Not just the right for a wheelchair but the right wheelchair: a multi-site study of the wheelchair public service provision in Belo Horizonte city, Brazil

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A multi-site study of the wheelchair’ Public Service Provision in Belo Horizonte city.

by
Tulio Pereira dos Santos Maximo
Not Just the Right for a Wheelchair
But the Right Wheelchair:
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Public Service Provision in Belo Horizonte city, Brazil.

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Tulio Pereira dos Santos Maximo

February 2018
Abstract

For decades the care of disabled population in Brazil has been neglected by the government and was provided largely by the charitable institutions. It was as only recently, as in the year 2011 that Brazilian government created the national plan for the rights of the disabled people. The plan articulates policies regarding social inclusion, access to education, accessibility and health care. The last section of the plan includes the provision of wheelchairs free of cost to the Brazilians citizens, who are in need of a wheelchair.

It is common knowledge that a wrong wheelchair specification can lead to physical damage for the user and the carer; the abandonment of device, and wastage of time and resources involved in the wheelchair provision. The World Health Organization has propounded several good practices and training material with reference to wheelchair services towards enabling of right wheelchair fit to the user characteristics. Though, there is no evidence that the service provided in Brazil adheres to these guidelines or any other wheelchair service good practice.

This research reviews the wheelchair service provision in Belo Horizonte city, Brazil with the aim to understand the functionality of these services in order to provide context-specific interventions and recommendations to improve the design of current services. Herein, three main studies were conducted using a mix of methods: A first exploratory study was conducted to assess the Belo Horizonte assistive technology services and identify a research focus. A second study was conducted to develop an in-depth insight on the understanding of the wheelchair service provided and to collect the necessary information towards creating a context-based and collaborative designed intervention. A third study was conducted to evaluate and improve the proposed interventions. A total of sixty-six interviews were conducted (n=66) with service stakeholders and two hundred and fifty user care observed (n=250) from which ninety-five (n=95) tested the proposed interventions.
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I would also like to express my deep appreciation to the Brazilian government and CNPq for the funding provided through the programme Science Without Borders and for Santander for the travel fund that made additional data collection possible.
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Glossary

Assistive Technology: an umbrella term indicating any product or technology-based service that enables people of all ages with activity limitations in their daily life, education, work or leisure.

Assistive Solution: the set of human and technology supports needed by an individual to compensate for disablement and participate in society on equal footing.

Conceptual models: a visual model that makes use of symbols, icons, and other visual artifacts to denote connections and possible direction between different concepts.

CReab – Centro de Reabilitação: rehabilitation centres from Belo Horizonte public services that provide the services involved in the provision of assistive technology devices.

Disability approach: society approach towards disability. Examples of current approaches are the medical approach and social approach.

End user: refers to the user who benefits from the assistive technology service. End user refers not only to the person using a piece of an assistive technology device but those supporting him/her, such as the carer or a close relative.

Inclusive Design: The design of mainstream products and/or services that are accessible to, and usable by, as many people as reasonably possible, without the need for special adaptation or specialised design.
Medical approach: a disability approach that views the disabled people as consequence of their own condition and seeks to remedy their impairment.

Organisational models: models assisting the comprehension of the functioning of assistive technology service delivery systems.

Providers: refers to the person who works in the assistive technology service, also referred to as the service delivery system providers. These are the practitioners involved in any stage of the assistive technology service, to cite the social worker, the physiotherapist, the occupational therapist and the service’ administrators.

Service Delivery System: a system that provides the services involved in the assistive technology provision. In Belo Horizonte city case, the CReabs.

Social approach: a disability approach that sees people as disabled or enabled by the social context in which they function and proposes that changes in the social context or environment can remove or alleviate disability.

Universal Design: the concept of designing all products and the built environment to be aesthetic and usable to the greatest extent possible by everyone, regardless of their age, ability, or status in life.

User: a person who uses or operates something. In the context of this thesis, the term user is mainly referred to the assistive technology service’ user. There are two main user groups described in this document. They are the ‘providers’ and the ‘end user’ (see glossary).
List of Abbreviations/ Acronyms

AAATE: Association for the Advancement of Assistive Technology in Europe
ABNT: Associação Brasileira de Normas Técnicas
ADL: Activities of Daily Living
AT: Assistive Technology
BPC: Beneficio de Prestação Contínua
CER: Centros Especializados em Reabilitação
COPM: Canadian Occupational Performance Measure
CReab: Centro de Reabilitação
CRPD: Convention on the Rights of Persons with Disabilities
CS: Centro de Saúde
EASTIN: European Assistive Technology Information Network
ESF: Equipe de Saúde da Família
FWM: Free Wheelchair Mission
GBS: Guillain-Barré syndrome
HAAT: Human Activity Assistive Technology
IBGE: Instituto Brasileiro de Geografia e Estatística
ICF: International Classification of Functioning
IADL: Instrumental Activities of Daily Living
MPT: Matching the Person and Technology
NASF: Núcleo de Apoio à Saúde da Família
NBR: name of standard from Associação Brasileira de Normas Técnicas
NHS: National Health Service
O.T: Occupational Therapist
PBH: Belo Horizonte Prefecture
PSD: Postural Support Devices
R&D: Research and Development
SAMS: Sistema de Assistência Médica Supletiva
SDD: Sistema de Desembolso Direto
SDS: Service Delivery System
SISREDE: Sistema Saúde em Rede
SISREG: Sistema de Informação de Regulação das Ações de Saúde
SMEs: Small and medium-sized enterprises
SUS: Sistema Único de Saúde
UK: United Kingdom
UN: United Nations
URS: Unity of Secondary Reference
U.S.: United States of America
USAID: US Agency for International Development
VSL: Viver Sem Limites
WC: Wheelchair
WF: Wheelchair Foundation
WHO: World Health Organization
WSTP: wheelchair service training package
Defining the research

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CHAPTER 1

INTRODUCTION

This chapter provides contextual information from the scenario this research is grounded from. It describes the focus given, introducing the main research topics, the research aims, research questions and objectives settled to provide answers to the research questions.
1.1 The Healthcare and Assistive Technology Provision in Brazil

Healthcare in Brazil is provided by a complex system and subsystems of public and private care. Brazil is the only country with a population larger than 100 million inhabitants to declare healthcare as a duty of the State and a civil right (Varella, 2014). Brazilian National Health service called *Serviço Único de Saúde* - *SUS* is integrated into the municipalities, states and union services, also with the philanthropic and for-profit services. The SUS corresponds to the only health service option for more than 150 million of Brazilians, what corresponded to nearly three-quarters of the Brazilian population (Paim, 2004; Varella, 2014; Temporão, 2013). Nonetheless, private healthcare spending represents around 54% compared to 46% spent by government (WHO, 2011). This rate is inversely proportional to many developed and emerging countries’ government spending, which usually invests the greater proportion, as is the case of UK (83%), Japan (80%), Turkey (75%) and Colombia (74%) (BBC Brasil, 2013).

Not surprisingly, the care of people with disability was for long time secondary to SUS. Historically, this population’ care had been mostly provided by charitable or civil institutions (Junior and Martins, 2010). Nonetheless, care provided by these institutions is limited, especially when it comes to the provision of assistive technology–AT, which is an umbrella term for a series of different devices, products and services used by a person with a disability. Assistive technology examples can vary from devices that focus on function replacement, for instance, orthotics, prosthetics and hearing aids, to personalised environmental modifications, for instance, the adaptation of a bathroom or a worksite (Andrich, et al., 2013). According to Bernardes, et al. (2008), there were more than one million persons on the waiting list to receive an orthotics or prosthetics from SUS in 2007.

In the face of data evidence of an underfunded health system, government spending with each citizen healthcare per year has more than doubled in the past decade, achieving the mark of US$477, what is still below the world’ average rate of US$ 716 (BBC Brasil, 2013). In this scenario, in 2011, the government created the national plan of the rights of disabled people called *Viver Sem Limites-VSL*, with investments predictions going around US$ 3.04bn for the first four years of the programme (SNPDP, 2013). The programme articulates policies regarding social inclusion, access to education, accessibility and healthcare. There are
various investments regarding AT, varying from home adaptations to pedagogic equipment provision at schools, from creation and accreditation of rehabilitation centres and orthopaedic workshops to the creation of microcredits lines to AT acquisition. As a consequence, AT acquisition has boomed in Brazil since the start of the programme. For example, 36,722 wheelchairs were delivered in 2011 compared to 19,890 delivered in 2008 (CONITEC, 2013).

It should be noted however that all these improvements are recent and there is a lack of research and data available, apart from government publications, regarding the functioning of these services. Also, there is a lack of research and publication investigating whether the user requirements and service delivery best practices are being considered and implemented.
1.2 The Assistive Technology Design and Service Provision

It is undeniable the potential benefits AT can bring to its end user regarding its functional independence (Msall, et al., 2001; Cook and Hussey, 2001; EUSTAT, 1999). It can increase participation in everyday activities (Haley, et al., 1992; Cook and Hussey, 2001) or lighten day-to-day caregiver burden (Floyd and Gallagher, 1997). To experience these and other benefits, a person in need of an AT will often require more than one piece of equipment but a set of devices, services or what is also called an assistive solution (Andrich, et al., 2013). The life quality of a person in need of an AT is also influenced by factors external to his/her AT solution, such as the environmental accessibility and society perception towards disability (Andrich, et al., 2013).

Several factors make an assistive technology design and commercialization a complex issue. Often assistive technologies are bespoke or need the support of health service to define its characteristics to fit end user’s requirements (Cook and Hussey, 2001; Garcia and Filho, 2012; Andrich, et al., 2013). The reduced number of end users with similar characteristics reduces the market niche, making it difficult its industrialization (Hersh, 2010; AAATE, 2003; Livingston, 2010; Lewis and Matsuok, 2010; Borisoff, 2010). Consequently, preference is often given to the production of high demand items such as wheelchairs, walking and hearing aid (Hersh, 2010; AAATE, 2003; Livingston, 2010; Borisoff, 2010). Therefore, there is a lack of products available in the market that covers the extensive end user’s requirements (Hersh, 2010; AAATE, 2003; Livingston, 2010; Borisoff, 2010). The result is that, often, assistive technologies are expensive items and have uncertain commercial value (Cook and Hussey, 2001; Livingston, 2010; Borisoff, 2010).

Assistive Technology is commonly provided or defined through the intermediate of health and social care practitioners but is also more and more available for direct purchase, either online or at high street shops (Andrich, et al., 2013). The Internet had facilitated the access between end-user and AT suppliers worldwide, also enabling knowledge and software related to AT to be shared freely (Ritchie and Blanck, 2003). Nonetheless, although end-users have easy access to AT devices, the European Assistive Technology Information Network – EASTIN and the Association for the Advancement of Assistive Technology in Europe- AAATE lists four reasons why a service delivery system- SDS are needed when obtaining an assistive technology (Andrich, et al., 2013). The reasons are:
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- The **ethical** issue related to the principle of equal opportunities.
- The **financial** issue related to the need to remove cost barriers and allowing equal opportunities in the access of those who need them.
- The **expertise** issue related to the need for qualified professional support when selecting and implementing an assistive solution.
- The **consistency** issue related to the need to ensure that an assistive technology intervention fits into overall individual intervention packages.

Characteristics of the SDS for AT provision vary greatly between countries and regions for various reasons such as policies, local history and culture (Andrich, et al., 2013; Garcia and Filho, 2012). Some of the problems with AT provision using services are that: often government are the biggest purchasers (Newell, 2003; Key Note, 2012) and as a consequence AT designers tend to think consumer as the government agency, not the end users (Newell, 2003). Another issue is the policies restrictions towards what should be provided, which not always represents the end users’ requirements, neither represents the most cost-effective existing solution or integrates the individual intervention package needed (Andrich, et al., 2013).

Considering this scenario, the HEART study was published in 1995 by the European Commission on a consensus process within the Board of the AAATE (AAATE, 2003; Andrich, et al., 2013). It formulated suggestions for system improvement by developing quality indicators and guidelines to function regardless of system characteristics. These guidelines have constantly been updated, and a recent survey among experts in Europe indicated that these criteria are still valid (Andrich, et al., 2013).

Concluding, several factors affect the AT design and service provision which produces a direct effect on the quality of life of a person using these technologies. The use of a service is essential to ensure equal opportunities in the access to these technologies and to ensure that person’s requirements are considered regarding an overall AT solution rather than solving separate problems. Investigating the functioning of service provision and application of existing best practices seems a logical path to enhance the design of AT service provision.
1.3 Why Belo Horizonte City?

Brazil is a continental size country in South America with a population of more than 190mi inhabitants, of which 84,4% live in urban areas (IBGE, 2010). Brazilian healthcare service SUS is structured to function similarly in the whole country. As mentioned earlier the system is integrated into the municipalities, states and union services. Despite great centralization of SUS management under the union responsibility in the past, the focus has shifted to its decentralization with emphases in its Municipality level (Galvão, Barroso and Grutt, 2013). Consequently, it became more important to understand the municipality context in order to investigate its current issues and provide context-specific interventions.

The State of Minas Gerais, the capital of which is the Belo Horizonte city (See Figure 1.1), presented the same disabled population proportion as the country average of 14,5% (IBGE, 2001). As the rest of the country, Belo Horizonte represents a heterogeneous, unequal and complex space that needs to be understood (Baptista and Rigotti, 2014).

![Figure 1.1: Belo Horizonte location](image)

According to IBGE (2013), Belo Horizonte has estimated population of 2.479.165 persons in 2013. The Belo Horizonte Municipalities are those with the greater
concentration of disabled population in Minas Gerais State, following the national trend of the disabled population concentrating in urban areas (Baptista and Rigotti, 2014). A hypothesis that might explain this is the greater infrastructure of education, health and transport available in urban areas (Baptista and Rigotti, 2014).

On a practical level, Belo Horizonte is the researcher’s hometown, which facilitates access to relevant bodies and organizations involved in the assistive technology service provision.

1.4 Aims

This research aims to understand how assistive technology service provision functions in Brazil in order to provide context-specific interventions and recommendations to improve the design of current assistive technology services. Specifically, it seeks a deeper understanding of the wheelchair’s public service provision at Belo Horizonte city and to assess this service in the light of existing good practices, providing context-specific interventions and recommendations.

1.5 Research Questions

The research was driven by one main research question followed by narrower research questions that were matured during the research process either to answer the broader question as to find the research focus. The main research question was:

*How to improve the current assistive technology services in Belo Horizonte city, Brazil from a user-centred perspective?*

The narrower research questions and the stage or study that they are related to are described in Table 1.1.
Table 1.1: Research questions linked to the research stages

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Related Study/Stage</th>
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<tbody>
<tr>
<td>1. What are the factors influencing assistive technology services in Europe and Brazil?</td>
<td></td>
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<tr>
<td>2. What are the quality indicators used to assess user-centred aspects of assistive technology services in Europe?</td>
<td>Literature Review</td>
</tr>
<tr>
<td>3. What are the characteristics of the current assistive technology services provided by SUS in Belo Horizonte city?</td>
<td>STUDY 1: Finding a Research Focus</td>
</tr>
<tr>
<td>4. To what extent the current assistive technology services provided by SUS in Belo Horizonte city applies user-centred service provision good practices?</td>
<td>STUDY 2.1: Understanding the focused area</td>
</tr>
<tr>
<td>5. What are the characteristics of the existing wheelchairs services provided by SUS in Belo Horizonte city?</td>
<td>STUDY 2.2: Defining the interventions</td>
</tr>
<tr>
<td>6. How CReab’ practitioners assess and record wheelchair user information?</td>
<td></td>
</tr>
<tr>
<td>7. How to implement user-centred protocols at Belo Horizonte SUS’ current wheelchair service provision?</td>
<td></td>
</tr>
<tr>
<td>8. What are the major barriers encountered when testing the proposed interventions?</td>
<td></td>
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<tr>
<td>9. What are the necessary modifications and possible solutions for the implementation of the interventions in CReab Services?</td>
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</table>
1.6 Objectives

The specific objectives of this research project are:

1. review academic literature on assistive technology service provision in Europe and Brazil to build up background knowledge, identify the current best practices and identify the research gaps;

2. collect data to understand the functioning of assistive technology services provided in the Brazilian public health service, more specifically in Belo Horizonte city;

3. collect data to identify the assistive technology services provided at Brazilian public health service- SUS and the pathway taken by users to access these devices;

4. collect data to find a research focus based on the major concerns in applying existing user-centred good practices regarding assistive technology services;

5. collect data to identify how user requirements are accessed in these services;

6. collect data to develop evidence-based and contextual-based interventions and recommendations;

7. inform the research findings to the stakeholders involved in the studies;

8. test the developed interventions, collect data to evaluate its effectiveness and provide information for necessary modifications;

9. provide a package of improved interventions and recommendations for the service.
1.7 The Research Stages

This Research is divided into three main stages, which are:

**Exploratory Stage:** At this stage, much of the research questions and the research focus were still unclear. The aim at this stage was to have a deeper understanding of the various factors affecting the researched scenario and to find the research focus. Three strategies were adopted for achieving this: reviewing the existing literature, visiting institutions involved in the AT service provision in Belo Horizonte and interviewing practitioners involved in the AT service provision at these institutions.

**Preparatory Stage:** At this point, the research focus was clarified after analysis of the exploratory study data and the focus shifted to prepare a system intervention. A second study was designed to deepen the understanding of the focused area and to collect the necessary information to design a context-based and collaborative designed intervention.

**Evaluative Stage:** At this stage, the intervention package designed on preparatory stage was tested in the Wheelchair Service at Belo Horizonte rehabilitation centres and evaluated by the service stakeholders. The collected data was used to improve the interventions and provide a series of recommendations for the service.
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Chapter 2 Literature Review

Factors affecting AT services
Wheelchair services literature
Methodological stances
CHAPTER 2

LITERATURE REVIEW

This chapter introduces seminal texts from the review of the literature, gathering existing knowledge from the various disciplines inherent in this research topic. It aims to describe the research context to the reader, critically reviewing previous studies and identifying the gaps in knowledge. This Chapter is divided into four parts. Part 1 review the main factors affecting assistive technology services; Part 2 provides an overview of healthcare services in Brazil; Part 3 presents the literature of the research’ focused area, the wheelchair service provision; and Part 4 presents the review of the literature with regards to the methodological stances considered for this research.
2.1 Factors Affecting Assistive Technology Services

This chapter presents the main factors affecting the AT design and service provision covered in the literature. It also differentiates key concepts and approaches found in the literature. Seminal texts are presented, critically reviewed and a conclusion is drawn posing further enquires.

2.1.1 Assistive Technology and Inclusive Design

Assistive technology is an umbrella term for a series of different devices, products and services used by a person with a disability. One widely used definition of ‘assistive technology device’ is from American Public Law 108-364- the Assistive Technology Act of 1998, which states:

‘Any item, piece of equipment, or product system whether acquired commercially off the shelf, modified, or customized that is used to increase, maintain, or improve functional capabilities of individuals with disabilities.’ (Assistive Technology Act of 1998 in Cook, 2001, p.5).

Another widely used definition is the one recommended by the Association for the Advancement of Assistive Technology in Europe-AAATE, which states:

‘Assistive Technology is an umbrella term indicating any product or technology-based service that enables people of all ages with activity limitations in their daily life, education, work or leisure.’ (Andrich, et al., 2013).

The term ‘assistive technology’ is relatively new, but its use can be traced back to early man, i.e., when a wooden stick was first used to support walking (Garcia and Filho, 2012). Its definition has been widely discussed since any language used to describe issues around disability can be politically charged (Pullin, 2009).

One might argue why AT should be related only to individuals with a disability since various products and services can also improve non-disabled person’s
capabilities. Examples of these are the auto-completion and voice input features on electronic devices, lens stabilizers to reduce the shaking of hands when taking pictures, zooming features in touchscreen devices, or walking poles designated to long distance walking but more often used for daily commute. Nevertheless, matters of funding, insurance, law and regulations associated with the use of AT by disabled people, have distinguished its terms from other mainstream designed devices (Litvak and Enders, 2001; Cook and Hussey, 2001; Garcia and Filho, 2012).

There have been many terms used to refer to design for inclusion as mainstream, such as Design for All, Universal Design, Inclusive Design. Universal Design is mostly known in U.S. and Inclusive Design in Europe and Japan (Pullin, 2009). The architect Ronald L. Mace coined the term universal design in 1985 to describe the concept of designing all products and the built environment to be aesthetic and usable to the greatest extent possible by everyone, regardless of their age, ability, or status in life (NCSU, n.d.). The term inclusive design first appeared in 1994 in the paper: “The Case for Inclusive Design” presented at the 12th Triennial Congress of International Association in Toronto Canada (Coleman, 2011) and later described by British Standards Institute (2005) as:

“The design of mainstream products and/or services that are accessible to, and usable by, as many people as reasonably possible ... without the need for special adaptation or specialised design.” (BSI, 2005).

The difference between the terms Universal Design and Inclusive Design has been commonly discussed (Morrow, et al., 2002; Newell, 2003; Coleman, 2011; Plos, et al., 2012). The term universal design can be misleading, suggesting that it seeks ‘universal solutions’ what is considered by many authors an idealistic view. The term inclusive design was introduced as a simple concept to help stakeholders to recognize commercial benefits for their business (Coleman, 2011) and can be extended to address not only age, gender and disability, but also race, income, education, culture, etc. (Morrow, et al., 2002).

Despite the differences in definitions, the term ‘inclusive design’ will be used in this work as an umbrella term for all those other terms mentioned above to facilitate the differentiation from assistive technologies. Exceptions will be made in quotes, where the original term will be kept.

