=36)</td>
<td>Compliance with intervention</td>
<td>Increased compliance</td>
<td>50%</td>
</tr>
<tr>
<td>Dietz and Baumann (2000)</td>
<td>Nurses and physiotherapists (n=103)</td>
<td>Biomechanical evaluation of spinal loading</td>
<td>76% felt they had not learned the basic positions at the end of the course</td>
<td>33%</td>
</tr>
<tr>
<td>Dixon et al (1996)</td>
<td>Ward staff (n=7)</td>
<td>Musculoskeletal sickness absence</td>
<td>No episodes of sickness absence after implementation</td>
<td>20%</td>
</tr>
<tr>
<td>Duggan (1995)</td>
<td>Nurses (n=24)</td>
<td>Postural analysis</td>
<td>Significant reduction in manual tasks and RPE</td>
<td>74%</td>
</tr>
<tr>
<td>Engels et al (1998)</td>
<td>Nurses (n=24)</td>
<td>Postural load</td>
<td>Both postural load and errors decreased significantly</td>
<td>44%</td>
</tr>
<tr>
<td>Engkvist et al (2001)</td>
<td>Nursing staff (n=292)</td>
<td>Interaction between risk factors for back injuries and training</td>
<td>No association with decreased risk of injury</td>
<td>100%</td>
</tr>
<tr>
<td>Entwhistle et al (1996)</td>
<td>Nurses (n=900)</td>
<td>Amount of patient handling</td>
<td>Reduction in certified illness from 35 to 8 episodes per annum</td>
<td>35%</td>
</tr>
<tr>
<td>Evanoff et al (1999)</td>
<td>Hospital orderlies (n=67)</td>
<td>Reportable injuries (OSHA 200 log)</td>
<td>Reduction in injury rate from 32.5 per 100 FTE to 16.3 per 100 FTE</td>
<td>58%</td>
</tr>
<tr>
<td>Fanello et al (1999)</td>
<td>Non-clerical hospital staff (n=272)</td>
<td>Injury rate (musculoskeletal disorders)</td>
<td>No significant difference for all three measures</td>
<td>80%</td>
</tr>
<tr>
<td>Feldstein et al (1993)</td>
<td>Nurses, aids and orderlies (n=55)</td>
<td>Back pain</td>
<td>Reduction (not significant)</td>
<td>68%</td>
</tr>
<tr>
<td>Paternoster et al (1999)</td>
<td>Hospital workers (n=80)</td>
<td>Postural analysis</td>
<td>19% improvement in transfers</td>
<td>31%</td>
</tr>
<tr>
<td>Author</td>
<td>Intervention subjects (n)</td>
<td>Outcome measures</td>
<td>Results</td>
<td>QR</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------------------------</td>
<td>-------------------------------------------</td>
<td>----------------------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td>Foster (1996)</td>
<td>5 Nurses (n=100)</td>
<td>Change in practice</td>
<td>74% change in practice</td>
<td>57%</td>
</tr>
<tr>
<td>Garg and Owen (1992)</td>
<td>1, 2, 5 Nursing Homes (n=57)</td>
<td>Use of equipment</td>
<td>77% improved use of equipment</td>
<td>63%</td>
</tr>
<tr>
<td>Garrett and Perry (1996)</td>
<td>1, 5, 10, 12, 15 Nursing and therapy staff (n=700)</td>
<td>Incidence of back injuries</td>
<td>Reduced from 83 to 47 per 200,000 work hours</td>
<td>46%</td>
</tr>
<tr>
<td>Goodridge and Lauria (1997)</td>
<td>2, 13 Nurses (n=7)</td>
<td>Lost working time cases</td>
<td>Reduced from 42 to 23 per annum</td>
<td>44%</td>
</tr>
<tr>
<td>Gray et al (1996)</td>
<td>5 Nurses (n=14 units)</td>
<td>Injury rate</td>
<td>Reduction in injury rate from 6.7 to 4.1 patient handling injuries per staff member per month</td>
<td>43%</td>
</tr>
<tr>
<td>Griffith and McArthur (1999)</td>
<td>5 Health care assistants (n=502)</td>
<td>Knowledge of procedures</td>
<td>Significant improvement</td>
<td>43%</td>
</tr>
<tr>
<td>Harber et al (1994)</td>
<td>5 Newly qualified nurses (n=179)</td>
<td>Impact of training using questionnaire</td>
<td>No acquisition of transferrable skills with respect to applying the techniques in different environments</td>
<td>73%</td>
</tr>
<tr>
<td>Head and Levick (1996)</td>
<td>1, 2, 3, 5 Nurses and ambulance workers (n=7)</td>
<td>No. of back injury claims</td>
<td>Reduction in number (by 23%), lost time (by 38%) and average cost (by 56%) of back injury claims</td>
<td>28%</td>
</tr>
<tr>
<td>Holliday et al (1994)</td>
<td>2 Nursing staff (n=22)</td>
<td>Vertical force and duration of lift, weight distribution and no. of steps while carrying</td>
<td>Fewer staff needed and significant reduction in RPE</td>
<td>50%</td>
</tr>
<tr>
<td>Johnston (1987)</td>
<td>5 Student nurses (n=7)</td>
<td>Prevalence of back pain (12 months)</td>
<td>Only 28% of lifts were planned</td>
<td>43%</td>
</tr>
<tr>
<td>Kilbom et al (1985)</td>
<td>2, 6, 7 Home care nurses (n=12)</td>
<td>Prevalence of back pain (12 months)</td>
<td>Assistance was used for 50% of lifts</td>
<td>27%</td>
</tr>
<tr>
<td>Knibbe and Friele (1999)</td>
<td>2 Home care nurses (n=378)</td>
<td>Questionnaire on musculoskeletal symptoms, physical fitness and physical workload</td>
<td>Modern ward showed a reduction in: lifting rates (50%); cumulative force (57%); total lifting time (78%); no. of steps while carrying (72%)</td>
<td>65%</td>
</tr>
<tr>
<td>Lagerström and Hagberg (1997)</td>
<td>2, 15, 19 Nurses (n=348)</td>
<td>Lifting rates, cumulative force, total lifting time, and no. of steps while carrying</td>
<td>No change in level of knowledge</td>
<td>50%</td>
</tr>
<tr>
<td>Lynch and Freund (2000)</td>
<td>5 Nursing staff (n=24)</td>
<td>Knowledge about back injury risk factors</td>
<td>Modern ward showed a reduction in: lifting rates (50%); cumulative force (57%); total lifting time (78%); no. of steps while carrying (72%)</td>
<td>65%</td>
</tr>
<tr>
<td>Menckel et al (1997)</td>
<td>1, 2, 5, 8 Health care staff (n=122)</td>
<td>Change in work practices</td>
<td>No change in level of knowledge</td>
<td>50%</td>
</tr>
<tr>
<td>Miller and Johnson (1995)</td>
<td>1, 5, 10 Home care staff (n=10)</td>
<td>No change in level of knowledge</td>
<td>Modern ward showed a reduction in: lifting rates (50%); cumulative force (57%); total lifting time (78%); no. of steps while carrying (72%)</td>
<td>65%</td>
</tr>
<tr>
<td>Monaghan et al (1998)</td>
<td>2, 3, 10, 13 Nurses (n=48)</td>
<td>Questionnaire</td>
<td>No significant change</td>
<td>59%</td>
</tr>
<tr>
<td>Nussbaum and Torres (2001)</td>
<td>5 Nurses (n=24)</td>
<td>Knowledge of procedures</td>
<td>Net saving of $57,439</td>
<td>65%</td>
</tr>
<tr>
<td>Nyran (1991)</td>
<td>1, 2, 4, 5 Nursing Homes (n=48)</td>
<td>Knowledge of procedures</td>
<td>Reduction over 6 months, with alternative techniques used</td>
<td>50%</td>
</tr>
</tbody>
</table>