The Usability Pyramid from Nordby (2004) visualises markets according to users’ ability levels. In an adapted version, illustrated in Figure 2.1, Eikhaug, et al. (2010) describe the pyramid, with the bottom representing the main
market, characterized by the healthy, able-bodied users often referred to as the ‘average consumer’. The second segment from the bottom represents those who need some individual adjustment to live in the ‘designed world’. The top two segments show people who need specialized design, AT or personal assistance to complete simple daily activities such as bathing, eating or drinking. Since their needs differ greatly from the mainstream, they are usually not considered to be primary markets for inclusive design (Eikhaug, et al., 2010).

Despite the existing differentiation of assistive technology, inclusive designed and other mainstream products there is a trend for the distinction be more blurred. An example is that both AAATE and World Health Organization-WHO definition of assistive technology both leave a margin to incorporate any products and service necessary to overcome disablement, including mainstream products. Many authors believe that the design of both mainstream products and AT should extend its appeal towards a greater number of users’ requirements and should be looked at as part of the same domain of knowledge (Newell, 2003; Pullin, 2009; Coleman, et al., 2003; Plos, et al. 2012; AAATE, 2003, De Couvreur and Goossens, 2011). Nonetheless, assistive technologies are
still being designed mostly in the clinical medium (Pullin, 2009) and are likely to continue to be confined within a marginal market niche, lacking industrial strength, and the potential benefits of technology (AAATE, 2003). Part of the reason is that the cultural factors affecting AT design still vary significantly from mainstream products. These factors are exposed in section 2.1.4 Barriers to Assistive Technology Design and Provision.

2.1.1.1 Emerging Questions

Some questions emerged at this point of literature review, such as:

- What features on AT service culture hinders/enable user-centred approach?
- How could Assistive Technology be designed more inclusively?

2.1.2 The Assistive Solution

Many authors recognize that neither AT nor the inclusive design approach alone enable the full participation of disabled people in society (Cook and Hussey, 2001; Rose, et al., 2005; Newell, 2003; Loy and Batiste, n.a.). Newell (2003) states that:

“Design for All’ in its true sense, i.e., one product for all, is virtually impossible, so there is always going to be a need for specialised accessibility features and equipment, and also for equipment which has been designed primarily for an impaired user” (Newell, 2003, p.175).
Overcoming one or more dysfunction caused by disability may involve more than just a device. It often requires a mix of mainstream products, service, and assistive technology devices. AAATE coined the term assistive solution to describe the set of human and technology supports needed by an individual to compensate for disablement and participate in society on equal footing. Figure 2.2 illustrates the assistive solution concept of “the four A equation” (Andrich, et al., 2013), in which AT is summed to personal assistance and individual environmental adaptations in order to equal an assistive solution. It’s important to remind the reader that by assistive technology AAATE also means mainstream and inclusively designed products. It is the right combination of these elements that would compose the right assistive solution, enabling the person to engage in daily activities and social life.

Figure 2.2: The four A equation adapted from Andrich, et al., 2013

2.1.3 The Different Approaches to Models

As already mentioned, a continuous challenge in disability research regards its definition. Attempts have been made to define disability with simple statements, theoretical models, classification schemes, and even through different forms of measurement.

Altman (2001) differ these definitions in terms of context, as follow: legal and administrative definitions; clinical definitions and scholarly research definitions. Similarly, Ladner (2010) suggested five different models according to different contexts, namely: Medical models; Rehabilitation Model; Special Education Model; Legal Model and Social Model. According to Edyburn (2001,
cited in Lenker and Paquet, 2003), models help practitioners and researchers to “understand key variables, relationships, and systems that stimulate advancements in theory, research development, policy and practice”.

Ambiguity may arise from the literature concerning disability models. Partly because authors often use the same terminology but describe a different meaning to the terms (Altman, 2001). The term ‘model’ itself and its various connotations in the scientific world lead to confusion (Rosen, 1989 cited in Lenker and Paquet, 2003). One interpretation is a model representing systematic organizations of conceptual elements in a visual representation. Examples of conceptual models are WHO’s International Classification of Functioning-ICF levels of functioning’ model (Figure 2.3) and Swiss Cheese’ model (Figure 2.4).

While the ICF levels of functioning model aim to facilitate the understanding and interaction of health-related concepts, the Swiss Cheese model helps to identify cumulative failures that lead to an accident in complex systems (Reason, 2000). The holes in the Swiss Cheese model represent active failures and latent conditions. A bad outcome occurs when the holes in various layers line up to permit a trajectory allowing an accident to occur (See Figure 2.4). In both models, the relationships between or among concepts are visually represented by symbols, icons, and text-boxes, that are often linked by lines and arrows to denote connection and possible direction of those relationships. This type of model will be mentioned here as a **conceptual model** in order to differentiate from other connotations.
2.1.3.1 Assistive Technology Organizational Models & Disability Approach

Other common connotation of the term model found in the literature regards to the classification of different approaches, for example, standards or classic approach which is often contrasted with other ways of doing things (Rosen, 1989, in Lenker and Paquet, 2003). In this sense, the Andrich, et al. (2013) define three different models based on AT service provision from an organizational point of view, described in Table 2.1.
Table 2.1: AAATE organizational model classification adapted from AAATE (2003)

<table>
<thead>
<tr>
<th>AAATE Organizational model classification</th>
<th>Medical model</th>
<th>Social model</th>
<th>Consumer model</th>
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<tr>
<td>Within the medical model, each AT device eligible for public provision should be prescribed by a qualified professional under his/her responsibility. The model is called “medical” due to its similarity to drugs prescription in medical practice, although not in all Countries the authorised prescribers are always physicians. A medical model is usually regulated by a list of products (Registry) or product specifications (Types of products) eligible for public provision, with or without established prices or reimbursement thresholds.</td>
<td>Within the social model, the focus is on the whole assistive solution, rather than on specific devices. Once the individual assistive solution has been decided and the budget has been authorised, the choice of the specific devices is quite free, provided that they effectively meet the intended goals. Within a social model, basically any device may be eligible for public provision, unless public procurement policies restrict the range of products meeting a certain price or safety or quality rules.</td>
<td>Within a consumer model, the user decides on the devices and purchases them directly. This does not mean that users have to pay everything out of their pockets (the system may provide financial help through vouchers or cash) nor that they can purchase whatever they wish (financial help is provided against authorised objectives on which the user should be accountable) or that they are left alone in their choices (information and professional support services play a fundamental role in consumer models; empowering the user to be capable of responsible choices is also an important issue that should be addressed in consumer models).</td>
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</tbody>
</table>

Confusion may arise between these classifications and Clarkson, et al. (2003) classification of the medical and social model of disability. A ‘medical’ model of disability implies that people are disabled as a consequence of their own condition, and seeks to either remedy the impairment through medication, rehabilitation, and surgery, etc. or through adaptive aids and equipment (Clarkson, et al., 2003). A ‘social’ model of disability sees people as disabled or enabled by the social context in which they function and proposes that changes in the social context or environment can remove or alleviate disability (Clarkson, et al., 2003).

While AAATE definition indicates an organizational model to differentiate existing approaches to assistive technology service provision, Clarkson, et al. (2003) definition indicates a historical change in society approach towards disability. Clarkson, et al. (2003) classification will be referred here as medical approach and social approach, or just disability approach while AAATE classification will be kept as the medical model, social model, consumer model or simply organizational models in order to facilitate the differentiation.
2.1.3.2 Section Summary

The complexity involved in disability research leads to the development of various models designed with different intentions. Confusion is often made regarding these model and its intentions. A specific classification was adopted in this work to avoid confusion and distinguish models intentions. Therefore, the Organizational models mentioned here are those assisting the comprehension of the functioning of specific AT service, and consequently the policies, practices and other contextual factors involving the service. Conceptual models are those visual models helping to classify areas of enquiry, predict usage pattern, reduce trial and error when evaluating intervention options, and structure usability testing of design alternatives. Models need continuous attention in disability research and practice so it can facilitate the understanding of the complex relationship between its dimensions, and to provide guidelines for service provision.

2.1.4 Barriers to Assistive Technology Design and Provision

Assistive technologies are often bespoke or partly personalised devices. In some cases, the design processes are directly linked to the AT service provision, such as in orthotics and adapted wheelchairs. To understand the barriers to AT design was thought to be an essential part of the overall understanding of the topic.

During the revision of the literature, various aspects were recognised to influence the AT design. This section aims to review the literature on those factors and expose some the research gaps encountered.

2.1.4.1 Discontinuance

Abandonment of assistive technology is a commonly cited topic in assistive technology literature review. Phillips and Zhao (1993) designed a survey with more than 200 users of assistive technologies and identified four factors significantly related to the abandonment of assistive technologies, they are:
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1. Failure of providers to take consumers’ opinions into account.
2. Easy device procurement.
3. Poor device performance.
4. Changes in consumers’ needs or priorities.

Another factor identified by Pape, et al. (2002) is the personal meaning attributed to assistive devices by the end user. It seems that those factors together can result in the mismatch between technology specifications and end-user requirements, leading to abandonment. Galvin and Scherer (1996) comment that one of the major causes for this mismatch, and thus AT abandonment, is the myth that assistive technology requirements need to be assessed just once.

Lauer, et al. (2006) suggest the term “discontinuance” in preference to the term “abandonment” to imply a more accurate explanation of why AT is used or not used. They designed a study to identify and categorise the variety of factors influencing both the positive and negative discontinuance of AT and to develop a method to quantify the continuum of discontinuance. Lauer, et al. (2006) conclude that: “Certainly, device discontinuance may reflect faulty devices and inadequate services, resulting in negative impacts on both the client and the profession”.

2.1.4.2 Industrialisation and Market Barriers

One of the challenges in AT design regards to its market characteristics and industrialisation process that varies significantly from mainstream products. In this sense, Table 2.2 gathers common problems and its consequences found in the literature.

According to AAATE (2003), AT initiatives continue to suffer from a somewhat vicious circle. Despite its economic significance, the sector is still characterised by high fragmentation of the market. It is dominated by small and medium-sized enterprises-SMEs that are often highly competent in solving individual problems but have limited Research and Development-R&D and market capacity. Large industries that possess high innovation potential, substantial R&D capacity, and massive market penetration, often are not prepared to provide competent responses to such an individualised range of need.
### Table 2.2: Assistive Technology Industrialization and Market Barriers, adapted from Source: Hersh, (2010); AAATE (2003); Andrich, et al. (2013) which is described as AAATE 2013 on the table; Livingston (2010); Lewis and Matsuoka (2010); Borisoff, F.J. (2010)

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<tr>
<td>Small number of potential user's to the same AT device.</td>
<td>• Small market niche.</td>
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<td>• Difficulty to attract investments.</td>
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<td></td>
<td>• Limited revenues and little free operating cash.</td>
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<td>Companies give preference to high demand items such as wheelchairs, walking frames and hearing aids.</td>
<td>• Lack of devices covering different requirements.</td>
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<td></td>
<td>• Lack of companies that can design tailored to individual needs.</td>
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<td>Non-standard routes to product development and distribution of AT.</td>
<td>• Difficulty to establish best practice.</td>
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<td></td>
<td>• Additional stakeholders in the supply chain with different goals.</td>
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<td>• Higher project risks.</td>
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<td>Primary purchaser is often not the end user.</td>
<td>• Design may need to satisfy both the end-users and primary purchaser requirements.</td>
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<td>Need of economic incentives.</td>
<td>• Relying greatly on government tax incentive.</td>
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<td>• Relying greatly on external source of funding for R&amp;D.</td>
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<td>• Uncertain commercial value.</td>
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<td>Deciding Intellectual Property rights.</td>
<td>• Restrictions on creating patents that are not owned by the university or corporations.</td>
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<td>Insurance does not cover many devices.</td>
<td>• Higher project risks.</td>
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<td>• Difficulty to attract investments.</td>
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<td>• Uncertain commercial value.</td>
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<td>Regulatory issues.</td>
<td>• Complex and cumbersome process to certify devices.</td>
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<td>Sales support and on-going servicing and maintenance.</td>
<td>• Higher costs.</td>
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<td>• Complex institutional arrangement.</td>
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<td></td>
<td>• Uncertain commercial value.</td>
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- Mentioned by Author
2.1.4.3 The Assistive Technology Dealer The Purchaser and The End-User

A report on equipment for people with a disability regarding the years of 2007 to 2011 (Key Note, 2012) estimates that global demand for equipment for people with a disability had a value of £70.1bn in 2011. According to the report, North America and Western Europe were the largest markets within the overall global market, accounting for nearly half (48.1%) of the total market combined. The same report reveals the National Health Service-NHS as the primary purchaser of this equipment in the UK. Other major buyers include private independent organisations running hospitals; nursing homes and residential homes; charities and voluntary organisations; local authorities; and individuals who wish to invest in a more specific choice of equipment that best accommodates their needs. The profile of the primary purchasers has a direct impact on how assistive technology designers see and considers the end users as observed by Newell (2003):

“...designers of assistive technology tend to think of the people for whom they are designing not as ‘users’ or ‘consumers’, but as ‘clients’ or ‘patients’, and the true ‘customer’ as a government agency. The AT industry has also often considered its ‘clients’ to be economically poor and politically powerless, using equipment which is procured for them either by government agencies or charitable bodies. The clients are rarely seen as the customer, because, they neither paid for their equipment nor had a major say in the choice of the equipment purchased.” (Newell, 2003).

In the same context, Steel and de White (2011) affirms that the competing business interests of AT dealers and health insurers must be recognised, and differentiated from the role of independent advice and service providers.
2.1.4.4 Section Summary

The quality of AT design and service provision outcome suffers large influence from market characteristics and the organisational model where it is located. Hence, research is continuously needed to investigate the quality of AT products and services’ available in a specific region to explore whether they meet the needs of the population they are designed for.

Some questions have emerged at this point of the literature review, such as:

- How to address tailored needs in AT service provision in an economically viable way?
- How to create a market for tailored AT?
- How AT regulations can be implemented in a way that it does not make implementation unfeasible?

2.1.5 Best Practice on Assistive Technology Service Provision

Scherer and Galvin (1996), on the topic of AT service provision’ best practices, stated:

“Matching people with the most appropriate assistive technology is a complex process, but the process need not be problematic and difficult. Appropriate technology interventions occur at all levels of technological sophistication and can be achieved through the implementation of a logical, systematic decision-making approach and guided by certain fundamental principles.” (Scherer and Galvin, 1996)

There are in the literature several conceptual models and quality indicators aiming to facilitate and improve the provision of disability services that includes AT services. This section will explore some of the most influential.
2.1.5.1 Conceptual Models

According to Lenker and Paquet (2003), conceptual models help to classify areas of enquiry, predict usage pattern, reduce trial and error when evaluating intervention options, and structure usability testing of design alternatives. On this seminal paper, Lenker and Paquet reviewed six of these conceptual models for AT outcomes research and practice. The models were reviewed in six domains: background and goals; descriptive characteristics; validation in the literature; and utility to AT practitioners, developers, and consumers. The models analysed were: Cook and Hussey’s Human Activity Assistive Technology - HAAT; the WHO’s International Classification of Functioning, Disability and Health–ICF; Scherer’s Matching the Person and Technology-MPT; Gitlin’s model of an AT user’s career; social cognition decision-making theories; and Rogers’ Perceived Attributes Theory.

The HAAT describes an AT system in terms of a person (human) using an assistive technology device (AT) aiming to accomplish a specific task (activity) in a certain context (environment). Figure 2.5 represents the interactions of these elements in HAAAT model. Lenker and Paquet (2003) state that HAAAT reflects the perspective of human factors engineering and occupational therapy.
The first, by analysing how the characteristics of tasks and environments impact human performance, the second by improving human performance in purposeful activities. They conclude that despite many indicators of impact are mentioned, HAAT does not suggest specific causal relationships between its descriptive methods and outcomes (Lenker and Paquet, 2003).

The ICF Levels of function model (see Figure 2.3) describes individuals in terms of the level of functioning, rather than describing levels of deficit or dysfunction. The aim is to provide a framework for assessment, diagnosis, intervention, and outcomes measures regardless of the ability level or health condition (Lenker and Paquet, 2003). Cook and Hussey (2002, cited in Lenker and Paquet, 2003) affirm that the model has successfully helped to spread the social approach by transforming the view in rehabilitation research from a perspective that places the ‘problem in person’ to a conceptual framework that features a ‘problem in system’ orientation. Smith (1996, cited in Lenker and Paquet, 2003) critiques that the ICF model does not clearly delineate the parallel interventions that affect performance, such as alternatives to AT or personal assistance.

The Matching Person and Technology (MPT) model suggests that the interaction of milieu, person and technology influences long-term use and non-use of AT devices (Lenker and Paquet, 2003). The MPT includes a structured process to facilitate the selection of an AT device that is the best “match” for the end user, AT device, and context of use (Scherer and Craddock, 2002, cited in Lenker and Paquet, 2003). Lenker and Paquet critique that, despite some explications of the MPT in the literature suggests the existence of an ideal match between a person and technology the reality is that AT devices are often recommended because they represent the best available compromise at the time of evaluation.

They conclude that HAAT, ICF and MPT models offer a superior descriptive framework for classifying and describing traits associated with individuals and their contextual environment. However, they lack validation, especially accessing the person-environment interactions affecting human behaviour, which can be learned from other models and theories such as social cognition decision-making theories.
2.1.5.2 Quality Indicators

The EASTIN and AAATE (Andrich, et al., 2013) list four reasons why intermediaries and more specifically the existence of a service delivery system (SDS) are needed when acquiring an assistive technology, they are:

- The **ethical** issue related to the principle of equal opportunities.
- The **financial** issue related to the need to remove cost barriers and allowing equal opportunities in the access of those who need them.
- The **expertise** issue related to the need for qualified professional support when selecting and implementing an assistive solution.
- The **consistency** issue related to the need to ensure that an assistive technology intervention fits into overall individual intervention packages.

Andrich, et al. (2013) sustain that the AT systems differ significantly from each other. They might differ concerning each Country's disability policy, socio-economic context, and history. They say that a system may be considered more or less advanced than others; however, no system recognises itself as “perfect”. Thus, each country needs to design systems that are best tailored to its context, basing on state-of-the-art recommendations. Saying that the development of such recommendations should work whatever organisational model approaches the country or service adopts.

AAATE have been supporting service improvement in Europe by various means such as workshops and conferences, defining the AT world agenda with WHO and service stakeholders, and providing recommendations for those who are engaged in the design, development, and implementation of AT service delivery system policies. The main recommendations were developed at the HEART Study published in 1995 by the European Commission, and on a consensus process within the Board of the AAATE. The HEART Study identified the following seven steps in any service delivery process demonstrated in Table 2.3.
Scherer and Galvin (1996, p.8) suggest similar steps when matching person and technology. The main difference is that Scherer and Galvin (1996) suggests specific steps for an AT selection or decision-making process rather than focusing on service stages.

More than identifying the necessary steps in the AT selection/provision process it is crucial to provide recommendations for the complexity involved in each of this steps or stages. The Quality Indicators for Assistive Technology (QIAT) community put into the on-going process of identifying, disseminating, and implementing a set of quality indicators in the school settings (QIAT, 2012). More broadly, the HEART study provided recommendations for service improvements by developing quality indicators and guidelines to function regardless of system characteristics. According to Andrich, et al. (2013), these guidelines have been continuously updated, and a recent survey among experts in Europe indicated that these criteria are still valid. The quality indicators are grouped in six categories: Accessibility, Competence, Coordination, Efficiency, Flexibility and User Influence (Andrich, et al., 2013). Table 2.4 describes these in detail.