QR: Quality Rating
<table>
<thead>
<tr>
<th>Author</th>
<th>Intervention subjects (n)</th>
<th>Outcome measures</th>
<th>Results</th>
<th>QR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paternoster et al (1999)</td>
<td>Italy, Hospital workers (n=80)</td>
<td>Postural analysis</td>
<td>Incorrect postures reduced from 68% to 38%</td>
<td>31%</td>
</tr>
<tr>
<td>Peers (1998)</td>
<td>Canada, 5, 10, 13, 15, 20, Nursing home staff (n=131)</td>
<td>Last time and modified work duties</td>
<td>Last time reduced from 249 to 30 days</td>
<td>37%</td>
</tr>
<tr>
<td>Pohjonen et al (1998)</td>
<td>Finland, 1, 2, 3, 7, 9, 10, 11, Home care staff (n=70)</td>
<td>Postural analysis, Heart rate, Psychosocial questionnaire (Work Ability Index)</td>
<td>Significant increase in proportion of straight back positions (from 59 to 75%)</td>
<td>58%</td>
</tr>
<tr>
<td>Rodgers (1985)</td>
<td>UK, Ward staff (n=4 wards)</td>
<td>Use of taught lifting techniques</td>
<td>No change in heart rate data or psychosocial data for intervention group</td>
<td>38%</td>
</tr>
<tr>
<td>Santore (1998)</td>
<td>USA, Neurology staff (n=65)</td>
<td>Effectiveness of lifting team</td>
<td>Shoulder lift not used</td>
<td>30%</td>
</tr>
<tr>
<td>Scopa (1994)</td>
<td>USA, Nurses (n=49)</td>
<td>Evaluation of body mechanics</td>
<td>No significant difference</td>
<td>65%</td>
</tr>
<tr>
<td>Stubbs et al (1983)</td>
<td>UK, Student nurses (n=2)</td>
<td>Use of taught handling methods (6 principles)</td>
<td>Application of all 6 principles only in 1% of sample. Frequency of use of individual principles ranged between 11-33%</td>
<td>70%</td>
</tr>
<tr>
<td>St Vincent et al (1989)</td>
<td>UK, Orderlies (n=33)</td>
<td>Use of taught techniques, Back injuries</td>
<td>New skills were acquired and increased use of equipment</td>
<td>54%</td>
</tr>
<tr>
<td>Tuffnell (1989)</td>
<td>NZ, Nurses (n=7)</td>
<td>Type of lifts</td>
<td>Increase in use of shoulder lift from 6 to 50%</td>
<td>30%</td>
</tr>
<tr>
<td>Videman et al (1989)</td>
<td>Finland, Student nurses (n=200)</td>
<td>Skill assessment, Prevalence and incidence of back pain and injuries</td>
<td>Improvement in skills for techniques (63%) and lifting aids (53%) used</td>
<td>41%</td>
</tr>
<tr>
<td>Wachs and Parker (1987)</td>
<td>USA, Nursing staff (n=178)</td>
<td>13 point skills checklist (environmental factors and postural assessment)</td>
<td>No significant difference in prevalence or incidence of back pain and injuries</td>
<td>41%</td>
</tr>
<tr>
<td>Wood et al (2000)</td>
<td>USA, Nursing assistants (n=90)</td>
<td>Evaluation of transfer skills</td>
<td>Prescribed techniques were performed 68% of the time</td>
<td>46%</td>
</tr>
<tr>
<td>Wood (1987)</td>
<td>Canada, Nursing staff (n=3 units)</td>
<td>No. of wage loss claims for back injuries caused by interactions with residents</td>
<td>No significant difference between exp. and control groups (both reduced)</td>
<td>56%</td>
</tr>
</tbody>
</table>