Table 2.3: seven steps in any assistive technology service delivery, adapted from Andrich, et al. (2013)

<table>
<thead>
<tr>
<th>Steps</th>
<th>Description</th>
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<tbody>
<tr>
<td>Initiative</td>
<td>The first user’ contact with the service delivery system.</td>
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<tr>
<td>Assessment</td>
<td>Evaluation of user’ requirements.</td>
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<tr>
<td>Selection of the assistive solution</td>
<td>Defining the user’ individual AT programme.</td>
</tr>
<tr>
<td>Selection of the equipment</td>
<td>Choosing the specific equipment within the AT programme.</td>
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<tr>
<td>Authorisation</td>
<td>Obtaining funding or authorizing a procedure for accountability.</td>
</tr>
<tr>
<td>Implementation</td>
<td>Delivering the equipment, fitting and training the user.</td>
</tr>
<tr>
<td>Management and Follow-up</td>
<td>Maintenance and periodic verification of users’ requirements.</td>
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Table 2.4: Six assistive technology service delivery quality indicators, derived from text in Andrich, et al. (2013)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Description</th>
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<tr>
<td>Accessibility</td>
<td>A service delivery system is accessible when no one is excluded from the services or in any other way discriminated. It is essential that the system is driven by the user needs and that funds are available to remove financial barriers that may hinder access to assistive technology. It is important that people know that there is a service delivery system, that assistive technology products exist, and where to go to make the first contact in order to access the system. Once the contact is established, it should be easy to get appropriate assistive solutions without unnecessary delay. Accessibility indicators include the scope of the system, its simplicity, the availability of information to the public, financial barriers and costs for the user, the duration of the process and the complexity of the procedures.</td>
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<tr>
<td>Competence</td>
<td>A service delivery system is competent if the involved professionals have the knowledge and the skills needed to properly meet the user needs. Competence indicates the availability of knowledge, skills and experience necessary to serve the client. Competence indicators include the educational level of the professionals involved, the possibilities for further education, the use of protocols and standards in the process, the availability of information about assistive technology, the possibility to learn from users’ feedback.</td>
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<tr>
<td>Coordination</td>
<td>A service delivery system needs to be well-coordinated at three levels: within the primary process of service delivery (everything “around” the individual user or client: micro level), during the various steps of the service delivery system process (all professionals working harmoniously together: meso level), and within other policies and processes (research and development, market processes etc.) involving assistive technology (macro level).</td>
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<td>Efficiency</td>
<td>A service delivery system is efficient when it is able to achieve the best solution for the highest number of users, using the available resources in the shortest time and at the lowest cost. An efficient system involves low costs for the users, their direct involvement in all procedures, simple bureaucracy, accessibility to information, completeness of service. Efficiency indicators include complexity of procedures and regulations, duration of the process, control of the system over the process, mechanisms able to control costs and effectiveness, allocation of decision-making power to the appropriate level of competence between the various actors involved.</td>
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<td>Flexibility</td>
<td>A service delivery system is flexible when it is able to respond to the different needs of individuals; when a producer/importer can get a device tested at a reasonable cost and within reasonable time, and get into the market; when researchers and developers can get support for their work, coordinate their work, cooperate and communicate with users, designers, producers, and utilize new technology to meet needs.</td>
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<tr>
<td>User influence</td>
<td>A service delivery system takes advantage of the user influence when it empowers, actively involves and makes the user participate in responsibilities in all decisional processes related to assistive technology interventions. The lack of user involvement exposes the process to the risk of wrong or ineffective intervention, abandonment of the devices provided and waste of resources. User influence indicators include the presence and strength of user organisations, the availability of juridical protection of the user’s rights, the involvement of users at a policy level, the user empowerment during the individual assessment, communication with the user in the service delivery process and the influence of the user on decisions in the process.</td>
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More recently, the Global Cooperation on Assistive Technology (GATE) was created to develop and coordinate a global initiative to realise the obligations of the Convention on the Rights of Persons with Disabilities towards increasing access to assistive technology (WHO, 2014). The GATE initiative has only one goal: to improve access to high-quality, affordable assistive products globally. The initiative is in partnership with stakeholders who represent international organisations, donor agencies, professional organisations, academia, and user groups.

It seems to be consensus from different authors regarding AT service provision best practice that, in order to achieve these quality indicators, an interdisciplinary approach is required that involves design and engineering competence, clinical expertise, socio-economic knowledge, understanding of industrial and market issues, insight into public policy matters, and, last but not least, the perspective of end-users (AAATE, 2003; Andrich, et al., 2013; Oishi, Mitchell and Machiel Van der Loos, 2010; Andrew, Batavia and Guy, 1990).

### 2.1.5.3 The User Influence

From all the quality indicators the *User Influence* is probably the main to pledge that the system is designed from a user-centred and participatory perspective. Andrich, et al. (2013) published fifteen updated recommendations with regards to the *User Influence* in the AT service provision (See Appendix 1 for the full set of recommendations). To simplify their explanation in this section, they were divided into six categories that they relate. They are:

- Assessing The User Requirements.
- Empowering the User.
- Rights of the Disabled Person.
- Access to Assistive Technology.
- Research and Development.
- The Assistive Technology Solution.
Assessing the user requirements are recommendations to ensure that users are consulted with regards to their needs and the goal they perceive to achieve. Practical recommendations given are:

“The user is the best judge of whether a specific technical solution to a functional limitation is good. The individual AT programme should be built in relation to what life goals the user wants to achieve”. “... professional assessment reports might be integrated by self-assessment reports, in order to better take into account environmental factors and personal goals.”

Empowering the user are the recommendations that empower users to make their own choices and to become a specialist him/herself of his/her needs. Practical recommendations given are:

“a) Educating professionals to have an attitude of equity towards users; b) providing information and consultation to enable users to make responsible choices; c) allowing users to try out products for a reasonable time before making the final choice; d) providing the possibility, to both users and professionals, to change decisions that have been made.”

Rights of the Disabled People are recommendations to ensure that the disabled people rights are being catered. Practical recommendations given are:

“a) Adequate legislation; b) accompanying financial means; c) platforms (e.g. advisory committees) at local, national and/or European level promoting and monitoring regulations and practices; d) statutory bodies to ensure and protect the rights of individuals (right to appeal).”

Access to Assistive Technology are recommendations to overcome the access barrier to ATs. Practical recommendations given are:

a) Providing individual users with their own budget to use towards services and devices; 
b) providing user organisations with financial support which may be earmarked for specific uses or open for whatever the organisation sees as most important.

Research and Development are recommendations to encourage the user participation in the development of both new AT devices and service delivery systems, also to the improvement of existing ones. Practical recommendations given are:

“a) Mechanisms to systematically collect individual user feedback, e.g. through panels of expert users; b) user involvement in specific projects; c) user involvement in defining priorities in Research and Development programs.”
The Assistive Technology Solution are the recommendations that provide guidance on how user requirements should be considered when deciding on the AT solution. Practical recommendations given are:

“A service delivery system should be able to provide appropriate services tailored to different needs; according to the level of complexity of the problem of the user; to the level of knowledge, awareness and decision making ability of the user; to the expected level of complexity of the solution.”

“Individual AT programmes should be part of a wider life plan (rehabilitation, care, education, employment etc.). They shouldn’t be a goal in itself.”

2.1.5.4 Using and Adapting Guidelines

The use of evidence-based protocols to improve health care service quality is widely acknowledged and encouraged. The production of guidelines has been promoted and supported by the governments and professional organizations as a mechanism to reduce practice variations (Harrison, et al., 2010). Likewise, barriers to the use of guidelines and evidence-based protocols in AT services have been reported in several European countries (Friederick, Bernd and De Witte, 2010; Steel and De Witte, 2011).

A study by Friederick, Bernd and de Witte (2010) involving neurological rehabilitation centres providing AT in western European countries found that a large proportion of professionals do not demonstrate the use any specific protocol. From the 29 participants that replied to the survey, only ten reported using a theoretical framework to select AT. Four models, three frames of reference, and one international classification were mentioned. Fifteen professionals replied to the question about which protocol they utilise by mentioning one or more methods. Fourteen participants stated that they used no specific protocol or left the question unanswered. The protocols mentioned show the use of a broad variety, and the majority of the published ones not being AT-specific. Participants often reported using self-made tools to fill this gap.

A study conducted by Steel and de Witte (2011) reported that the use of evidence-based decision, as well as the use of protocols and information support to improve processes, was noted as a challenge in the Netherlands AT services. The lack of standards and the inconsistencies in service delivery approaches across sectors were also noted as barriers in Cyprus.
Although, guidelines on similar topics are produced by a large number of organizations worldwide. Nonetheless, previous studies have suggested a considerable variation in the quality of published guidelines to a similar end. It has been suggested that unnecessary effort could be avoided if the existing guidelines were relevantly adapted rather than being developed de novo (Baker and Feder, 1997; Harrison, et al., 2010). In addition, a literature review reveals the existence of a few studies with regards to adapting guidelines to specific AT service rather than developed de novo.

Desideri, et al. (2016) identified a set of internationally validated tools for developing a structured and validated powered mobility device assessment and training program in Italy. The research was divided into three parts: A first study to define a tool for the powered mobility device assessment; a second to define tools to measure the powered mobility device outcome; and a third to define the elements for a powered mobility device training. A systematic review of the literature and discussion of review results with stakeholders was a common method to all the studies. In the first two studies, a decision was made between the existing tools and the subsequently adapted and translated tools into Italian following international recommended guidelines. For the third study, more than one tool was used to define the necessary elements for the development of the training circuit. The Wheelchair Skill Test 4.2 (WST) was employed as a guide for the selection of physical components and the design of the training circuit. In addition, the studies considered the obstacles course guidelines from the Wheelchair Skills Program (WSP) and also included pedestrian traffic elements (e.g., zebra crossing, traffic lights), since Italian traffic regulations consider powered mobility device users as pedestrians. However, little detail is provided about the rationale of the adaptation process.

A study by Steel, Gelderblom and de Witte (2011) had developed a tool that builds on the MPT model for the selection of AT devices, and the mapping of the ICF framework with the elements of AT assessment. Notably, the approach is not specific to one service delivery context. The tool attempts to combine elements from AT selection theory that includes MPT, EUSTAT, social-cognitive model for practical use, collecting clinical data in a structure and sequence, recognisable by the ICF terminology (Steel, Gelderblom and De Witte, 2011). The tool was developed using four steps. The first was outlining a framework. In this stage, the relevant factors and items from tools and models were collected, prioritised and organised within the concept groups and steps. The second step was the initial expert review: Feedback on project plan and framework. Experts in the field of AT were consulted on the framework and project plan. In this process, twen-
ty-six AT practitioners and researchers from twelve countries provided individual feedback on the project concept and initial framework. The third step was the tool development and website construction. A tool was drafted from the framework and collected factors. A website was constructed to introduce the project and framework. The fourth step was the second expert review: Evaluation of the tool and its potential use. In this stage, AT researchers and practitioners from the first review were contacted by email to evaluate the tool, and the project (Steel, Gelderblom and De Witte, 2011).

Reports show that several national and international bodies have made great efforts to improve the quality and rigour of guidelines (GRADE, 2004) but in comparison, the investment made is less towards developing an understanding on how guidelines can be targeted to the local context of healthcare (Harrison, et al., 2010).

Fervers, et al. (2006) performed a systematic review of the literature on guideline adaptation, and from these results, proposed a step-wise, structured approach for the adaptation of guidelines. This was part of the ADAPTE Working Group, a project aimed at adapting French guidelines on the treatment of colon and ovarian cancer for use in Quebec. The project retrieved 1044 publications and identified 18, which reported models, practical examples, and experiences of guideline adaptation. They designed an approach to trans-contextual guideline adaptation that comprises seven sequential steps. The steps are:

1. definition of the clinical questions to be included in the final guideline;
2. search for source guidelines;
3. assess clinical content of the source guidelines;
4. evaluation of the quality and coherence of the source guidelines;
5. adaptation of the recommendations;
6. external review of the adapted guideline;
7. adoption, endorsement, and implementation of the adapted guideline.
Although high-quality guidelines may be perceived as necessary, they are insufficient to ensure evidence-based decision-making (Harrison, et al., 2010; Toman, Harrison and Logan, 2001). Correspondingly, certain recognized barriers, which contribute to this, include: Clinicians may not have the necessary skills and expertise to implement a recommended action, or the setting may not have the mandatory equipment, staff or the time to deliver a guideline’s recommendation (Straus, Richardson and Glasziou, 2005 in Harrison, et al., 2010).

2.1.5.5 The User-Centered Design and The Service Design Perspective

Stepping back from the assistive technology services and looking from a broader perspective to the health care services, much attention has been paid to cost savings and efficiency improvements (Bowen, et al. 2013; Smalley, 2012). The call is ‘More for the same or the same for less’ with a clear aim of optimising healthcare provision with a limited financial budget. This has led to a revision of the current practices, opening the opportunity to incorporate strategies from different areas. The application of a ‘User Centred Design’ approach to the design of healthcare provision can both reduce holistic costs as well as improving outcomes and so is deserving of greater investigation (Eikhaug, et al., 2010, Smalley, 2012).

The key principles of User Centred Design have been identified (Gould and Lewis 1985, Preece, et al. 2002). They can be summarised as:

- an early focus on users and tasks;
- empirical measurement;
- iterative design;
- users’ tasks and goals are the driving force behind the development;
- user’s behaviour and context of use are studied and the system is designed to support them;
- users’ characteristics are captured and considered in the design;
- users are consulted throughout development from earliest phases to the latest, and their input is seriously taken into account;
- all design decisions are taken within the context of the users, their work and their environment.
A similar term gaining popularity is ‘Human-Centred Design’. Some authors argue that Human-Centred Design takes a more systematic approach to problem-solving, looking from a service perspective rather than just to the product or technology (Yalanska, 2016; Gasson, 2003). The focus on the service could also be a reflection from the transition from a manufacturing economy to a service economy which has lead to the ‘servitization’ phenomena - the process of creating value by adding services to products (Vandermerwe and Rada, 1988 in Baines, et al., 2009).

As a consequence, new approaches looking into the service perspective has emerged such as New Service Development, Service Design, and Service Innovation. For more information on the difference between those terms read the work of Braines, et al. (2009). These different strategies all borrow from the User-Centered Design methodology. The term Service Design is used in this thesis as an umbrella term for all those others. It is defined as:

“The activity of planning and organizing people, infrastructure, communication and material components of a service in order to improve its quality and the interaction between service provider and customers. The purpose of service design methodologies is to design according to the needs of customers or participants, so that the service is user-friendly, competitive and relevant to the customers” Service Design Network (n.a).

The term ‘User-Centred Design’ was used in this thesis as an umbrella term that encompasses human-centred design, participatory design, co-design. For more information on the difference between those approaches read the work of Sanders & Stappers (2008).
2.1.6 Section Summary

There are few publications on how end-user requirements are accessed and translated into assistive technology specifications. The end user requirements specification is inherently a multidisciplinary and user-centred approach, requiring effective communication between those involved in the process. There are several existing good practices and quality indicators to access the current state of an AT SDS. The User Influence quality indicator from HEART Study seems to be the one to assess if the system is designed from a user-centred perspective.

Some questions emerged at this point of the review, such as:

- How medical professional evaluates end users’ ‘non-medical/non-functional’ requirements?
- How end user’ requirements evaluated in AT service provision are translated into product specification?
Literature Review PART 2

This section aims to review the literature the available service provision for people with disabilities in Brazil. The goal is by no means to cover in details the Brazilian health system and subsystems but rather to contextualise the reader with regards to the Brazilian health service scenario.

2.2 Health Services in Brazil

According to Paim (2004, p.25), Brazilian health services are composed of three subsystems: the Sistema Único de Saúde-SUS; the Sistema de Assistência Médica Supletiva-SAMS; and the Sistema de Desembolso Direto-SDD.

The SUS is the public health service, which is integrated into the municipalities, states and union services, also with the philanthropic and for-profit service. It was established in the national constitution of 1988 with the goal to implement the right to health as a right for any citizen and duty of the State (Paim, 2004). The SUS corresponds to the only health service option for more than 150 million of Brazilians, what compares to nearly three-quarters of the Brazilian population (Paim, 2004; Varella, 2014; Temporão, 2013).

The SAMS has private nature, nonetheless, shares many connections with the public service, making it the most complex and segmented service in Brazil (Paim, 2004). Its main characteristic is the pre-paid or post-paid service to assure medical assistance when necessary. It is divided into four categories which are: Health Insurance plans, Self-Managed Plans, Group Medicine and Medical Cooperatives.

Health Insurance plans appeared in Brazil on the 70’s linked to big banks companies and insurance plans (Bahia, 2001 cited in Paim, 2004). Self-Managed Plans corresponds to the services offered by employer companies to its employees and eventually to their families, by means of trade unions or specific contracted company. Group Medicine also emerged in the seventies with the setting of multinationals companies in Brazil, moving their employees from the medical welfare by hiring the service of medical companies. Medical Cooperatives started in the same decade as a critic of the commercial character given to the health
services. It works by means of voluntary filiation of medical professionals, of which the service provided is paid by the end of a term (Paim, 2004).

The SDD is utilised mostly by high-income persons to occasional services that are not covered by their plans or to do medical appointment and exams with prestigious professionals that are not linked to SUS and SAMS (Paim, 2004).

The government subsidises both SAMS and SUS by means of the tax deduction for health expenses. Many authors’ criticise the SAMS and SDD subsystems (Paim, 2001; Bernardes, et al., 2008; Marsiglia, 2013). One of the reasons is that the end users in these subsystems have a free initiative when looking for health services, following a spontaneous demand. As a consequence, end users are not aware of the preventive measures and the systematic quality of health service provision in what concerns the person’s full care. Another reason is that these approaches are not committed to the impact of population welfare and health improvement (Paim, 2001; Marsiglia, 2013). Paim (2004) came to the following conclusion about health care services in Brazil:

“Healthcare from both individual and community suffer the influence of these organisational arrangements, management, and funding, besides the infrastructure and resources available. These resources represent an unequal distribution of social stratum, regions, states, municipalities, urban and rural areas, cities and outskirts…hence equity, in a society extremely unfair as the Brazilian, is a great challenge to healthcare services and SUS.” (Paim, 2004 p.25).

Despite the apparent concern of SUS system with the welfare and improvement of the population health it still lacks an effective integration between services (Mendes, 2011). This is further detailed in the following section.

2.2.1 The Move towards an Integrated Healthcare System

In a seminal book from the Organização Panamericana de Saúde - a regional WHO organization- Mendes (2011) reviews the existing healthcare systems. In his assessment, he highlights the differentiation between the fragmented and the integrated healthcare systems. He states that fragmented systems are heavily dependent on the figure of clinicians and nurses and tend to focus on the health conditions and acute events. On the other hand, the integrated systems
are based on multidisciplinary teams and manage to balance the focus between acute and chronic conditions. Furthermore, Mendes identified a visible trend in healthcare systems to move from fragmented to integrated systems and, as a consequence, to increase the role of a multidisciplinary primary care team in the coordination of the user-care.

Mendes lists the advancements made in Brazil towards a more integrated system. He mentions the implementation of health centers in the sixties, the programme Ações Integrada de Saúde (suggested translation: Integrated Health Action programme) in the eighties, and the implementation of the Programa Saúde da Família-PSF (suggested translation: Family Health Programme) in the nineties, which is still ongoing. The PSF is part of what is called basic healthcare in SUS. Mendes criticizes that naming primary healthcare as basic was a huge mistake, thereby, contradicting the concept of integrated healthcare and creating a paradigm that needs to be overcome.

More recently other strategies were additionally created to integrate the health system. The Estratégia de Saúde da Família (suggested translation: Family Health Strategies) aims to restructure the primary care in SUS employing the Equipe de Saúde da Família - ESF (suggested translation: Family Health Team). ESF is a multidisciplinary team supporting the primary care units. The ESF is composed by at least one general practitioner or specialist in family health, one general nurse, nurse technician and one community health agent (Brasil, 2011).

Another strategy towards a more integrated service was the implementation of the Núcleo de Apoio à Saúde da Família - NASF (suggested translation: Health Family Support Team). The Health Ministry created the NASF in the year 2008, with the aim to support the consolidation of the primary care in Brasil, in order to increase the service offer and access (Brasil, 2008). Each NASF team supports between 8 to 20 ESF teams and are composed of up to 19 professionals. This personnel have diverse clinical proficiencies, to cite some: Physiotherapist, phonoaudiologist, social worker, acupuncturist, nutritionist, and psychologist. The aim was to promote integration by encouraging discussion of clinical cases, thereby, providing multidisciplinary care, assessing users in its home environment, acting in the prevention and health promotion, and assisting therapeutic projects in qualifying and increasing health interventions (Brasil, 2012a).

However, the introduction of the NASF in the primary care is considered insufficient to build an effective multidisciplinary care (Mendes, 2011). The underlying reason is that professionals tend to offer longitudinal support to PSF but fail to compose the team organically, including the capacity to bond with SUS users.
Mendes correlate this failure to the higher number of ESF teams that each NASF has to support. Mendes points that, despite favourable results, the PSF as a practice has run out. He quotes:

“It is not possible to have a quality primary healthcare service...with a primary care unities installed in rented homes, that offers low-tech services, with a restricted range of medications, that works based on professional care from clinician and nurses, that cannot offer supported self-care due to the lack of multidisciplinary staff, that presents a precarious procurement system that, overall, does not have a professionalised management. And much less trying to solve the problems of PSF with a compromised agenda that focus on the flexibilization of the medical work.”(Mendes, 2011, p.90. Author translation).

He concludes that PSF cannot cope with the role that an integrated healthcare system requires in the primary care, and neither sustain the changes proposed by WHO 2008 annual report.

### 2.2.2 Profile of Disabled Population in Brazil

According to the 2010 Census in Brazil (IBGE, 2010), 45.606.048 Brazilian residents declared having at least one type of disability. It corresponds to 23.9% of the Brazilian population, which compares to nearly 3/4 of the entire UK population in the year 2010. The visual disabilities were found to be the most common among the population and affected 45.6 million people. The motor-related disabilities were the second most frequent and affected 13.3 million people. The hearing disabilities affected 9.7 million people, and the mental or intellectual disabilities affected 2.6 million people.

The census also revealed that, for the job market, the mental and intellectual disabilities exert more influence as a limiting factor for both the men and women population. From the 44 million people within the considered active age (10 or more years), 53.8% (23.7 million) were unemployed or were not economically active.

The differences in the income as a result of disability are higher among the poorest. The census investigated the monthly nominal income for the active age category with at least one disability. The results show that 46.5% of this population earned minimum wages or did not have an income, and nine percentage points
of difference with those having none of the investigated disabilities (37.1%).

The job market disadvantages for the disabled population is explained partly by the companies’ lack of preparation to receive them, and partly from the education level of the disabled population. Between the people having at least one of the listed disabilities and aged 15 or more, the literacy rate was 81.7%, i.e. an 8.9 percentage points of difference to those with none of the investigated disabilities (90.6%). The southeast region presented the highest rate of disabled population literacy (88.2%) and the Northeast region, the lowest rate (69.7%). The most substantial gap, however, was found in the education level. Specifically, 61.1% of the population with at least one of the listed disabilities and aged 15 or more had no level of education or did not complete the elementary school, while this percentage was 38.2% for those with none of the investigated disabilities. However, the gap is smaller for those with higher education, represented by 6.7% with disabilities and 10.4% with none of the studied disabilities (IBGE, 2010).

2.2.3 Care of the Disabled Population in Brazil

The care of disabled population as stated in the law 8.080/90 (Brasil, 1990), which regulates the SUS service, is far from being a reality. This is true especially regarding the aspect of universal access and decentralised management (Paim, 2001; Paim, 2004; Bernardes, et al., 2008; Marsiglia, 2013). The care of people with disability was for long time secondary to SUS. Historically, this population’s care had been mostly provided by charitable or civil institutions (Junior and Martins, 2010). Nonetheless, care provided by these organisations is limited, especially when it comes to the provision of assistive technology. This section reviews the recent advancements and the gaps in disabled people care provided by the SUS.

The Brazilian Constitution of 1988 brought advancements regarding the security of rights and social equality (Paim, 2004; Bernardes, et al., 2008; Junior and Martins, 2010). However, the decisions concerning the disabled population were postponed to further regulations (Bernardes, et al., 2008). Despite the formalisation of the basic rights, it was kept the charitable character already set in Brazilian society by that time (Bernardes, et al., 2008, Junior and Martins, 2010). The charitable service was the only choice for the majority of the disabled population (Paim, 2004).
Neri, et al. (2003) designed a study based on the 2001 Census to identify the socio-economic-demographic profile of disabled people in relation to their health condition, education, income transfer, accessibility and working insertion. Figure 2.6 represents the crosschecking of the disabled person and the average income of the major employer in the family.

![Disabled Person X Average Monthly Income of the major worker in the family](image)

Source: CPS/ IBRE/FGV from IBGE demographic census micro-data in 2000

Figure 2.6: crosschecking of the disabled population and the average income of the major employer in the family, adapted from Neri, et al. (2003)

The results present a higher concentration of disabled persons with lower income in the northeast area of the country and a general trend to increase the revenue as it approaches the centre and southwest area of the country. When other social aspects are analysed, such as average education level and the concentration of disabled people, the trend is that the closest to centre and southwest the higher the results (Neri, et al., 2003).

It was as recent as 2007 that a program to address elderly and disabled population with low-income was regulated by the decree Nº 6.214/2007, putting in practice two laws approved since 1993 (Brazil, 2007). It regulated an assistive benefit to the person living under a quarter of the minimum wage per person in the family and whose severe disability disabled them to work. This benefit is called Beneficio de Prestação Contiuada-BPC. Regarding this benefit, Munhoz and Regan (2013) suggest alterations to provide the adequate living
standards stated in the UN Convention on the Rights of Persons with Disabilities (CRPD) published in the federal decree 6.949/2009. The main alteration regards the change in the selection criteria to up to one minimum wage per person in the family income.

As for the provision of AT devices, SUS started providing them in 2002 and, according to Bernardes, et al. (2008), just the SUS’ orthotics and prosthetics service had a restrained demand of 1.042.000 persons waiting to receive a device in 2007. This fact shows that, despite significant advancements in the public provision of AT, charitable services were still relevant to alleviate the restrained demand. In the following year, the CRPD was ratified in Brazil. Later in 2009, the CRPD was published in the federal decree 6.949/2009 giving the convention power of Constitutional Amendment (SDH, 2010).

More recently in 2011, the government established the national plan for the rights of the disabled people called Viver Sem Limites-VSL (SNPDP, 2013). The plan was set from 2011 until the end of 2014 and articulated policies regarding social inclusion, access to education, accessibility and health care. Policies regarding the social inclusion gave continuity to the BPC benefit, introduced the BPC work benefit for those having difficulty to find work due to their disability, and brought investments regarding inclusive residence and day care homes (SNPDP, 2013).

Policies regarding access to education included funding support to public school accessibility; equipping one room of public schools with a multifunctional kit containing accessible furniture and pedagogic material; providing accessible transport; giving priority in technical education scholarship; giving support to accessibility projects at universities; implementing sign language education programs; and increasing the BPC to those registered in school (SNPDP, 2013).

Policies regarding accessibility included support for those in need to acquire an adapted home, and installation of accessibility kit according to the resident disability; installation of guide dog centres; creation of the national program of innovation in AT; creation of the national centre for reference in AT; providing microcredit lines to AT acquisition, and tributary relief (SNPDP, 2013).

Policies regarding the health care included disability identification and early intervention programs; therapeutic guidelines; the creation of a net of rehabilitation centres called Centros Especializados em Reabilitação-CER; the creation of orthopaedic workshops; the creation of odontology centre, and capacitation of professionals working in those different centres (SNPDP, 2013).
Chapter 2 | Literature Review

The CER is divided into four levels depending on the number of disability types they cover (hearing, physical, visual and intellectual). A CER II can offer services to a combination of any two types of disability, for example, hearing and physical disability or physical and intellectual disability. Funding also became available to existing services to upgrade from one CER level to other (Brasil, 2012b).

2.2.4 Viver Sem Limites Recent Achievements

As VSL program approached the end of its first planned period during this review, it was possible to start analysing its early achievements. Table 2.5 presents the program’ goals for the healthcare sector, what was promised and what was achieved until 11th February 2014.

After three years from the program start, from the 14 projects related to the healthcare sector, five achieved the initial goals, three have not been providing with information, and six has not achieved the initial goals. From the projects related to the assistive technology service provision, just one-third of the orthopaedic workshops have been qualified, and no information was provided regarding the implementation of the road and watery travelling orthopaedic workshop. On the other hand, the website (SDH, 2014) provides information that the goals regarding the active rehabilitation centres surpassed more than twice the initial goals.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Disability identification and early intervention</td>
<td>Estates with new-born screening in stage IV implemented.</td>
<td>27</td>
<td>12</td>
<td>Goal NOT achieved</td>
</tr>
<tr>
<td></td>
<td>Maternity equipped with hearing screening.</td>
<td>175</td>
<td>75</td>
<td>Goal achieved</td>
</tr>
<tr>
<td></td>
<td>National System of new-born screening implemented.</td>
<td>1</td>
<td>no info.</td>
<td></td>
</tr>
<tr>
<td>Therapeutic guidelines</td>
<td>Therapeutic guidelines published.</td>
<td>10</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Rehabilitation centres</td>
<td>Active rehabilitation centres.</td>
<td>45</td>
<td>102</td>
<td>Goal NOT achieved</td>
</tr>
<tr>
<td></td>
<td>Acquisition accessible vehicle.</td>
<td>88</td>
<td>108</td>
<td></td>
</tr>
<tr>
<td>Orthopaedic workshops</td>
<td>Static orthopaedic workshops implemented.</td>
<td>6</td>
<td>6</td>
<td>37 approved</td>
</tr>
<tr>
<td></td>
<td>Road travelling orthopaedic workshops implemented.</td>
<td>7</td>
<td>no info.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Waterway travelling orthopaedic workshops implemented.</td>
<td>6</td>
<td>no info.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Qualified orthopaedic workshops.</td>
<td>60</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prosthetists and orthotists trained.</td>
<td>660</td>
<td>99</td>
<td>1367 in undergrad.</td>
</tr>
<tr>
<td>Odontology care</td>
<td>Odontology centre qualified.</td>
<td>420</td>
<td>425</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Surgical centre equipped.</td>
<td>27</td>
<td>81</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oral health team trained.</td>
<td>6000</td>
<td>5674</td>
<td></td>
</tr>
</tbody>
</table>

Figure 2.7 illustrates the geographical distribution and amount of the rehabilitation centres and the orthopaedic workshops implemented by VSL program up to 11th February 2014. The image on the left side of the reader refers to the rehabilitation centres. The image on the right side of the reader refers to the orthopaedic workshops.

Figure 2.7: Distribution of Rehabilitation Centres and Orthopaedic Workshop by VSL

While the distribution of the rehabilitation centres throughout the country was better distributed, there was a concentration of the orthopaedic workshops towards the south of the country. A hypothesis that might explain this event was that the VSL program focused in qualifying existed structure rather than building new ones, what could be assumed by the aim to implement six new static orthopaedic workshops and to qualify 61 existing ones.

It still unclear the proportion of rehabilitation centres and orthopaedic workshops that were implemented from scratch and those just habilitated. It is not possible to draw reliable conclusions since not all the habilitated centres and workshop were updated on the map and it was difficult to find information apart from the programme website.

Regarding the types of institutions upgrading to different levels of CER, they vary from philanthropic, universities, private and government (Brasil, 2012b; Furrer, 2012). This fact will possibly bring changes in the way these institutions
works since they usually provide care only to a specific age and disability group. Incorporated by the SUS, these organisations are expected to provide care to all population, without discrimination. This raises some questions with regards to the quality of care to be offered, such as:

- Are the incorporated institutions ready to attend the whole population?
- What kind of quality protocol does SUS require from incorporated institutions to follow through the service provision?
- What user-centred good practices SUS and incorporated institutions utilise to assure AT fits user requirements?

### 2.2.5 Assistive Technology Definitions Used in Brazil

Confusion is often made with regards to the definition and terms used to refer to assistive technologies in Brazil. Common terms used are ajudas técnicas, tecnologia assistiva and tecnologia de apoio. While the term ajudas técnicas frequently makes reference only for devices, the terms tecnologia assistiva and tecnologia de apoio often cover services and methodologies (Garcia and Filho, 2012). The term ajudas técnicas is the one used on federal decrees (Brasil, 1999, Brasil, 2004). Despite the difference between terms, they are often used as synonyms (Garcia and Filho, 2012). For the purpose of this thesis, we are going to use the AAATE definition of AT, which considers devices, mainstream or inclusively designed products and technology-based service. A distinction will be made in the text when the word AT is used to refer specifically to one of them.

### 2.2.6 Assistive Technology Provision in Brazil

Assistive technology provided for public provision in Brazil is regulated by a list called OPM list, which stands for orthotics, prosthetics and locomotion aid (órteses, próteses e meios de locomoção auxiliar in Portuguese). The list contains 95 items, adaptations, and substitutions (See Table 2.6). It also describes the device specifications and the established price. The price is a
reference to be paid to suppliers, as devices have no cost to the SUS end users. AT devices from the list are usually provided by CERs or rehabilitation centres that are not yet certified as a CER.

It is worth mentioning that there are other AT items guaranteed by law (Brasil, 1999) not included on this list, such as devices to facilitate education and work. This research focused on the ATs delivered at the rehabilitation centres and CERs by means of the OPM list.

Table 2.6: Types of Assistive Technology offered at SUS (adapted from OPM list)

<table>
<thead>
<tr>
<th>Type of Assistive Technology</th>
<th>Variety</th>
<th>Type of Assistive Technology</th>
<th>Variety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bath Chair</td>
<td>4</td>
<td>Orthotics used on the upper limbs</td>
<td>3</td>
</tr>
<tr>
<td>Cane</td>
<td>1</td>
<td>Prosthetics for the lower limbs</td>
<td>11</td>
</tr>
<tr>
<td>Crutches</td>
<td>2</td>
<td>Prosthetics for the upper limbs</td>
<td>12</td>
</tr>
<tr>
<td>Inner Sole</td>
<td>4</td>
<td>Prosthetic parts (for the lower limbs)</td>
<td>4</td>
</tr>
<tr>
<td>Orthotics used in the cervical region</td>
<td>2</td>
<td>Prosthetic parts (for the upper limbs)</td>
<td>4</td>
</tr>
<tr>
<td>Orthotics used in the lower limbs</td>
<td>12</td>
<td>Shoes</td>
<td>5</td>
</tr>
<tr>
<td>Orthotics used in the pelvic and lower limbs</td>
<td>3</td>
<td>Walking Frame</td>
<td>1</td>
</tr>
<tr>
<td>Orthotics used in the pelvic region</td>
<td>3</td>
<td>Wheelchairs</td>
<td>5</td>
</tr>
<tr>
<td>Orthotics used in the thoracic and back region</td>
<td>10</td>
<td>Wheelchair’ Adaptations</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>White Stick</td>
<td>1</td>
</tr>
</tbody>
</table>
2.2.7 Assistive Technology Services in Belo Horizonte SUS

According to the Belo Horizonte Prefecture-PBH website (2014), the SUS’s service to the population is divided into Primary care and Secondary care (See Table 2.7).

Table 2. 7: Levels of SUS service at Belo Horizonte Prefecture

| Primary care | The basic healthcare available at health centres, hospitals, and basic health units. The basic health unit is the closest of citizen locality and it should be the first to be contacted when a person shows any adverse health sign. |
| Secondary care | They are the unity of secondary reference- URS, previously called PAM. They conduct medical appointment and specialized examinations for patients from the 146 health centres in the capital. |

Source: Prefeitura de Belo Horizonte website http://portalpbh.pbh.gov.br/

Another visit to PBH website was made by the end of the research period and it revealed a different structure. According to PBH website (PBH, 2017), SUS healthcare network in Belo Horizonte is divided between basic healthcare, specialized healthcare, urgency and emergency, hospital care regulation, high complexity regulation, and health surveillance. The basic healthcare network contains 147 healthcare centres, which are distributed in nine districts and host the ESF team mentioned in the Section 2.2.2. The author believes that the attempt was to eradicate the division between primary and secondary care as a strategy to overcome the paradigm of basic primary care to a more integrated healthcare network (See Section 2.2.2).

According to the PBH website (2014), five main units of secondary care are evident in Belo Horizonte. In addition, other private and non-profit centres and clinics are linked with the SUS’s secondary care, however, the PBH website offers no details regarding their names and services. From the five existing centres, three have rehabilitation services, offering public AT services. They are:

- Centro Geral de Reabilitação- CGR (State accountability)
- Centro de Reabilitação Leste- CREAB Leste (Municipality accountability)
- Centro de Reabilitação Norte- CREAB Norte (Municipality accountability)
According to VSL website, despite the three rehabilitation centres at Belo Horizonte, it still does not have a CER, and neither does the surroundings regions (SDH, 2014). The two CERs built or certified in Minas Gerais State, of which Belo Horizonte is the capital, are spread in different regions as presented in Figure 2.8. The closest CER to Belo Horizonte is located outside of what is considered to be the metropolitan area of Belo Horizonte (see Figure 2.8) and is located 56.7 km from Belo Horizonte, at the city of Itabirito. The second closest CER is located at 83.6 km from Belo Horizonte, in the city Pará de Minas (see Figure 2.8). These facts give us reasons to believe that priority is given to build CER in regions that lack a rehabilitation centre in its surroundings.

There is little information available online about the type of service offered and the user pathway to access AT; notably only a person with an AT referral can go to the closest unity of secondary reference. It was known so far that, AT accepted referrals from both private and public medical institutions. However, during the course of the research and more specifically in the year 2017, the protocol has been revised and now the patients need to be referred by the ESF or NASF team from the basic healthcare network.
In summary, healthcare in Belo Horizonte SUS works in the following manner. The users can proceed to the closest healthcare centre to access and avail a variety of non-urgent care or proceed to the Unidades de Pronto Atendimento-UPA for emergency care (PBH, 2017). Healthcare is not only a passive operation, as the professionals also work out of the unities (PBH, 2017). The user can receive emergency care on the spot by the Serviço Móvel de Atendimento às Urgências-SAMU (PBH, 2017). The users are also visited in the community for non-urgent care. This is easier to understand in terms of the teams rather than the physical structure. ESF and NASF teams work closer to the community and can refer the user to other services that are not available in their healthcare centres. Likewise, if the ESF and NASF teams identify the user need for one or more assistive devices, they refer the user to the CReab covering their region. Correspondingly, if the AT need is identified outside the SUS structure, then the users are referred to the health centre closest to its home, for subsequent referral to CReabs, if required. Figure 2.9 illustrates the role of ESF and NASF when user referral is necessary.

![Diagram](image)

Figure 2.9: SUS Referral dynamic, Adapted from Xavier (2014)
Chapter 2 | Literature Review

2.2.8 Section Summary

Healthcare in Brazil has a complex relationship between its subsystem, unequal distribution and a recent government support to implement the rights of the disabled person. Despite the government’s increased support for those rights and recent programs to address the disabled population needs, there is no actual proof of how these user requirements are being accessed and that government’s promises with regards to the national plan for the rights of the disabled people VSL will be kept. Currently, Belo Horizonte population has access to AT devices by means of the rehabilitation centres called the CReabs. The user needs to be referred by the primary healthcare network, more specifically the ESF and NASF teams. Assistive technology provided for the public provision in Brazil is regulated by a list called OPM list, which stands for orthotics, prosthetics and locomotion aid. The list contains 95 items, adaptations, and substitutions. In accordance with the way disabled people care has been functioning in Brazil, based on a restricted list of devices, Brazil can be considered as the medical model of AT service provision according to the AAATE definitions.

Some questions arose at this point of the literature:

- What are the functions shared between CER and orthopaedic workshops?
- How they assess end-user requirements and translate these requirements into AT specifications?
- How this process affects the user choice of an AT?
- What differentiates Belo Horizonte rehabilitation centres’ from CERs?
- What does it needs to Belo Horizonte rehabilitation centres’ to become a CER?
Literature Review PART 3

2.3 Not Just the Right for the Wheelchair but the Right Wheelchair

Results of the Study 1 called for the review of the literature concerning the wheelchair service, as this became the research focus. This chapter reviews the seminal texts and resources in the literature from where the interventions proposed during Study 2 and 3 were grounded.

2.3.1 Introduction

It is a well-established fact that the mobility is a gateway to an individual’s participation in society. Mobility facilitates an individual’s independence in activities of daily living such as bathing, eating and dressing (Gartz, et al. 2016). In addition to providing mobility, an appropriate wheelchair brings benefits to the physical health and quality of life of the user (WHO, 2008). It decreases common health issues such as pressure sores, the progression of deformities or contractures, and other secondary conditions, thus, resulting in the reduction of healthcare expenses (Khasnabis, 2006). In addition, it facilitates improved respiration, digestion, and a better posture. All these results lead to increased activity levels and a better quality of life (Khasnabis, 2006). An appropriate wheelchair can thus, alter a disabled person’s situation from isolation to inclusion, dependency to freedom, passive receiver to an active contributor (Khasnabis, 2006). Conversely, immobility adversely affects the lives of the disabled person by, for example, making it difficult to attend school, participate in the community, or earn an income (Winter, 2006).

It is estimated that approximately 10% of the world has a disability and that 10% of this section of the population requires a wheelchair (WHO, 2008). In 2016, this fraction represented, nearly 74 million people to be in need of a wheelchair (Worldometers, 2016). In 2003, it was estimated that 20 million of those requiring a wheelchair did not have access to one (Sheldon and Jacobs,
2006, in WHO, 2008). In order to improve these discouraging figures, States adopting the CRPD have the obligation “to take effective measures to ensure personal mobility with the greatest possible independence for persons with disabilities”, which for many, implies ensuring access to appropriate wheelchairs (WHO, 2008).

2.3.2 The Need for a Wheelchair Service Provision

The reasons for the necessity for a service to provide wheelchairs are similar from other assistive technologies (ethical, financial, expertise and consistency reasons mentioned in 2.1.5.2 Quality Indicators). Above all, a service is needed to ensure that the person in need of a wheelchair receives an appropriate wheelchair. WHO (2008, p.21) states that a wheelchair is appropriate when it:

- Meets the user’s needs and environmental conditions.
- Provides proper fit and postural support.
- Is safe and durable.
- Is available in the country.
- Can be obtained and maintained and services sustained in the country at an affordable cost.

WHO (2008, p.71) states that:

"Wheelchair services provide the framework for assessing individual user needs, assist in selecting an appropriate wheelchair, train users and caregivers, and provide ongoing support and referral to other services where appropriate".

In the light of the realities of the developing world and the immediate need to develop functioning systems of wheelchair provision in less-resourced parts of the world, the Guidelines on The Provision of Manual Wheelchairs in Less Resourced Settings was produced. The document was an initiative from the WHO, the US Agency for International Development-USAID, the International Society for Prosthetics and Orthotics, and Disabled People’s International, in partnership with the centre for International Rehabilitation, the Motivation Charitable trust and Whirlwind Wheelchair International (WHO, 2008). To train human resources appropriately and provide a good wheelchair delivery system based on the wheelchair guidelines, the WHO and USAID, in partnership
with various organisations, developed in 2012 the Wheelchair Service Training Package Basic level (WHO, 2012) and the intermediary version of the training package in 2013 (WHO, 2013b). The basic level training supports the delivery of the theory and practices needed to start working with wheelchair users who can sit upright without additional postural support. The intermediary level training supports the delivery of the theory and practices for the care of users who require additional postural support to be able to sit upright.

### 2.3.3 Types of Wheelchair

The diversity among wheelchair users creates a need for different types of wheelchair. Like any other type of AT device, no single model or size of a wheelchair can meet the needs of all users. Decisive aspects to be considered when selecting a wheelchair are the physical needs of the intended user and how he or she expects to use the wheelchair (WHO, 2008, p. 27).

#### 2.3.3.1 The Physical Needs of the User

Wheelchairs are often available in different range of sizes and levels of adjustability to accommodate the physical needs of users. These will vary especially between temporary and long-term users. Wheelchairs designed for temporary uses are not designed to provide the user with a close fit, postural support or pressure relief (See Figure 2.10). This is the case of hospital wheelchairs aimed to move patients from one ward to another.

![Wheelchairs](image-url)

*Figure 2.10: Types of wheelchair according to physical needs (adapted from WHO, 2008)*
In the case of long-term users, a wheelchair must fit well and provide appropriate postural support and pressure relief (See Figure 2.10, 2.11). To ensure that these users are fitted correctly, wheelchair options should have a range of seat widths and depths, and the possibility to adjust at least the footrest and backrest height. Other common adjustments and options include cushion types, postural supports and an adjustable wheel position (WHO, 2008, p.28).