Key

- 1 = Risk assessment
- 2 = Equipment provision or/purchase (including training in 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
- 12 = Injury monitoring system with follow up. Return to work programme
- 13 = Change/introduction of patient assessment system
- 14 = Introduction of hazard register
- 15 = Audit of working practices/risk assessments
- 16 = Review of staffing levels. Increase in staffing level
- 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
results is supported with moderate evidence from two studies. Additional support is given at the limited level from four studies.

The evidence statement that interventions based on technique training can have short term positive outcomes is supported with moderate evidence from four studies. Limited evidence is available from another five studies. However, all these studies reported either procedural difficulties with a lack of control groups, use of different workers and/or patients pre/post intervention, or that statistical significance was not achieved.

**DISCUSSION**

International evidence was found for a range of intervention strategies. The results have been summarised as evidence statements to group the papers into three categories: multifactor interventions, single factor interventions, and interventions based on technique training.

**Multifactor interventions**

The multifactor intervention strategies included risk assessment, equipment provision, equipment evaluation/design, equipment maintenance, education and training, work environment redesign, work organisation/practices changed, feedback, group problem solving/team building, review and change of policies and procedures, discussion of goals with clients, injury monitoring systems (return to work programme), patient assessment systems, hazard registers, audit of working practices/risk assessments, physical fitness training, and medical examinations.

The papers in this category were subgrouped to look at whether they included a risk assessment programme which, although not an intervention in itself, has an important role to play as an integral part of an intervention. The evidence statement for interventions, including a risk assessment is supported by 14 studies at the moderate and limited levels. The risk assessment programme could include feedback to staff and supervisors and the discussion of goals with clients. Some also gave evidence of audit of either working practices and/or the risk assessment programme. It is suggested that risk assessment (in the context of interventions to reduce risks associated with patient handling) provides the framework which is needed for an intervention to be embedded within an organisation’s structure and culture.