Long-term users with special postural requirements often need a wheelchair that is highly adjustable or individually modified. Such wheelchairs frequently have additional components added to help support the user (See Figure 2.10) (WHO, 2008, p.28).

2.3.3.2 How the Wheelchair Is Used

Wheelchair designs also vary to function as accord to the environment in which the user lives and work. A wheelchair that is used mostly in rough outdoor environments needs to be robust, more stable and easier to propel over uneven ground (See Figure 2.11) (WHO, 2008, p.28). In contrast, a wheelchair aimed for indoor use and smooth surfaces needs to be easy to manoeuvre in small indoor spaces (See Figure 2.11). Compromise is often necessary considering that many users live and work in different settings.
Another important consideration that affects the wheelchair design is how users may need to transport their wheelchair, for example in a bus or car. Different designs allow for the wheelchairs to be made more compact in different ways (WHO, 2008, p.29). Some are cross-folding (See Figure 2.12), while others have quick-release wheels and the backrest folds forwards (See Figure 2.12).

![Wheelchair features to transportation](image)

*Figure 2.12: Wheelchair features to transportation (adapted from WHO, 2008)*

The user lifestyle might also require specific wheelchair design. A sportsperson, for example, might need a rigid (non-folding wheelchair) made from light material and that is easy to manoeuvre. Wheelchair design can change drastically as according to the intended sports. Nonetheless, sport-specific wheelchairs are hardly offered in wheelchair services, hence, it will not be reviewed in this research. Other aspects affecting wheelchair design are how users get in and out of the wheelchair or the way they propel it (WHO, 2008).
2.3.3.3 The Wheelchair parts

Wheelchairs are a complex product composed of various parts with different functions. The names of common wheelchair parts are shown in Figure 2.13. Despite some ‘hospital style’ wheelchair’ does not come with a cushion, WHO (2008, p. 40) recommends it must be considered an integral part of a wheelchair, and is, therefore, to be included with all wheelchairs. Every well-fitting wheelchair provides the wheelchair user with some postural support. The backrest, cushion, footrests, and armrests provide postural support when adjusted to suit the wheelchair user’s size (WHO, 2013b, p. 31).

![Figure 2.13: Common wheelchair parts (Adapted from WHO, 2008)](image)

Nonetheless, many persons need additional postural support in their wheelchair. This additional postural support is provided by a postural support device-PSD, defined as “any addition or modification to a wheelchair, which is prescribed to provide additional postural support” (WHO, 2013b, p. 31). PSD is needed for various reasons such as poor balance, uncontrolled moments or spasms, risk or presence of pressure sores and pain or discomfort (WHO, 2013b, p.32).
There is a variety of PSDs that are often classified as according to its location in the wheelchair, named: seat, backrest, headrest, footrest, armrest and straps. Additionally, a tray attached to the wheelchair is also considered a PSD. The tray “supports the users’ length of the forearm and elbows while doing an activity and does not push on the stomach” (WHO, 2013b, p.199). Figure 2.14 provides a detailed example of the various PSDs and their names. The names presented in this figured were used to describe the PSD types in this research as nomenclature can vary according to the author, practitioner, etc.

Figure 2.14: Different types of postural support device (WHO, 2013b)
2.3.4 Problems with Wheelchair Donation and Loan

Charitable organisations often donate or provide wheelchairs loan for those in need aiming to reduce the access barrier to wheelchairs. Donation occurs both on massive or smaller scale. Examples of organisations promoting large scale of wheelchair donations are the Free Wheelchair Mission (FWM) and the Wheelchair Foundation (WF). The last already delivered more than 1 million wheelchairs (WF, 2016). Similarly, FWM strives to distribute over 100,000 chairs annually and have the goal to donate 1 million chairs by the end of 2017 (FWM, 2016). On a much smaller scale, it is a common knowledge that religious institutions and community-based organisations also donate and loan wheelchairs to those in need in their community.

Nonetheless, donation and loan of wheelchairs are often said to occur irresponsibly (Winter, 2006; Jefferds, et al., 2010; Toro, et al. 2012). The main reason is that donations and loan process do not meet the criteria to ensure that each wheelchair will be more helpful to the user than harmful (Toro, et al. 2012; Krizack, 2003; Mines, 2008). Essential criteria involve assessing the requirements of the person in need of a wheelchair, measuring the body size to select the right wheelchair size, ensuring the person fits appropriately in the wheelchair taking the necessary measures when it does not, and ensuring the person is trained how to use the wheelchair (WHO, 2008). A poorly fitted wheelchair can result in fatigue, discomfort, postural deformities, pressure sores and even premature death (Toro, et al. 2012; Armstrong, et al., 2007; Borg, et al.; 2012; WHO, 2008).

Authors allege that donated wheelchairs often lack adjustability; are frequently provided without cushion, or with an inappropriate cushion; does not meet the functional needs of the users; and are frequently provided without associated services, such as training and maintenance (Pearlman, 2008; Borg, et al., 2012; Toro, et al., 2012; WHO, 2008).

As a consequence of a poorly fitted wheelchair, discontinuance of the device is likely to occur (Phillips and Zhao, 1993; Mukherjee and Samanta, 2005). In a study to examine the destiny of 162 donated wheelchairs in India, Mukherjee and Samanta (2005) found that 57.4% of the donated chairs were not used and 14.2% had been sold. Reasons for low usage included fatigue, pain, discomfort, and unsuitability of the wheelchairs to the climate.
2.3.5 Wheelchair Service Best Practices

Similar to other types of AT devices, the definition of good practices related to wheelchair services goes beyond the simple specification and provision of the device. It involves ensuring access to an appropriate device and the several steps necessary to identify the user requirements and goals, select an appropriate device, make sure the device provided fits user requirements and that the users are trained how to use and maintain their device. WHO, AAATE and the several institutions associated to these two have been working together defining and improving wheelchair service good practices. This section covers the wheelchair service good practices that were found most appropriate to the research enquiry.

The WHO recommends common steps for wheelchair services that are similar to those recommended by AAATE for AT services in general (see 2.1.5.2 Quality Indicators). Table 2.8 describes these steps.

<table>
<thead>
<tr>
<th>Stages</th>
<th>Description</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Referral and appointment</td>
<td>The system of referral will depend on existing services in the country. Users may self-refer or be referred through networks made up of governmental or nongovernmental health and rehabilitation workers or volunteers working at community, district or regional level. Some services may need to actively identify potential users if they are not already receiving any social or health care services or participating in school, work or community activities.</td>
<td></td>
</tr>
<tr>
<td>2. Assessment</td>
<td>Each user requires an individual assessment, taking into account lifestyle, vocation, home environment and physical condition.</td>
<td></td>
</tr>
<tr>
<td>Stages</td>
<td>Description</td>
<td>Illustration</td>
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<tr>
<td>3. Prescription (selection)</td>
<td>Using the information gained from the assessment, a wheelchair prescription is developed together with the user, family member or caregiver. The prescription details the selected wheelchair type, size, special features and modifications. Also detailed is the training the user needs to effectively use and maintain the wheelchair.</td>
<td></td>
</tr>
<tr>
<td>4. Funding and ordering</td>
<td>A funding source is identified and the wheelchair is ordered from stock held by the service or from the supplier.</td>
<td></td>
</tr>
<tr>
<td>5. Product preparation</td>
<td>Trained personnel prepare the wheelchair for the initial fitting. Depending on the product and service facilities, this may include assembly, and possible modification, of products supplied by manufacturers or production of products in the service workshop.</td>
<td></td>
</tr>
<tr>
<td>6. Fitting</td>
<td>The user tries the wheelchair. Final adjustments are made to ensure the wheelchair is correctly assembled and set up. If modifications or postural support components are required, additional fittings may be necessary.</td>
<td></td>
</tr>
<tr>
<td>7. User training</td>
<td>The user and caregivers are instructed on how to safely and effectively use and maintain the wheelchair.</td>
<td></td>
</tr>
<tr>
<td>8. Follow-up, maintenance and repairs</td>
<td>Follow-up appointments are an opportunity to check wheelchair fit and provide further training and support. The timing depends on the needs of the user and the other services that are available to them. The service may also offer maintenance and repairs for technical problems that cannot be easily solved in the community. It is appropriate to carry out follow-up activities at the community level as much as possible. If the wheelchair is found to be no longer appropriate, a new wheelchair needs to be supplied starting again from step 1.</td>
<td></td>
</tr>
</tbody>
</table>
WHO (2008) provides overall good practices to the wheelchair service as well as good practice that are specific to each of the service steps. Only the overall good practice is reviewed in this section (See WHO, 2008 for good practices to the specific steps). Good practices that are specific to a service stage are mentioned in further chapters as necessary. Table 2.9 distinguishes the WHO’ suggested good practices as according to the AAATE quality indicators (see 2.1.5.2 Quality Indicators).

Table 2.9: Overall good practices to wheelchair service (adapted from WHO, 2008 and Andrich, et al., 2013)

<table>
<thead>
<tr>
<th>Accessibility</th>
<th>The service is equally accessible to all users, regardless of gender, age, ethnicity, religion or social status.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competence</td>
<td>The service has personnel trained in its clinical, technical and training roles, who work closely with users to provide advice, assessment, prescription, fitting, training and follow-up.</td>
</tr>
<tr>
<td>Coordination</td>
<td>The service has a designated service manager or coordinator. The services promote teamwork between clinical and technical personnel in providing service to users. A referral network is in place. The service is well integrated with other rehabilitation and health services.</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Services carry out quality control to ensure that every wheelchair is assessed for safety before the user tries it and for safety and correct fit before each user leaves the workshop or rehabilitation centre with the wheelchair. Repair services are available to provide continuing support to users. Services identify local needs and measure their effectiveness in meeting these needs through regular monitoring and evaluation.</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Services are knowledgeable about the range of wheelchairs available locally. Services can offer more than one type of wheelchair, giving the user a choice based on the assessment. Wheelchairs are sourced from a range of suppliers, including local and international, depending on their appropriateness and affordability.</td>
</tr>
<tr>
<td>User influence</td>
<td>Wheelchair services recognise users as clients of the service and adopt a “client-centred approach”. This means, inter alia, that: users receive information about the process the wheelchair service will use to provide a wheelchair; and the rights and responsibilities of the user in this process; users are actively involved as members of the service team in all steps leading to the provision of their wheelchair; and services actively collect feedback from users about their opinion of the service and how it may be improved.</td>
</tr>
</tbody>
</table>

The WHO wheelchair service training package- WSTP is a comprehensive source of training material aiming to develop the skills and knowledge of personnel involved in the wheelchair service delivery. As previously mentioned, there are two service-training packages. One is the WSTP Basic level, designed to support the training of personnel or volunteers to provide an appropriate manual wheelchair and cushion those who have mobility impairments but
can sit upright without additional postural support (WHO, 2012). The other is the WSTP Intermediate Level, designed to support the training of personnel or volunteers to provide an appropriate manual wheelchair and cushion for those who need additional postural support to sit upright (WHO, 2013b). WHO estimates that the minimum length of time needed to teach each of the complete WSTPs is between 35 to 40 hours.

Most of the WSTP Basic Level resources have been translated into various languages. A visit to WHO website in March 2016 shows the following available languages: Chinese, English, French, Khmer, Portuguese, Romanian, Spanish, Thai, Turkish. These have been translated and made available during this research. As for the WSTP Intermediate level, the only languages available until 2016 were English and Romanian.

### 2.3.6 WHO Forms and Checklist

Each WSTP contains eight forms and checklist to be used at the various stages of the service delivery. These are protocols to ensure that wheelchair service providers consider and record the necessary information to provide a quality service in accord with best practices. WSTP forms and checklist for both basic and intermediate level are named:

1. Wheelchair Service Referral Form
2. Wheelchair Assessment Form
3. Wheelchair Prescription (Selection) Form
4. Wheelchair Summary Form
5. Wheelchair Safe And Ready Checklist
6. Wheelchair Fitting Checklist
7. Wheelchair User Training Checklist
8. Wheelchair Follow Up Form

Apart from the Wheelchair Follow-up Form that is identical in both basic and intermediate version, there are few differences between the two forms and checklists (See WHO, 2012; WHO, 2013b; for the complete forms and checklist).
Some forms present minor variations in one or two items. It is the case of the Wheelchair Service Referral Form and the Wheelchair Safe And Ready Checklist. The other forms, despite similar, presents differences in various items. WHO acknowledges that either the suggested service steps or the forms and checklist are not necessarily representative of different service stages. Different steps are commonly integrated into the same stage. As an example, assessment and selection often occur together, so the fitting and user training. Hence, different forms and checklist might be necessary for a single stage.

The WHO WSTP forms and checklists were chosen as a starting point to design context based and participatory interventions to the wheelchair service in Belo Horizonte city, Brazil, during Study 2.2. The reasons to chose these over other existing wheelchair protocols were:

- it considers the various stages involved in a wheelchair service, providing clear guidance to each of these stages;
- it is developed to work whatever the organisational model established in the country;
- the forms and checklist are free to purchase and easily available online. This was considered an essential future considering existing financial barriers at SUS, lacking funds for training and the purchase of tools and protocols.

### 2.3.7 Wheelchair Services In Brazil

There are very few scientific publications available with regards to the provision of the wheelchair services in Brazil. Most of the recent publications involving the term ‘wheelchair’ are related either to Paralympic sports or the wheelchair impact in specific disabled group rehabilitation. The 2016 Olympic games in Brazil had certainly a considerable influence on this research scenario. However, publications about the service provision of the wheelchairs are rare despite growing investments in the area. When conducting this literature review, a boolean search of the terms ‘wheelchair’ AND ‘service’ AND ‘Brazil’ found zero results in Scopus, Science Direct, and Scielo Brasil platforms. No results were encountered in the boolean search of the terms ‘wheelchair’ AND ‘serviço único de saúde’ OR ‘SUS’ in these same platforms. Only a few publications were found
when similar terms were searched on Google Scholar or when searching inside specific Brazilian journals, such as the Brazilian Journal of Physical Therapy.

Similar to other AT devices, the public provision of wheelchair services in Brazil seems to be provided by a mixture of charitable, governmental and private institutions. Wheelchairs are part of the OPM list hence are provided at SUS with no costs to the user. Data from the ministry of health (Conitec, 2013) shows that the number of wheelchairs distributed at SUS increased from 19890 to 36722 units from 2008 to 2011, nearly doubling the wheelchairs units provided during that period (See Figure 2.15). According to the magazine Revista Nacional de Reabilitação Reação, the SUS delivered 75.317 wheelchairs in 2016, more than the double of units provided in 2011 (Revista Reação, 2017).

The types of wheelchairs provided have also increased as OPM list was updated in 2012 (Brasil, 2012c) and 2013 (Conitec, 2013). Instead of two types of wheelchairs, the list now supports five types of wheelchairs and eight types of wheelchair adaptations (See Chapter 4 for more details). Such measures were only possible due to a new federal resource made available annually in the value of 24.5 million Brazilian reais. The investment is intended for the purchasing and maintenance of the OPM items through the decree 2109 (Brasil, 2012c). In the situations where complementary resources are seen necessary, the states and municipalities should provide this as agreed in the programme Programação Pactuada Integrada (PPI) (SES, 2016; Galvão, 2013).

![Wheelchairs provided by SUS during 2008-2011](image)

Figure 2.15: Wheelchairs provided by SUS between 2008-2011
Despite the fact that the number of wheelchair types and adaptations had increased, the quality of the provided wheelchairs remains a concern. A test conducted by the Instituto Nacional De Metrologia, Qualidadee Tecnologia-Inmetro based on the Brazilian standards for wheelchairs ABNT NBR ISO 7176:2009 revealed that all the eight wheelchairs brands and models tested had failed to conform to the minimal standards (Inmetro, 2013). Whether one brand or other had succeeded in few tests, the same brands failed in most of the other tests. All the wheelchair brands and models tested are provided at SUS.

A study by Galvão, et al. (2008) investigated 458 wheelchair protocols issued between 2004 and 2008 in the main Rio Grande do Norte Estate rehabilitation centre. According to the study, the age of users receiving the wheelchair varied between 1 to 93 years. From these, 320 (69%) users had between 1 to 17 years showing a predominance of young users. As for the users diagnostics, 291(64%) were classify having cerebral palsy, 28 (6%) having spinal cord injury, 18(4%) having neuromuscular injury, 15 (3%) having congenital malformation, 14 (3%) having meningomyelocele, 11(2%) having locomotion difficulty, 11 (2%) having stroke’ after-effects, 4(0.8%) with Traumatic brain injury after effects, 3(0.6%) with mental disability and 6(1.3%) with other varied diagnostics.

It is questionable that this represents the population in need of wheelchair in the Rio Grande do Norte state as the centre researched seems to focus on children and teenagers care, what may explain the large proportion of users at a younger age. In a more recent study, Galvão, et al. (2013) had shown a different picture. The study analysed 1884 wheelchairs and bath chairs procedures between the years 2009 and 2011. The numbers of users between 0 to 20 years were 31% of the total. 28% of the total users were in productive age, and 24% had more than 71 years old. As for the diagnostics, 37% were classified having cerebral palsy, 14% did not have the diagnostics specified, 12% having stroke’ after-effects, 10% having paraplegia, 5% had suffered amputation, and 21% were classified with other varied diagnostics.

In the first study (Galvão, et al., 2008), the time to receive a wheelchair varied between 0 to 36 months, with an average time ranging between 13 to 18 months. In the second study (Galvão, et al., 2013) 43% of the wheelchairs were delivered within less than 90 days, 29% within less than 30 days, 16% provided between 6 to 9 months and 9% between 9 to 12 months. A study by Caro, et al. (2014) revealed an average waiting time of 30 months for a user to access a piece of AT in one of the rehabilitation centres researched in São Paulo estate. However, all these studies provide little information with
regards how the time was counted, making it difficult to draw comparisons. Evidence-based publications with regards to the implementation of good practices at SUS’ wheelchair services are even scarcer. It was only at the end of 2015 that a workforce group was created to qualify SUS’ wheelchair service delivery (ISPO Brasil, 2015).

2.3.8 Challenges for the Wheelchair Users in Brazil

It does not take much effort to predict some of the challenges experienced by the wheelchair users in Brazil. A short walk outside of the central region of most Brazilian metropolises will reveal the terrible conditions of the walkways. According to the 2010 Census (IBGE, 2010), only 4.7% of Brazilian urban sidewalks have ramps for the wheelchair users, and in the Belo Horizonte Municipality, only 9.6% of urban walkways have ramps (IBGE, 2010). Worse, the census also reveals the probable poor and unusable conditions of the existing ramps. These poor conditions extend to the road asphalt, additionally making the commute through the streets a problematic option. An investigation of the Brazilian roads by the Brazilian Transport Confederation in 2016 revealed that 58.2% of the roads presented problems and are considered either terrible, poor or regular (Lis, 2016). The 2010 Census also shows a considerable gap between rich and poor neighbourhood accessibility levels. While the percentage of ramps in urban walkways is 12.2% in places where the average population income is more than two minimum wages; the ramp rate is 1% for regions where the average population income is lower than 1/4 of the minimum wage.

Valdir Gonçalves, 41, a wheelchair user, shared a series of obstacles experienced by the wheelchair user in São Paulo city, with the Veja Magazine (Filho and Pinho, 2012). To illustrate similar examples faced in Belo Horizonte city, the author took pictures from its neighbourhood during a walk using a stroller (See figures 2.16 to 2.18). A single 30-minute walk was necessary to shoot images to illustrate this section. Valdir, notably mentioned that it is hard to find an adequate place to enter the walkway due to the negligible amount of ramps, or the poor conditions of even those available (Figure 2.16), not to mention that often water accumulates in the dropped kerbs. Also, the author observed through the course of the research that often ramps does not comply with the Brazilian standard ABNT NBR 9050:2004 (ABNT, 2004) (Figure 2.16). Evidently, when commuting on the
walkway, some obstacles like holes, trees and tree roots, broken glasses, signposts and public telephones in the middle of the sidewalk, increasingly disrupt movement (Figure 2.17). Valdir mentioned that due the bad conditions of the walkways he often had to ride with the cars through the road, a situation also observed in various circumstances through the course of this research.

Figure 2.16: Example of dropped kerbs and asphalt poor conditions in Belo Horizonte, 2017

Figure 2.17: Example of poor walkway conditions in Belo Horizonte, 2017
Another difficulty Valdir mentioned was the lack of working lifts in metro stations, thereby forcing users to use the escalator or to ask for help to climb stairs. A TV news report at Belo Horizonte metro stations also recorded the wheelchair users facing a similar situation (Record, 2015).

With regards to public buses, a common problem faced by wheelchair users in Brazil is that often drivers do not stop for wheelchair users (Junqueira, 2017). And, even when they do, many-a-times, the wheelchair lifts are not working (Junqueira, 2017; MGT, 2012; Tolendato, 2017). Users also report listening to complaints and verbal aggression from other users, i.e. blaming them for the delay due to the long time required to operate the lifts (MGT, 2012; Tolendato, 2017). It seems that one situation feeds the other. It is common knowledge in Brazil that the majority of buses use truck chassis, which, in turn, necessitate the use of lifts to promote accessibility for wheelchair users. The operation of the lifts can take few minutes, due to which the bus drivers refrain from stopping for wheelchair users to avoid delays or complaints from other users, causing embarrassment to wheelchair users.

Another known issue is drivers parking on accessible parking spaces, i.e. without holding an appropriate license, parking in front of ramps or parking on the walkways to cite few examples (Garbin, 2016)(See Figure 2.18). Because of this, the penalty for irregular parking on reserved spots has been increased by more than double in the year 2016 and such incidents are no longer considered light but a grave violation of regulations (Garbin, 2016). Another solution adopted in
various regions in Brazil is the ‘moral’ fine, where a sticker or a printed notice is used to make the offender who is parking in the disabled slot realise that he is committing a ‘moral’ offence (Rios, n.d; Camargos, 2016). Examples of the ‘moral’ fine sticker or print notice can be found in blogs, in the social media or printed version are available at the Brazilian Universities, TV stations, shops, clinics, etc. (Rios, n.d).

Wheelchair users in Brazil also face several challenges inside the buildings and constructed areas aiming the collective use. This can be attributed to the fact that the majority does not seem to comply with accessibility standards (A Liga, 2013; Calado, 2006, Corrêal and Manzinill, 2012; Record, 2015; Fernandes, 2010). As a result, wheelchair users often struggle to access community buildings, shops, houses and other constructed areas. In addition to having mobility issues in moving around these places and accessing the toilets, not to mention they struggle to read communications out of their eyesight, to cite some examples. The law 10098/2000 establishes standards and minimum criteria for the promotion of accessibility to the persons with disabilities or reduced mobility. It requires the removal of obstacles and barriers on the paths and public spaces, urban furniture, in the construction and refurbishment of buildings and at the means of communication and transport (Brasil, 2000). The law is also valid for private spaces, which are aimed at the collective use of the public. Previous studies show early levels of physical accessibility in schools buildings from the interior of São Paulo state (Corrêa and Manzini, 2012) and Natal city (Calado, 2006). A study by Vasconcelos and Pagliuca (2006) also shows an early level of accessibility inside 12 basic health units in the interior of Ceará state. A study by Mazzoni, et al. (2001) reveals that the central library from the Universidade Federal de Santa Catarina Trindade campus fails to comply with most accessibility standards from the decree 1.679/1999.

Few studies report the level of accessibility in the interiors of constructed areas in Brazil. However, several magazines, TV reports, and blogs expose the current challenges and the low accessibility levels in the interior of both public and private spaces (A Liga, 2013; Record, 2015; Rios, n.d; Fernandes, 2010). Apart from the accessibility issues, these types of media also highlight the prejudice faced by wheelchair users and the lack of awareness in people regarding the disabled condition and rights (A Liga, 2013; Rios, n.d; Fernandes, 2010; Carbonari, 2016). Carbonari (2016) conducted a study surveying the physically disabled Brazilians to enquire and collect information as regards the most embarrassing and offensive situations they face on a daily basis. The results were published in the Super Interessante magazine in a comic strip style. Examples of situations illustrated are people expressing pity towards the
disabled individual(s), people talking to the disabled in an infantile way, and people treating those dating a disabled person as an act of kindness. The challenges faced by the wheelchair users and people with disability in Brazil are many, and a huge gap is still evident between existing laws, existing standards, and the reality. There is a manifested need for a change in behaviour regarding the disability stigma, increased evaluation, an audit of existing laws and more effective actions to reduce this gap.

2.3.9 Section Summary

This section presented information about the literature of the research area of focus. Hence, it was conducted after analyses of the exploratory studies data. It became clear after reviewing the literature how vital is the role of the service in the wheelchair provision. A poorly fitted wheelchair can result in fatigue, discomfort, postural deformities, pressure sores and even premature death. As a consequence of a poorly fitted wheelchair, discontinuance of the device is likely to occur representing a waste of effort and resources. A service provision increases the chances of delivering an appropriate wheelchair, hence improving the benefits and effectiveness of the wheelchair use, consequently reducing the chance of the device discontinuance. A service that is based on good practices allows the user to be informed, trained and involved in the wheelchair selection and fitting process. WHO had produced many resources to enable the good practice to be implemented in wheelchair services providing manual wheelchairs. There are very few publications about the wheelchair service provided by SUS in Brazil and no indication that good practices have being applied. Results from the exploratory Study reveals that AT service in Belo Horizonte lacks several of the stages and good practices recommended.

Some questions arose at this point of the literature:

- What are the characteristics of the existing wheelchairs services provided by SUS in Belo Horizonte city?
- How is the user assessed at wheelchair services provided at Belo Horizonte?
- How can good practices be implemented in wheelchair services provided at Belo Horizonte?
- What is the average time for a wheelchair to be delivered in Belo Horizonte?
2.4 Methods

This section discusses the research methodology and research methods considered in this research project. The research methodology is deconstructed in the following layers: research purpose, research type, research approach, research data collection techniques, types of qualitative analyses and sampling strategies. Each of these topics is reviewed, followed by a conclusion section, discussing the methodology selected and reasons for including or excluding specific methodology. A summary of the overall research design is provided at the end of this section. More details on how selected methods were explored in each study are specified in the chapters related to the respective study.

2.4.1 Research Purpose

The review of the literature and the identification of the research gaps enabled the definition of the research questions. Thinking about the research question inevitably leads to thinking about the purpose of the research. Often in the social research methods literature, the research purpose is classified as exploratory, descriptive and explanatory (Saunders, et al., 2007, p 133). Robson (2002) adds emancipatory as an alternative research purpose. Table 2.10 presents a comparison of these four.
Table 2.10: The four research purpose (Robson, 2002, p.59)

<table>
<thead>
<tr>
<th>Classification</th>
<th>Characteristics</th>
</tr>
</thead>
</table>
| Exploratory    | • To find out what is happening, particularly in the little-understood situations.  
                • To seek new insights.  
                • To ask questions.  
                • To assess phenomena in a new light.  
                • To generate ideas and hypotheses for future research.  
                • Almost exclusively of flexible design. |
| Descriptive    | • To portray an accurate profile of persons, events or situations.  
                • Requires extensive previous knowledge of the situation etc. to be researched or described, so that you know appropriate aspects on which to gather information.  
                • It is necessary to have a clear picture of the phenomena on which you wish to collect data prior to the collection of the data.  
                • May be of flexible and/or fixed design. |
| Explanatory    | • Seeks an explanation of a situation or a problem, traditionally but not necessarily in the form of casual relationships.  
                • To explain patterns relating to the phenomenon being researched.  
                • To identify relationships between aspects of the phenomenon.  
                • May be of flexible and/or fixed design. |
| Emancipatory   | • To create opportunities and the will to engage in social action.  
                • Almost exclusively of flexible design. |

Adding to these purposes, there is a growing demand that the research impact goes beyond the academic audience and promote change (Penfield, et al., 2013). The Research Excellence Framework (REF), more specifically the Assessment framework and guidance on submissions (REF2014, 2012), defines impact as ‘an effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia’. *Action research* and *evaluation research* provides the appropriate approach for the particular purpose of promoting change (Robson, 2011, p.175; Newton, 2006, p.16). These two approaches are detailed next.
2.4.1.1 Evaluation

The SAGE Dictionary of social research defines evaluation research as ‘the systematic identification and assessment of effects generated by treatments, programmes, policies, practices and products.’ (Tilley, 2006, p. 104). There have been a rapidly growing of this type of research in the whole scope of public services, especially those involving people, such as education, health and social services (Tilley, 2006; Robson, 2011).

Robson (2011) distinguishes two main types of evaluations in the literature, which are formative and summative evaluation. Using the healthcare service to exemplify, a formative evaluation would have the purpose of supporting the development of a healthcare service. In contrast, a summative evaluation would focus on assessing the effects and effectiveness of a healthcare service. However, the distinction is not absolute as summative could have a formative effect on future developments. Another difference in evaluation research is expressed in terms of process and outcome. Traditionally, evaluation research seems to restrict the research questions to the concerning outcomes, consequently assessing the impact, for example, of a service practice in accord with the service stated goals and objectives. Despite this still a central feature of evaluation it is now viewed as a part of what is needed. Process evaluation concerns with a systematic observation and studying the ‘real picture’, or ‘what is going on’, instead of focusing on what is stated as a goal. Robson affirms that “the discrepancy between the ‘official’ view of what should be going on, and what is taking place, might be substantial” (Robson, 2011,p.182).

Regarding the communication of the results, it should occur differently from traditional research. Communicating the results for the participant stakeholders and decision-makers, who are less likely to be knowledgeable and sympathetic with the empirical enquiry, is more relevant or should be a priority rather than communicating to the scientific community (Robson, 2011; Tilley, 2006).

Difficulties planning an evaluation are mostly related to clearance and permissions to the participants and gatekeepers, also the political nature that evaluation might be involved. The last is because evaluations are intrinsically a sensitive activity as it might reveal inadequacy and negative issues. Consequently, the design of the evaluations has to be carefully planned, especially regarding what will be done and why. As for this, Robson states: “...you are more likely to get a positive response if the evaluation research is with and for those involved, rather than something done to them”(Robson, 2011,p.176).
2.4.1.2 Action Research

Newton (2006, p.2), in The Sage Dictionary of Social Research Methods, defines action research as ‘a type of applied social research that aims to improve social situations through change interventions involving a process of collaboration between researchers and participants’.

A widely adopted version of action research embraces the cyclical process of planning a change, acting and observing what happens following the change, reflecting on these processes and consequences and then planning further actions, thus repeating the cycle (Kemmis and Wilkinson, 1998, in Robson, 2011). Figure 2.19 illustrates this cycle.

One of the main characteristics of the action research it is the close collaboration between researcher and those involved in the researched focused area. This close collaboration also raises some dilemmas. In a seminal journal paper about action research, Rapoport (1970) list dilemmas related to issues of ethics, goals, and initiatives. He argues that ethical issues might appear with regards to the confidentiality and the protection of the participants. Information is sometimes sought and used in the context of industrial conflict. Personal involvement in the researched organisation may also pose problems as such over-involvement might result in bias.

![Figure 2.19: Action Research cycle](image-url)
Another issue in action research reported by Rapoport regards to the divergence of goals between the parts involved, such as divergence of goals between researcher, researched organisation and sponsors. For this, it is vital that the contract between these parts makes expectations explicit in an as detailed way as possible.

Lastly, Rapoport discusses the dilemma of initiatives, as in many cases, the need for action research parts from an organisation that identifies a problem and approaches the social scientist to help solve the problem. Pressure towards the researcher is likely to arise. This contrasts with the whole ethos of the academy to take the immediate ebb and flow of practical pressures off the researcher so that knowledge is pursuit with minimal interference.

2.4.1.3 Conclusion

Despite the considerable attention that it has been given to the assistive technology services by policies in Brazil, the review of the literature has unveiled the existence of few types of research and publications on this topic in the country. There is a need to find out what is happening in the ‘real world’, especially from the end-user and SDS providers perspective, therefore, the exploratory and process evaluation research seems to be most appropriate to this scenario. The exploratory purpose appears to be most appropriate to the starting aims, which is to understand how assistive technology service provision function in Brazil to generate ideas and hypotheses for future research. Nonetheless, this study also aims to contribute to improving the current assistive technology service in Brazil employing interventions. For this, the formative evaluation also seems an adequate approach for this purpose as it is intended to support the development of the evaluation (or the research) focus. The action research appears less appropriate than evaluative research since it focuses on implementing interventions from the early stages of research and in a cyclical manner. The evaluation approach was thought to fit better this study considering the complexity of the system and lack of information available in the literature, hence the need to understand its functioning to suggest an effective intervention. Conversely, the intention is that this research becomes action research in a long-term.
2.4.2 Research Type

Many writers find it helpful to distinguish between quantitative and qualitative research to facilitate the research design and selection of research methods (Bryman, 2004, p.19). A simplistic way of distinguishing between the two types is the focus on numerical or non-numerical data. Quantitative is predominantly used as a synonym for any data collection technique or data analysis procedure that generates or uses numerical data (Saunders, et al., 2007, p.145). Examples of numerical data can be durations, scores, counts of incidents, ratings, or scales (Garwood, 2006, p.250). In contrast, qualitative is used predominantly as a synonym for any data collection technique or data analysis procedure that generates or use non-numerical data (Saunders, et al., 2007, p.145). Examples of qualitative data collection could be notes from field observation and full or partial verbatim transcription of an interview or focus group.

Robson (2011) describes qualitative research as “flexible” and quantitative research as “fixed” since qualitative research can also include quantitative methods of data collection. Flexible since this approach shows substantial flexibility in the research design that could emerge and develop during the data collection (Robson, 2011, p.131). Fixed, since this method calls for a tight pre-specification of the design before the data collection (Robson, 2011, p.131).

Sumner (2006, p. 249) adds that qualitative research uses a range of methods to focus on the meanings and interpretation of social phenomena and social processes in the particular contexts in which they occur. It is concerned to explore the participative meanings through which people interpret the world, the different ways in which reality is constructed (through language, images and cultural artefacts) in particular contexts (Sumner, 2006, p. 249).
Table 2.11: Quantitative vs Qualitative data, adapted from Saunders, et al., 2007, p. 472

<table>
<thead>
<tr>
<th>Quantitative data</th>
<th>Qualitative data</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Based on meanings derived from numbers.</td>
<td>• Based on meanings expressed through words.</td>
</tr>
<tr>
<td>• Collection results in numerical and standardised data.</td>
<td>• Collection results in non-standardised data requiring classification into categories.</td>
</tr>
<tr>
<td>• Analysis conducted through the use of diagrams and statistics.</td>
<td>• Analysis conducted through the use of conceptualization.</td>
</tr>
</tbody>
</table>

Sources: Developed from Dey (1993); Healey and Rawlinson (1994); authors’ experience

In choosing the research methods, there is a possibility to either use a single data collection technique and corresponding analysis procedures, known as mono-method or use more than one data collection technique and analysis procedures to answer the research question, known as multiple methods (Saunders, et al., 2007, p 145). When both quantitative and qualitative data collection techniques and analysis procedures are used in research design, the term is called mixed methods (Saunders, et al., 2007, p 145).

2.4.2.1 Conclusion

The flexible approach appeared appropriate given the evaluative and exploratory purpose of this research, requiring flexibility in the research design. Nonetheless, the collection of quantitative data was also included whenever this was judged necessary to frame the researched scenario and help to answer the research questions.
2.4.3 Research Approach

The extent to which you are clear about the theory at the beginning of your research raises an important question concerning the design of your research project. This is whether your research should use the deductive approach, in which you develop a theory and hypothesis (or hypotheses) and design a research strategy to test the hypothesis, or the inductive approach, in which you would collect data and develop a theory as a result of your data analysis (Saunders, et al., 2007).

2.4.3.1 The Deductive Approach

The Deductive approach involves the development of a theory, which could ground on what is known in a particular domain, followed by a rigorous examination to test of falsifying the theory (Bryman, 2004). It is a dominant approach in the natural science, where the laws present the basis of the explanation, allows anticipation of phenomena, predicts their occurrence and therefore permits them to be controlled (Collis and Hussey, 2003 in Saunders, et al., 2007, 117). The emergence of social sciences in the 20th century had raised some critics from the scientist about the deductive approach and the cause-effect link to be made between particular variables without an understanding of the way in which humans interpret the social world (Bryman, 2004). Hence, a new approach was felt necessary.

2.4.3.2 The Inductive Approach

The alternative approach to deduction is the inductive approach. The purpose is to get a feel of what is going on to have a better understanding of the nature of the problem. Theory follows the data rather than vice versa as with deduction. For this is necessary to make sense of the data collected to formulate a theory. Research using an inductive approach is likely to be particularly concerned with the context in which such events were taking place. Therefore, the study of a
small sample of participants might be more appropriate than a large number as with the deductive approach (Saunders, et al., 2007, Bryman, 2004). Figure 2.20 resumes the relationship between theory and research from both inductive and deductive approach.

Figure 2.20: The deductive and inductive approached, adapted from Bryman (2004)

The deductive approach is typically associated with quantitative research approach, and the inductive approach typically associated with the qualitative approach (Bryman, 2004). However, this association can be confusing, especially in the qualitative research. The last not always aim to generate theory, but also theory is often used at the very last as background to qualitative investigations (Bryman, 2004, p. 11). Braun and Clarke (2006, p.83) and Guest, MacQueen and Namey (2012, p.7) give theoretical examples of the deductive approach used in qualitative research. This is further detailed in section 2.4.5 Types of Qualitative Analyses.

Another common discussion regarding the inductive and deductive approach is the same of lack of flexibility when interpreting a dichotomy in the different forms of analysis. In the same way that studies taking an inductive approach does not mean they are atheoretical (Guest, MacQueen and Namey, 2012 p.8), studies using a deductive approach can have the themes emerging from the data (Braun and Clark, 2006). What differentiates the selection of those approaches is whether the research theoretical and analytic interest is more explicitly between one and the other.
2.4.3.3 Conclusion

This research contemplates both the deductive and inductive approach in its design. The deductive approach is reflected in the research design for this research considers existing best practices and frameworks as a starting point to evaluate the current state of AT services. Nonetheless, in the greater sense, the inductive approach is the predominant one as the development of theory, interventions and recommendations were grounded from the analysis of the current state of the service, considering contextual factors in which the observed events took place.

2.4.4 Research Data Collection Techniques

The selection of data collection techniques is based on what kind of information is sought, from whom and under what circumstances. In the flexible design, the nature and number of data collection techniques used can change as data collection continues (Robson, 2011, p.232). Hence, this section has no conclusion as distinctive groups of data collection techniques were considered in each study. More information about the data collection methods considered in each study and the reason for selecting specific methods are presented at methods section in each study chapter. The main flexible design data collection techniques considered for the overall research are presented in this section.

2.4.4.1 Questionnaire-Based Survey

A questionnaire-based survey is a set of carefully designed questions provided in precisely the same form to a group of people aiming to collect data about some topic(s) in which the researcher is interested (McLean, 2006, p. 252). It is a widely used method in social research and can be used both as a primary method of collecting data or as a secondary method applied, for example, after participants have been involved in an experiment (Robson, 2011, p.235).
There is often confusion in the use and meaning of the word ‘questionnaire’ in the sense that some researchers reserve the term exclusively for self-administered questionnaires. Others also consider the interview schedule, which is personally administered face-to-face, under the umbrella term questionnaire (McLean, 2006, p. 252). To avoid this confusion, this thesis differentiates between self-administered questionnaires and personally administered face-to-face interview schedule.

Some advantages of a questionnaire-based survey are that it provides a relatively simple, relatively low cost and straightforward approach to the study of attitudes, values, beliefs, and motives (Robson, 2011, p.241). Also, it is a common knowledge that, by using an appropriate sample and sample strategy, it could be designed to collect generalizable information from almost any population. Some disadvantages of a questionnaire-based survey are that respondents will not necessarily report their beliefs, attitudes, etc. accurately as bias can occur to show them in a good light (Robson, 2011, p.240). Also, collected data can be affected by the characteristics of the respondents such as memory, knowledge, experience, and motivation. While there are various platforms through which questionnaire-based survey can be applied, such as post, Short Message Service (SMS), e-mail and websites, the rapid expansion of internet users has given web-based surveys the potential to become a powerful tool in survey research. Sills and Song (2002) discuss issues related to the methodological concerns and problems that arise from using web surveys, including noncoverage, nonresponse errors, confidentiality concerns, and technical issues. To overcome these issues, they recommend using a multimodal approach for delivery, such as traditional mail prenotification followed by several waves of e-mail solicitation and, if possible, telephone follow-up.

2.4.4.2 Interviews

An interview is generally defined as a method where data collection, information or opinion gathering specifically involves asking a series of questions (Dalves, 2006). Interviews can have considerable variation regarding the contexts in which they are carried out, its purpose, as for the structure and how they are conducted (Dalves, 2006). A commonly made distinction is based on the degree of structure or standardisation of the interview, such as structured or fully structured, semi-structured and unstructured interviews (DiCicco & Crabtree, 2006; Robson, 2011, p.279).
Structured interviews use pre-determined questions in a standardised questionnaire, also referred as interview-based survey questionnaire (Robson, 2011, p.279; Saunders, et al., 2007, p.312). Questions are read and responses are recorded on a standardised schedule, usually with pre-coded answers. There is little flexibility in the manner interview should be conducted to reduce the interviewer bias, such as changing the question order, omitting a question or even altering the voice tone between questions and participants. This type of interview is often used to collect quantifiable data and hence referred as quantitative interviews (DiCicco & Crabtree, 2006; Saunders, et al., 2007, p.312).

Semi-structured interviews, in comparison, are non-standardised. In semi-structured interviews, the interviewer uses a guide that serves as a checklist of topics to be covered (Robson, 2011, p.280), although this may vary from interview to interview as a consequence of the context (Saunders, et al., 2007, p.312). There is more flexibility in the way interview should be conducted to allow the discussion to flow. Thus, the order of the questions may vary and additional questions are asked, also called probe questions.

Unstructured interviews, also known as guided conversations and in-depth interviews, allow the discussion to develop in a general area of interest, hence, there is no need for a predetermined list of questions. These are often used in conjunction with participant observations field notes as strategies to elicit insights into the ways the medical professionals organise and manage patient encounters (DiCicco & Crabtree, 2006).

Interviews are a shortcut to the search for answers to research questions as you ask directly to people what is going on (Robson, 2011, p.280). However, interviews are time-consuming for both interviewer and interviewed. For the interviewer, anything under half an hour is unlikely to be valuable and anything going much over an hour brings issues of fatigue and numbers of persons willing to participate, what can bias the sample (Robson, 2011, p.281). For the researcher, especially when transcription of the recorded audio is required, the procedure involved to get the data ready for analysis is also very time-consuming. Adding to this, the less standardised the interview, the greater the need to control the interviewer bias.