The second subgroup (no risk assessment) includes 10 studies, with an overall lower level of evidence (only four studies at the moderate level) and one contradictory high quality study. These interventions were generally preplanned or expert led. Both subgroups included programmes as short as 6 months and as long as 3–5 years, so the duration of the intervention is unlikely to contribute to the different findings. The conclusion for this category is that although multifactor interventions may show some improvements, they are more likely to succeed if they are based on a risk assessment programme (involving the staff).

**Single factor interventions**

The single factor interventions are divided into the provision of equipment (moderate evidence from only two studies) and the lifting team approach. Although it is unusual to find only equipment provision without other factors, if the provision of hoisting equipment can be shown, in future high quality research, to have a significant impact on robust outcome measures (for example, local measures of physiological changes as well as organisational measures looking at sickness absence and incident reports), single factor interventions based on equipment provision might prove to be more cost effective than multifactor interventions.

The second single factor intervention is the lifting team approach which has an evidence statement supported at the moderate level. Currently the research for this approach is only available from the USA, so it might be interesting to see if the results can be replicated in other countries.

**Technique training based interventions**

Finally the third category, interventions predominantly based on technique training, has also been divided into three subgroups. The strongest support is for the evidence statement that interventions predominantly based on technique training have no impact on working practices or injury rates. This is supported with the highest level of evidence (strong) from four studies with an additional 13 studies at the moderate and limited levels. However, evidence was also found supporting the opposing statement for the use of training, but only to achieve short term changes, with four studies at a moderate level and five studies at the limited level.

**Generic multifactor intervention programme**

The 22 multifactor interventions from categories (1) and (2) included 19 strategies, in different combinations. These have been further analysed as shown in table 3, listing the seven most commonly used. The average QR score is given for each intervention strategy. Strategies using work organisation/practice change have the highest average score (63%) and those incorporating a patient assessment system, the lowest (43%).

It is suggested that these top seven factors could form the basis of a generic programme, although it is likely that an intervention strategy and programme will need to be further developed and extended in order to be responsive to local organisational and cultural factors. The risk assessment process could facilitate the detailed design of the programme, and identification of additional appropriate strategies, with the allocation of priorities based on local negotiation with managers and staff.

**Cost effectiveness**

The cost effectiveness of interventions was only reported for two studies, with $57 000–65 000 annual savings. These used a multifactor intervention programme, including risk assessment and the lifting team strategy.

---

**Table 3**

<table>
<thead>
<tr>
<th>Intervention strategy [key reference number]</th>
<th>No. of occurrences</th>
<th>Average QR of studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment provision/purchase (2)</td>
<td>18</td>
<td>50%</td>
</tr>
<tr>
<td>Education and training (e.g. risk assessment, use of equipment, patient assessment) (5)</td>
<td>18</td>
<td>54%</td>
</tr>
<tr>
<td>Risk assessment (1)</td>
<td>13</td>
<td>55%</td>
</tr>
<tr>
<td>Policies and procedures (10)</td>
<td>10</td>
<td>50%</td>
</tr>
<tr>
<td>Patient assessment system (13)</td>
<td>8</td>
<td>43%</td>
</tr>
<tr>
<td>Work environment redesign (6)</td>
<td>7</td>
<td>58%</td>
</tr>
<tr>
<td>Work organisation/practices changed (7)</td>
<td>7</td>
<td>63%</td>
</tr>
</tbody>
</table>
Conclusion
This systematic review has drawn together international data relating to patient handling interventions from 1960 to 2001. There is strong evidence against interventions predominantly based on technique training. It is suggested that the seven most commonly used strategies from the multifactor interventions could form the basis of a generic programme, with additional strategies being identified through the risk assessment process. However, the programmes using single factor interventions (hoisting equipment and lifting teams) also provided a moderate level of evidence and it may be, with more high quality research, that these may be shown to offer more cost effective strategies. Unfortunately, as only two studies from the USA reported data on financial savings, it will be difficult for health care managers to draw conclusions from these data as the financial accounting systems (for example, workers’ compensation and insurance) may be different.

The main recommendation from these findings is that health care providers should review their current approach to managing risks and injuries associated with patient handling activities. If their approach is predominantly based on technique training it is unlikely to be successful in reducing musculoskeletal injuries, and an alternative intervention strategy should be considered.

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