An essential element to considering when conducting a qualitative interview is developing rapport, which involves trust and respect for the interviewee and the information shared, providing a safe and comfortable environment for sharing the interviewee’s personal experiences and attitudes as they actually occurred (DiCicco & Crabtree, 2006).
2.4.4.3 Observation

Observation as a form of data collection involves a systematic observation, recording, description, analysis, and interpretation of people's behaviour (Saunders, 2007, p.282). Observation seems to be predominantly the suitable technique if the research question(s) and objectives are concerned with what people do (Saunders, 2007, p.282) and getting at ‘real life’ in the real world (Robson, 2011, p.316). Observation can be used as a supportive or supplementary method to collect data that may complement or set in perspective data obtained by other means, often by interviews (Coffey, 2006, p. 215; DiCicco & Crabtree, 2006; Robson, 2011, p.317).

Observations can be differentiated into two main types. One is the participant observation, where the researcher attempts to fully engage in the life and activities of the participant (Coffey, 2006; Saunders, 2007). The other is the structured observation, mostly concerned with the frequency of the observed events (Garwood, 2006 p.291; Saunders, 2007).

In participant observation, the researcher role has a direct impact on the outcome. Gill and Johnson (2002, in Saunders, 2007) developed a fourfold categorisation for the role the participant observer can adopt. The roles are:

1. Complete participant
2. Complete observer
3. Participant as observer
4. Observer as participant

In the first two, the researcher acts as a complete participant or complete observer of the activities without revealing its identity. In the last two, the role differentiates by the researcher taking part of the activities or just observing them. Figure 2.21 illustrates these differences.

In contrast to participant observation, structured observation is more systematic and has a high level of predetermined structure. The concern in structured observation is mostly quantifying behaviour (Saunders, 2007, p.293; Garwood, 2006 p.291). This technique may form only a part of the data collection approach since its function is to state how often things happen rather than why they happen.
A common threat to the research validity and reliability using observation as a data collection strategy is the observer bias. Regardless of the participant observation approach, there has been a recurrent concern about the position of the researcher within the field, and how this may alter the social realities under investigation (Coffey, 2006; Schwartz & Schwartz, 1955). Schwartz and Schwartz (1995) discuss the problems in participant observation and points three issues inherent to the use of the human instrument for gathering and evaluating interpersonal data. They are the operation of unconscious factors in observation, the influence of anxiety on how and what is seen, and the effect of the observer’s personal interests, values, and orientation are problems which are present in any research in which interaction of human beings is being studied. They suggest three conditions to deal with these bias in participant observation. The observer must be motivated to look for his/her biases; look for them actively and, having come upon a bias, explore its meaning and ramifications; and look upon the uncovering of his/her biases as a continuous process of discovery to which there is no end.
2.4.4.4 Focus Group

A focus group is, at its simplest, ‘an informal discussion among selected individuals about specific topics’ (Beck, et al. 1986 in Wilkinson, 1998). Focus group emphasises learning about the thoughts and experiences of others (Morgan, 2006, p. 122). The group dynamics help to focus on the critic topics and to assess the extent to which there is consistent and shared view between participants (Robson, 2011, p.294, Wilkinson, 1998, p.193). In participatory action research, the focus group is often used to empower participants and promote social and political change (Wilkinson, 1998).

A significant concern is that conflicts may arise between personalities, insofar as participants can collaborate or conspire to intimidate or silence a particular participant or to create a silence around specific topics, for example (Wilkinson, 1998). Also, power struggles may weaken the interview and status may conflict within the procedure (Robson, 2011, p.295).

2.4.5 Types of Qualitative Analyses

While quantitative analysis examines variables, qualitative analysis is often concerned with themes, interpretation and the use of language. There are different approaches to qualitative data analyses that can vary due to varying reasons as epistemology and the predominance of the specific type of data collected (Larkin, Watts, & Clifton, 2006; Birks and Mills, 2011). Examples of different kinds of qualitative approach to data analyses are discourse analyses, ground theory, conversation analysis and thematic analysis. This section resumes the main approaches that were considered as research was planned.

2.4.5.1 Discourse Analysis

Discourse analysis is an umbrella term that covers a variety of approaches to the study of language in its own right. It is defined by Muncie (2006, p.74) in The Sage Dictionary of Social Research Methods as:
“Detailed exploration of political, personal, media or academic ‘talk’ and ‘writing’ about a subject, designed to reveal how knowledge is organised, carried and reproduced in particular ways and through particular institutional practices”.

Language is explored in a specific context to construct social reality. The social reality is approached by focusing on the meaning and structure of the acts of communication in a particular context, exploring the connections between language, communications, knowledge, power and social practices through the analyses, or ‘reading’, of texts, conversations, and documents (Muncie, 2006, p.74).

### 2.4.5.2 Grounded theory

Grounded theory is an inductive qualitative approach to data analyses often used in ethnographic studies and studies where there is an aim to develop a theory grounded in the data collected. The first generation of grounded theorists (see Glaser and Strauss, 1967; Strauss and Corbin, 1990) did not write about grounded theory as a methodological/methods package, rather, they wrote about the various strategies and techniques that could be used (Birks and Mills, 2011). These techniques include:

- The use of different stages of codes as a way of identifying important words or group of words and labelling them accordingly, comparing them and separating into categories and core categories.
- The use of memos to record reflective thoughts, feelings, and insights about a research project;
- The use of theoretical sampling to focus and support constant comparative analyses of the data. This iterative process elucidates where more information is required.

Strauss and Corbin (1990) define the particular phases of coding as open, axial, and selective coding. Dey (2007) summarise the open coding as categorising the data, the axial coding as connecting the categorised categories, and the selective coding as focusing on core category.

Memos are records of thoughts, feelings, insights and ideas concerning a research project (Birks and Mills, 2011, p.40). The expression of ‘memoing’ is
used when these types of data are recorded. According to Birks and Mills (2011), memoing is the most significant factor to ensure quality in grounded theory. They suggest a set of themes a researcher might consider to write about in memos (Birks and Mills, 2011, p.42), they are:

1. the researcher feelings and assumptions about the research;
2. the researcher philosophical position in relation to the research;
3. musings on books and papers read;
4. potential issues, problems, and concerns in relation to the study design;
5. reflections on the research process, including factors that influence quality in the study;
6. procedural and analytical decision-making;
7. code, categories and the development of theory.

These techniques are used systematically and reflectively to generate integrated and comprehensive grounded theory that explains a process or scheme associated with the phenomenon (Birks and Mills, 2011).

Birks and Mills (2011, p.16) suggest that grounded theory is indicated when:

• Little is known about the area of study.
• The generation of theory with explanatory power is the desired outcome.
• An inherent process is embedded in the research situation that is likely to be explicated by grounded theory methods.

Saunders, et al. (2007, p. 493) call for the attention that the use of an inductive approach like grounded theory may also involve a lengthy period of data collection and simultaneous analysis to examine a theme adequately or to derive a well-grounded theory. Strauss and Corbin (1990, in Saunders, et al., 2007) suggest that this type of approach may take several months to complete.
2.4.5.3 Thematic Analysis

According to Braun and Clarke (2006, p.79) “thematic analysis is a method for identifying, analysing and reporting patterns (themes) within data”. The use of codes is typically developed to represent and identify themes in different stages of the analysis (Braun and Clarke, 2006; Guest, MacQueen and Namey, 2012; Boyatzis, 1998).

Braun and Clarke (2006) argue that despite there is no explicit agreement what thematic analysis is it is often used and not explicit claimed as the method of analysis but claimed as something else (such as discourse analyses, or content analyses) when actually a lot of that analyses are essentially thematic. The discussion is that many of the researchers claiming the use of qualitative analyses such as ground theory and discourse analysis lack in principle and several of the essential characteristics of the claimed approach. A typical example is researchers claiming to use grounded theory without an integrated and comprehensive generation of a theory that explains a process or scheme associated with the phenomenon studied (Suddaby, 2006; Birks and Mills, 2011).

In contrast to other similar approaches thematic analysis is not committed to any specific theoretic framework, and therefore, it can be used between various theoretic frameworks (Braun and Clarke, 2006; Guest, MacQueen and Namey, 2012). Thus, it can offer a more accessible and flexible form of analysis. What researchers do with the themes once they uncover them differ based on the intentions of the research and the process of analysis (Riessman, 2006, p.187).

Thematic analysis can be conducted from both inductive and deductive approach (Braun and Clarke, 2006; Guest, MacQueen and Namey, 2012). As discussed earlier, this should be seen with flexibility, aiming to support the primary intentions of the research. In an inductive approach themes identified are strongly linked to the data themselves, may have little relation to the questions asked to the participants and would not be driven by researcher’s theoretical interest in the area or topic (Braun and Clarke, 2006, p. 83). A deductive approach, or theoretical thematic analysis as called by Braun and Clarke (2006), would tend to be driven by the researcher’s theoretical or analytic interest in the area (Braun and Clarke, 2006, p. 84). The study is guided by specific ideas or hypothesis the researcher wants to assess (Guest, MacQueen and Namey, 2012, p.8).
2.4.5.4 Interpretative phenomenological analysis

The aim of interpretative phenomenological analysis (IPA) is to explore in detail how participants are making sense of their personal and social world. The main currency for an IPA study is the meaning that particular experiences, events, states hold for participants (Larkin, Watts & Clifton, 2006; Smith and Osborn, 2007). The approach is phenomenological in the sense that it involves a detailed examination of the participant’s life. It attempts to explore personal experience and is concerned with an individual’s personal perception or account of an object or event, as opposed to an attempt to produce an objective statement of the object or event itself (Smith and Osborn, 2007).

2.4.5.5 Using Computer-Assisted Qualitative Data Analysis Software

Bringer, et al. (2006, in Hutchison, Johnston, & Breckon, 2010) have demonstrated that Computer-Assisted Qualitative Data Analysis Software (CAQDAS) can be used successfully to facilitate a grounded theory investigation. They demonstrated that NVivo, a type of CAQDAS, can facilitate many aspects of the iterative process associated with grounded theory and can help provide a transparent account of this, which should ultimately enhance study validity. Nonetheless, concern has been voiced that computer analysis programmes allow users to do complicated analyses without fully understanding the principles of the techniques they are applying (Johnston, 2006; Richards, 1998; Weitzman, 2000, in Hutchison, Johnston, & Breckon, 2010). Hence, caution should be taken to ensure that the use of computers is not intended to replace the ways people learn from data, but to increase the effectiveness of such learning (Bazeley, 2007, in Hutchison, Johnston, & Breckon, 2010).
2.4.5.6 Conclusion

This research considered different types of approaches to the analyses of data before its collection. The discourse analysis focus on the language and IPA focus on the participant’ particular experiences seemed not to be the case. The intention was to have an overall understanding of service functioning to develop context-based interventions instead of focusing on participants’ personal experiences. Generating theory, despite was part of the process, was also not the ultimate intent of this research but to promote change in the service. The lengthy period of data collection necessary to a comprehensive generation of theory required by grounded theory approach was also thought to oppose the research’ intent to promote change. Thematic analysis seemed to be the most appropriate analysis approach, providing flexibility to uncover the themes from data collected without the need to be held with a particular theoretical framework. Such flexibility also allowed to borrow from other approaches, in the case of this research, borrowing techniques from grounded theory. How thematic analysis was used is further detailed in each study chapter.

2.4.6 Sampling Strategies

A sample is a crucial aspect of research as it is often impractical to include 100% of a population in order to make judgments about people, places, things or whatever is being researched. A sample represents the fragment of a population and population refers to all the cases. The various types of sampling strategies are usually divided whether the probability of the selection of each respondent is known, called probability sample, or not, called non-probability samples (Khotari, 2004, p.15). These two are explained in the following sections. The sample strategies selected for each study is detailed in the methods section in each study chapter.
2.4.6.1 Probability samples

Probability sample enables to make generalisations of the intended population. However, the generalisations are themselves probabilistic, hence likely to errors (Robson, 2011, p. 271). The larger is the sample, the lower the likelihood to commit errors in generalising. Various strategies for probability sample can be applied such as simple random sampling, systematic sampling, stratified sampling and cluster/area sampling (See Khotari, 2004; Robson, 2011; Bryman, 2004).

2.4.6.2 Non-probability samples

Any sampling plan where is not possible to specify the probability of any person (or another research unit) to be included in the sample is called 'non-probability sample’ (Robson, 2011. P. 274).

This approach is frequently used in flexible designs where often the data are non-numerical leading to a different strategy than from conventional statistical analysis. It does not mean that non-probability sample is exempt from numerical information. In a chapter regarding flexible design sampling, Robson (2011, p.152) mentions that aspects of the qualitative data may be converted into a numerical form, as there might also be the case where the data are collected directly as numbers, enabling summary or descriptive statistics to be calculated. Nonetheless, he mentions that sample sizes are likely to be below of those required for statistical testing. Hence, he concludes that the nature of flexible design sample is a typically non-probability sample, also called purposive or theoretical, rather than seeking to be representative of a population beyond the sample surveyed.

Examples of non-probability sample strategies are convenience sampling, quota sampling, dimensional sampling, purposive sampling, snowball sampling and others (see Khotari, 2004; Robson, 2011; Bryman, 2004; Creswell, 2007).
2.4.7 Section Summary

This section reviewed a variety of research methods considered for this research and discussed the reasons for including or excluding specific methodology. A total of three studies were designed using the mixed methods of literature review, semi-structured interviews, structured interviews and participant observations (See Figure 2.22).

The research aim varied between three research stages. First, an exploratory stage aiming to understand the functioning of the assistive technology services in Belo Horizonte and to find a research focus. Second, a preparatory stage aiming to set the parameters for an intervention in the focused area. Third, an evaluative stage aiming to test the proposed interventions and collect feedback for further improvements. Despite studies and its data collection were mostly related to a specific stage they all added information to the different stages.

![Figure 2.22: Research Design](image)

The purpose of the research was placed between an exploratory and an evaluative research purpose (See Figure 2.23). It was mostly a formative evaluation as it aimed to evaluate and improve the actual service, but was also exploratory as understanding the service functioning was necessary to provide context-based interventions. The type of the research was flexible, as its design was kept open to what could emerge and develop during the data collection.
collection, using mostly qualitative data collection technic but also some level of quantitative data collection. The research design mainly took an inductive approach, where theory and themes were grounded from the analyses of data instead of trying to prove or falsify hypotheses. Nonetheless, research also used a deductive approach as service was evaluated under a set of quality indicators defined previously to data collection. The approach to analyses was mostly based on thematic analysis but making use of a variety of grounded theory strategies. More details on how each of these methods was used to provide insights to the research question are presented in each study chapter.

Figure 2.23: Research Design
Defining the research

Chapter 1 Introduction
Aims and objectives
Research Question

Chapter 2 Literature Review
Factors affecting AT services
Wheelchair services literature
Methodological stances

Exploratory stage

Chapter 3 Finding a Research Focus
Understand Belo Horizonte AT services
Find a research focus
CHAPTER 3

STUDY 1: FINDING A RESEARCH FOCUS

A first exploratory study was conducted between early April and early June 2014 at Belo Horizonte city, Brazil. The primary goal of this study was to paint a picture of the current state of the AT services provided by SUS in Belo Horizonte, searching for answers that could not be found in the literature and defining a research focus.

The expected outcome of this exploratory study was to find a research focus based on the difficulties encountered by the AT service providers to apply user-centred best practices. In this sense, this first study aimed to provide information to answer the following research questions presented in Table 3.1.

Table 3.1: Rationale for Study 1

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Research Stage</th>
<th>Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>What are the characteristics of the existing assistive technology services provided by SUS in Belo Horizonte city?</td>
<td>Literature Review</td>
<td>Visiting Institutions</td>
</tr>
<tr>
<td>To what extent does the current assistive technology service provided by SUS in Belo Horizonte city apply user-centred service provision best practice?</td>
<td>Study 1</td>
<td>Interview Coordination staff</td>
</tr>
<tr>
<td></td>
<td>The Experts Perspective</td>
<td>Interview staff involved in AT service users’ care.</td>
</tr>
</tbody>
</table>
3.1 Research Design

Robson (2011, p.71) suggests the use of a framework that describes the fundamental components required to conduct any research. The components are those influencing and be influenced by the research question, or research problem (Figure 3.1). This model structure is used in the chapters 3, 4 and 5 as a starting point to define and inform the different aspects of each research study design. Other aspects were added as according to the study complexity.

![Framework for research design adapted from Robson (2011)](image)

3.1.1 Conceptual Framework

Review of the literature has revealed that healthcare in Brazil has a complex relationship between its subsystem, unequal geographical distribution and recent government support for ensuring the rights of the disabled person regarding access to assistive technology devices. Despite the recent increase in the support, there is a lack of research and data available proving that this population’ requirements are being accessed to fit their AT’ requirements. The way disabled population’ care has been functioning in Brazil, led by charitable institutions that focus on specific age and disability and the way SUS and VSL are
managing the AT service provision gives reason to believe that Brazil falls into the organisational’ medical model of AT as previously defined. Similar to many other large urban centres in Brazil, Belo Horizonte represents a heterogeneous, unequal and complex space that needs to be understood, especially considering recent decentralisation of SUS policies and focus on the municipalities.

3.1.2 Purpose

The purpose of this research stage was placed between an exploratory and an evaluative research purpose. Exploratory research is a methodological approach that is primarily concerned with the discovery and generation or development theory (Dalves, 2006, p.111), particularly in little-understood situations (Robson, 2011). Considering this, the first research question was:

**What are the characteristics of the existing assistive technology services provided by SUS in Belo Horizonte city?**

The study in question was not exploratory in the sense of focusing on the development of an explanatory theory, rather, it was exploratory in the sense of discovering the current state of the services, with the purpose to generate ideas and hypotheses for future investigations, consequently finding a research focus.

This study also aimed to evaluate the current state of the service. Evaluation research, according to Robson (2011, p.176) has the purpose of assessing the effects and effectiveness of something, typically some innovation, intervention, policy, practice or service. Overall, the purpose of this research was to evaluate the current assistive technology services in Belo Horizonte city, in the light of the existing user-centred best practices aiming to provide evidence-based and contextual based recommendations and interventions. Following this logic, the second research question was:

**To what extent does the current assistive technology service provided by SUS in Belo Horizonte city apply user-centred service provision best practice?**
The reference point for assessing the service from a user-centred perspective was the AAATE existing good practices, more specifically the HEART Study quality indicators (see Chapter 2 and Appendix 1). The reason these were chosen over other good practices was that it provides recommendations that are applicable no matter the organizational model established in the country or context. Nonetheless, it was found that assessing the entire set of HEART Study’ quality indicators would undermine the exploratory goal due to the amount of information necessary to be collected to cover all aspects of the service. For this reason, this study focused assessing solely the “user influence” quality indicator. The main reason for selecting this quality indicator over others was because it was the one to pledge that system is designed from a user-centred and participatory approach.

### 3.1.3 Objectives

Specific objectives were delineated for this research stage in order to accomplish the research purpose and provide answers to the research question set for the study. The objectives were stated as:

1. Identify the AT services provided at Belo Horizonte’ SUS.
2. Identify the pathway taken by end users to access assistive technology devices.
3. Identify the main difficulties providers encounters to deliver a better service.
4. Identify providers’ expectations regarding the necessary changes to improve the service.
5. Investigate the main concerns in applying best practice set in AAATE’ user influence quality indicators.

Table 3.2 provides the objectives set in order to answer Study 1 research questions.
Table 3.2: Study 1 Objectives in relation to the research questions

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Objectives</th>
<th>Study 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What are the characteristics of the existing assistive technology services provided by SUS in Belo Horizonte city?</strong></td>
<td>1. Identify what AT services are provided by SUS in Belo Horizonte city.</td>
<td>Investigate the main concerns in applying best practice set in AAAATE’s user influence quality indicators.</td>
</tr>
<tr>
<td></td>
<td>2. Identify the pathway taken by users to access assistive technology devices.</td>
<td></td>
</tr>
<tr>
<td><strong>To what extent the current assistive technology services provided by SUS in Belo Horizonte city applies user-centred service provision best practice?</strong></td>
<td>3. Identify what are the main difficulties staff encounters to provide a better service.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Identify what are the main expectations regarding the necessary changes to improve the service.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Investigate the main concerns in applying best practice set in AAAATE’s user influence quality indicators.</td>
<td></td>
</tr>
</tbody>
</table>

3.1.4 Methods

Different methods were considered at this point. A questionnaire-based survey with the different institutions involved in AT public service provision at Belo Horizonte was first considered. The disadvantages of using this approach are that questionnaires offer little room for probing in order to obtain more detailed answers to complex questions and no scope for adding questions if required (Robson, 2011, p.240), which were considered an essential aspect at this exploratory stage.

Interviews with different stakeholders involved in the AT service provision at Belo Horizonte were also considered. Amid fully structured, semi-structured and unstructured interview, the semi-structured interview was found to be the most appropriate method for the exploratory purpose of this study. This approach allows probing into areas of interest, which a fully structured interview does not. At the same time, it still has structure, which was found necessary to cover
some specific topics regarding AT service provision identified in the review of
the literature. Initially, the interviews were planned to be over the telephone due
restricted time to collect data in loco. However, the first pilot interview indicated
that it could take more than 40 minutes, which is more than the 30 minutes
recommended time before participants get fatigued (Marcus and Crane, 1986;

Focus groups with different stakeholders involved in the AT service provision at
Belo Horizonte were also considered. One concern about using this method was
that conflicts might arise between personalities. Power struggles may detract
from the interview and status may conflict within the procedure (Robson, 2011,
p.295). These were the major reasons for excluding this approach considering
that the research context is public service in Brazil, where considerable
attention is given to hierarchical position (Ferreira, 2005). It was also thought
to be too early to gather together different stakeholders without better
understanding their relationship and potential issues.

The methods selected were visiting the rehabilitation centres and conducting
face-to-face semi-structured interviews with the assistive technology service
stakeholders. The rationale of the application of the methods chosen is
described next.

3.1.4.1 Design of the Interviews

Two different interview schedules were developed to cover the study objectives.
They were:

- Interview schedule for the CReab administrative and coordination staff.
- Interview schedule for the CReab medical staff, AT technician and
  supplier's staff.

Both schedules were structured similarly but had predominantly different
questions. Both contained an introduction script, a warming up question and
a set of central questions divided into two parts. The translated versions of
the schedules are found in Appendices 2 and 3. The original versions in the
Portuguese language are found in Appendices 4 and 5.

The introductory script, read out loud at the beginning of each interview,
introduced the researcher, summarised the study intent and the interview content.
The first set of questions were related to the functioning and organisation of the AT services offered at the institution. These concerned the majority of the questions at the administrative and coordination staff schedule.

The second set of questions differed in purpose at each interview schedule. While questions for the administrative and coordination staff focused on the centre capacity and other demographic characteristics, questions directed to the medical staff, technician and suppliers focused on assessing the best practices suggested on user influence quality indicators. Questions regarding the service current main difficulties and future perspectives to enhance the quality of the service were made at this stage to both groups of participants.

Prompt cards were used to facilitate the answer to three questions. A prompt card listing the types of AT should government offer (according to Decree 3298, 1999) were given to participants to tick the devices offered at their centre. Another prompt card listing and explaining the different service stages suggested on best practices were given to the participant to tick the stages provided at their centres (See Appendix 2). A map containing Belo Horizonte city districts was given so that participant could highlight the areas covered by their centres.

3.1.4.2 Reducing Bias

One specific type of bias was identified previously to the Study 1 interviews data collection. It was the participant bias likely to produce the Hawthorne Effect - ‘an increase in worker productivity produced by the psychological stimulus of being singled out and made to feel important’ (Franke and Kaul, 1978 in McCannery, et al., 2007). If the participants knew they were going to be assessed, this could affect their answer so that negative aspects of their work could be ignored, or focus given just to the positive aspects of their work, or feel that certain responses would show themselves in a better light than others. To reduce these bias a deception approach was taken, where just part of the research goals was declared previous to the interview (Robson, 2011, p.96). Hence, only the exploratory purposes of the research were declared at this point aiming to avoid participant’s bias to the questions assessing the service state regarding the good practices.
3.1.4.3 Sources of material

Data collection methods included data obtained specifically for research purposes, more specifically:

- audio recordings of the semi-structured interviews;
- interview minutes and field notes.

In addition, use was made of existing records and data, including:

- assistive technology delivered in past years;
- assessment sheets;
- documents, laws and decrees;
- materials from publications and presentations;
- newspaper and document reviews.

3.1.4.4 Sample and Sampling strategy

In order to have a better understanding of the AT service provision, the literature suggests that different roles and professions must be consulted (AAATE, 2003; Andrich, et al., 2013; Oishi, et al., 2010; Andrew, Batavia and Guy, 1990). Participants were defined from the pilot study, where the main occupations working with assistive technology at Belo Horizonte’ SUS were identified. The following occupations were interviewed:

- The AT service administrators
- The occupational therapists
- The physiotherapists
- The service coordinators
- The AT technicians
A total of twenty-eight persons were interviewed (n=28). The institutions included in the study were based on the literature and the pilot study, which appointed the main institutions proving AT public service provision in Belo Horizonte city. They were:

- Centro Geral de Reabilitação - CGR (Municipality accountability)
- CREAB Sagrada Família (Municipality accountability)
- URS Pe Eustáquio (Municipality accountability)
- Associação Mineira de Reabilitação -AMR (Philanthropic accountability)
- Coordenação de reabilitação (Municipality accountability)

The first three institutions described are the SUS’s rehabilitation centres providing AT services in Belo Horizonte. AMR is a Philanthropic institution providing philanthropic AT services in Belo Horizonte and also a SUS’s supplier for AT devices and AT services. Coordenação de Reabilitação is the public institution which is responsible for coordinating the SUS rehabilitation centres, contracting the AT suppliers, among other duties.

3.1.4.5 Piloting

A criterion for choosing the pilot studies participant was set as:

- Have worked with AT service provision in the past five years at one of the SUS’s rehabilitation centres in Belo Horizonte.

- Work or have worked with AT service provision in the past five years at one institution that provides public or philanthropic AT services in Belo Horizonte city.

A pilot study was conducted with seven persons all matching the set criterion. The first participant in the pilot study has worked at CGR centre as a physiotherapist and the interview was conducted by telephone, lasting 45 minutes. Considering that other questions were added to the interview schedule after transcribing and analysing the first interview, the estimated time was likely to exceed the 30 minutes limit recommended for a telephone interview (Marcus and Crane, 1986; Thorberry and Poe, 1982; Lavrakas, 1987 in Carr and Worth,
2001). Hence, all other interviews including the pilots were conducted face-to-face.

The other participants in the pilot study either worked with AT in public hospitals that are not the rehabilitation centre or worked at Hospital Sarah Kubitschek, a public utility entity accountability that also provides AT services. It was found that, despite sharing many end users, Sarah Hospital works as a separate system from SUS, with different rules applying. Working with both systems was considered out of the scope of time and resources available to this research. Nonetheless, despite these data were not used in the main analysis, visiting Hospital Sarah Kubitschek and talking with practitioners from both systems was important to the general understanding of the current situation of AT service in Belo Horizonte. Adding to that, interviewing their staff enabled the researcher to refine the interview schedule and make the modifications needed before start collecting data at the SUS rehabilitation centres.

### 3.1.4.6 Ethical considerations

Participants in this study were healthy individuals, aged 18-65 years, working as occupational therapists, physiotherapists, service administrators and service coordinators. The population studied was from Belo Horizonte city in Minas Gerais estate, Brazil. Participants were required to meet the criteria described in Sampling strategy and Piloting section.

Overall, due to the exploratory and non-invasive character of this first study, potential risks associated with participation were unlikely and of low risk. The risks to the human participants were assessed and approval given by Loughborough University Ethical Advisory Committee on 1st of April 2014. Meanwhile, the institutions to be investigated were contacted to arrange the pilot study and check whether additional ethical clearance was necessary. It was found, that since 2012, any research involving human participants conducted at SUS institutions requires a specific ethics approval under Brazilian regulations. This is made through a specific online platform called Plataforma Brasil (MS, n.d.). For this, an initial approval from the Secretaria Municipal de Saúde de Belo Horizonte-SMSA-BH, which is Belo Horizonte Municipal Department of Health, was necessary so it could then be applied to its Ethical Committee Department. The necessary documents were gathered and submitted. This process turned out to be
exhausting and time-consuming since an extensive amount of project information was required in Portuguese language and the majority of the information about the research to this point was produced in English. SUS institutions approval was obtained on 26th of March 2014 and the project submitted on Plataforma Brasil on 1st of April 2014. Final approval was obtained on 15th of May 2014. All necessary approvals can be found in Appendix 6.

3.1.4.7 Risks to the Participants

The physical, psychological and social likely risks associated with participation and the precautions taken in order to reduce them are described in Table 3.3.

<table>
<thead>
<tr>
<th>Type of Risk</th>
<th>Likelihood and Precautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Risk</td>
<td>There was little likelihood of any physical risk as a result of participation in this research stage. Interview participants were not asked to perform any tasks as a part of an interview schedule that could result in physical harm.</td>
</tr>
<tr>
<td>Psychological risks</td>
<td>Participants were asked to provide information about: the population assisted; the AT provided and the undertaken pathway to access them; the referral, assessment, training and follow up process. These questions had a small likelihood of low psychological risk if participants had interpreted them as the quality of their work was being assessed. In order to reduce these risks a detailed description of the research, stating the exploratory character of the study, the goals and objectives of the research, and a resume of the questions to be asked was inserted in the informed consent form. Adding to that, a script resuming the consent information was read at the beginning of each interview confirming the ethical procedures agreed in advance.</td>
</tr>
<tr>
<td>Social risks</td>
<td>There was a small likelihood of participant vulnerability due to gender differences considering the fact that the researcher is male and there was a high probability of the participants being mostly female, as it often occurs in the occupational therapist and physiotherapist professions in Brazil. In order to reduce these risks, the interviews were all conducted in a public environment and at the participant’s work environment.</td>
</tr>
</tbody>
</table>
3.1.4.8 Analysis of Data

Data collected were analysed using a thematic analysis approach. A variety of grounded theory practices based on Birks and Mills (2011) were also used during the analysis process, to mention: memoing, concurrent data generation and collection, constant comparative analysis, category generation and selection of core categories. Despite interviews were conducted in the Portuguese language the categories, memos, and names of folders in NVivo were mostly created using the English language. The reason was that the research supervisors and internal reviewers could accompany closely. Also, this would avoid an excessive amount of data to be translated into this thesis.

Data collected in the fieldwork were all uploaded in the qualitative data analysis software NVivo, version 10.0. The digital audio recorded at the interviews was all transcribed using transcriptions convention adapted from Josetti (2011, See Appendix 7).

A set of initial memos was created based on Birks and Mills recommendations (2011, See Chapter 2) and additional memos were added through the course of the data collection and analysis process. Figure 3.2 list the memos used for this study.

![Memos](image)

Figure 3.2 Memos for Study 1
The type of analysis varied according to its purpose. Data collected with an exploratory purpose was analysed using the inductive approach, in which identified categories were strongly linked to data. Data collected with evaluative purpose were analysed using the deductive approach – or theoretical thematic analysis – for which categories were defined prior to data collection. These pre-defined categories refer to AAATE’ User Influence quality indicators (see Appendix 1, and section 2.1.5.3 The User Influence).

3.1.4.9 Presentation of Data

For confidentiality purposes, the participant’ names have been replaced by a corresponding alphanumerical abbreviation. This abbreviation brings information about participant classification as presented in Table 3.4, following a random number that was given to each participant and the time slot from which the citation was transcribed. For example, the term MSP:02, 10-12’ indicates that this refers to the medical staff participant allocated number 02 and extracted between the 10th and 12th minute of the interview.

Table 3.4: Participants corresponding alphanumerical abbreviation

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSP</td>
<td>Medical Staff Participant - Occupational therapist or Physiotherapist.</td>
</tr>
<tr>
<td>ASP</td>
<td>Administration Staff Participant</td>
</tr>
<tr>
<td>CSP</td>
<td>Coordination Staff Participant</td>
</tr>
<tr>
<td>TSP</td>
<td>Technician Staff Participant</td>
</tr>
</tbody>
</table>

Tables that contain data source presented in this chapter adopted the term ‘sources’ in the header to represent the number and percentage of participants that answered to a specific category. The term ‘references’ is used to represent the number of times participants mentioned that specific category subject during the interviews (See Table 3.7 example, p.126). The number of references...
and sources was used as one of the parameters to identify common concerns among participants. In some situations, it was also used to rate the importance of a topic over other between participant answers (See Table 3.5 example, p.121).

The ‘Tag Cloud’ images presented in the findings section are originally in Portuguese (See Figure 3.8, p.132 and Appendix 8). Tag Cloud, also known as Word Cloud and Weighted List, displays up to 100 words in varying font sizes, where frequently occurring words are in larger fonts (QSR, 2017). The English versions of Tag Clouds presented in this thesis were produced using Adobe Photoshop software in order to accurately reproduce the size of each word.

3.1.4.10 Pre Recognised Limitations

One specific aspect grounded the limitations recognised previously to this study and to the research overall, which was the researcher having to conduct the data collection on his own. Hence, the region to be covered and the number of persons to be interviewed had to be restrained and focused. As a consequence of this, the data collection was restricted to Belo Horizonte city region. Also, the systematic collection of opinion through the interviews was focused on the staff working directly at SUS, in a manner that suppliers were not formally interviewed. It does not mean that suppliers’ views were not investigated. Whenever opportune, the researcher informally interviewed the suppliers and other stakeholders and collected their views through note-taking.

Other limitations had regard to covering the variety of existing quality indicators for assistive technology services. Again, the time and research size constraints did not enable assessing all aspects of the service. Hence, this study focused on assessing HEART Study’s user influence quality indicator. As previously mentioned, the main reason for selecting this quality indicator rather than the others is because it is the one that pledges that the system is designed from a user-centred and participatory approach.
3.2 Findings of Study 1

The Study 1 findings are presented according to the research questions and objectives related to them. Section 3.2.1 to 3.2.4 presents the findings with regards to the following research question:

- What are the characteristics of the existing assistive technology services provided by SUS in Belo Horizonte city?

Section 3.2.5 to 3.2.8 presents the findings with regards to the following research question:

- To what extent does the current assistive technology service provided by SUS in Belo Horizonte city apply user-centred service provision best practice?

Section 3.2.9 provides information on defining a research focus.

Some of the findings presented in these sections were only possible to be confirmed or concluded after an extensive period of observation conducted at Studies 2 and 3. In those cases, reference is made to the observation period.

3.2.1 Service Characteristics

Assistive Technology public service provision in Belo Horizonte city occurs by means of three SUS’s rehabilitation centres called CReabs- abbreviation for Centro de Rabilitação.

As mentioned in the reviews of the literature, CReabs are part of the secondary care service network. CReabs are the reference service for AT services and any healthcare user that might need a piece of AT or an AT service. It means that whenever AT need is identified at the primary care, hence a public hospital or basic health unit, the user will be referred to a CReab. In addition, users from private hospitals and private clinics, users from philanthropic institutions or any type of care institution might also be referred to the CReab if they need an AT device or AT service.
Despite it may sound simple the relation between referring institutions and CReab has proven to be quite complex. This is because the referring institution might provide part of an AT service, such as training with the device, but do not provide the device. Or could be the opposite case that the referring institution provides only a few AT devices but not the necessary services. There are cases in which the end users are referred to CReab and might never return to the referring institution. There are also cases where the relationship between referring institution and CReab are recurrent as an end user might come and go between then through the service delivery.

As mentioned in section 2.2.5 (p.47-48), it was confirmed during interviews that there are no CER in Belo Horizonte city and, according to the coordination staff interviewed (CSP:1, CSP:2, CSP:3, CSP:4), just recently the first orthopaedic workshop was certified. This means they are the only supplier that can provide AT items from OPM list that other contracted suppliers do not offer or that are not included in their contract with SUS. The certified Orthopaedic workshop is the AMR.

### 3.2.2 The Rehabilitation Centres

CReabs in Belo Horizonte city are known by different names. *CReab Leste*, or CReab East as it is mentioned in this document, is also known as *PAM Sagrada Família* and *CReab Sagrada Família*. Sagrada Família is the name of the district where the centre is located and PAM is the Brazilian Portuguese abbreviation for a medical centre. *CReab Norte*, or CReab North as it is mentioned in this document, follow similar pattern nominations, also called *PAM Padre Eustaquio* and *CReab Padre Eustaquio*. The other rehabilitation centre is called CGR, Brazilian Portuguese abbreviation for General Rehabilitation Centre. CGR was the only centre that is not integrated with a medical centre.
The CReabs were located in three different regions as presented in Figure 3.3. Users are usually referred to the centres according to their postcode. By the time this research was conducted, CReab East was the only centre to attend the surrounding regions where there was no public rehabilitation centre close.

Figure 3.3: CReabs location and covered region
3.2.3 Assistive Technology Services and Devices Provided at CReab

The range of services offered at CReabs varies from:

- Physiotherapy
- Occupational therapy
- Orthopaedic services
- Phonoaudiology
- Therapy with psychologist
- Social worker advice
- Section with nutritionist
- Anthroposophical medicine
- Acupuncture sections

The CReabs also are supposed to have a physician or a physiatrist, performing a different role than a medical centre GP, but to support all other occupations in tasks where their accreditation is needed. However, CSP: 3 (1.2’-4.2’, 44’-51’) have commented on difficulties in maintaining these professionals in the centres due to the low salary paid. The lack of these professionals at CReab can result in delays in some AT procedures they are needed, such as prosthetics and orthotics assessment. Apart from these, the occupational therapist and physiotherapist can prescribe most of the other ATs provided. Actually, AT can be prescribed by a variety of other occupations, including the social assistant, orthopaedic practitioners, physicians and physiatrists. Referrals are accepted from both private and public medical institutions. Nonetheless, every person is reassessed at SUS’s rehabilitation centres for the identification of an assistive solution, to be provided without any cost to the user. This assistive solution is limited to a list of devices called the OPM list, describing the device specifications and the established price. The list contains 95 items, adaptations and substitutions (See Table 2.6, p.52).

It is worth mentioning that there are other AT items guaranteed by law (Brasil, 1999) not included on this list, such as devices to facilitate education and work. This research focused on the ATs delivered at the rehabilitation centres by means of the OPM list.
3.2.4 User Pathway to Access Assistive Technologies

The user’s pathway to access the ATs after being referred to the CReab was outlined during an initial interview with a member of staff coordinating the three CReabs in Belo Horizonte. Visits to each CReab institution with further interviews and participant observations were then used to confirm this information and to investigate the specific realities of each location. These pathways are illustrated in Figures 3.4 and 3.5.

Figure 3. 4: User pathway to access assistive technology services at CReab North

In their first visit to the service, the users go through a screening process on a first-come-first-served basis. This screening consists mostly of the users bringing their referral, having their requirements quickly assessed and are scheduled for the necessary services. When referral relates to an AT device, users are scheduled to an assessment specific to their referral, and the procedure varies according to the type of AT device and the centre providing them (See Figures 3.4 and 3.5).
There are two main differences in the user pathway to access AT devices. One is with regard to the splints and upper limbs orthotics offered at these services. In CGR and CReab East, this service is restricted to the user taking part in the rehabilitation programme at these CReabs (See Figure 3.5). In CReab North there is no such distinction and splints and orthotics services are offered to all users that CReab’ staff judge as necessary (See Figure 3.4). However, splints and upper limb orthotics are not included in the OPM list and because of this their funding differs and seems not enough in all CReabs. This topic is further discussed in section 3.2.5.1 Best Practice on Assistive Technology Service Provision.

Figure 3. 5: User pathway to access assistive technology services at CReab CGR and East CReab

The other main difference in the service pathway is with regard to hearing aid and cochlear implant services. All users in need of this service are referred to CReab North. Then, users undergo an internal assessment to verify the need for the device and define the service characteristics. The user is then referred to a third-party clinic to receive the treatment or an AT device or both.
There are two possibilities when a piece of AT not offered on the OPM list is required and claimed by means of referral. The most common seem to be users purchasing the equipment themselves. In this case, the practitioners are encouraged not to support the user in choosing equipment outside the list, as the user should receive no support from CReab staff when this happens. Despite this fact, some practitioners commented that they provide guidance to users whenever they can, despite not being recommended to do so (MSP: 3, MSP:7, MSP:9). The other possibility is by pursuing legal means, through court cases. In this case, users are referred to the SMSA-BH where each case is evaluated and items are purchased directly by SMSA-BH. Most participants mentioned that this process is bureaucratic and time-consuming.
3.2.5 Expected Improvements in The Assistive Technology Provided

During the interviews all CReab participants (n=15) were asked the following question:

- Cite three or more AT not yet offered by the OPM list that you consider most urgent their incorporation to the list.

All the answers were transcribed, coded and then grouped into two different main categories which were: AT not offered yet by the list and AT that needs improvement. Table 3.5 shows answer’s categories for AT not offered yet by the list, the numbers of sources or participants that answered that category, and the number of references, which means how many times participants mentioned the category subject during the interviews.

Table 3.5: Participant’s answer categories regarding inclusion of AT not offered

<table>
<thead>
<tr>
<th>AT not offered yet</th>
<th>Sources</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Splints</td>
<td>33% (N=5)</td>
<td>8</td>
</tr>
<tr>
<td>Stander</td>
<td>27% (N=4)</td>
<td>4</td>
</tr>
<tr>
<td>Augmentative &amp; Alternative Communication (AAC)</td>
<td>27% (N=4)</td>
<td>4</td>
</tr>
<tr>
<td>Activities of Daily Living (ADL) adaptations</td>
<td>20% (N=3)</td>
<td>5</td>
</tr>
<tr>
<td>Silicone socks</td>
<td>20% (N=3)</td>
<td>3</td>
</tr>
<tr>
<td>Computer input devices</td>
<td>13% (N=2)</td>
<td>4</td>
</tr>
<tr>
<td>Activity table for wheelchairs</td>
<td>13% (N=2)</td>
<td>2</td>
</tr>
<tr>
<td>Cane</td>
<td>13% (N=2)</td>
<td>2</td>
</tr>
<tr>
<td>Reverse mobile walkers</td>
<td>7% (N=1)</td>
<td>2</td>
</tr>
<tr>
<td>Finger prosthetics</td>
<td>7% (N=1)</td>
<td>1</td>
</tr>
<tr>
<td>AT to home environment accessibility</td>
<td>7% (N=1)</td>
<td>1</td>
</tr>
<tr>
<td>Special School Desk</td>
<td>7% (N=1)</td>
<td>1</td>
</tr>
<tr>
<td>Transferring board</td>
<td>7% (N=1)</td>
<td>1</td>
</tr>
</tbody>
</table>
3.2.5.1 Hand Orthotics and Activities of Daily Living’ Adaptations

Two out of the four most cited AT items participants found urgent to include in the OPM list were related to the upper limb function. They were splints (orthotics) for the hand; and adaptations for activities of daily living’-ADL.

By analysing participant’s answers, two main reasons stood out. They were:

- The high demand for splints and ADL adaptations;
- Issues with materials to make splints and ADL adaptations.

As mentioned previously, all CReabs offer splints and ADL adaptations services. CReab East and CGR offer these services only for users taking part in the rehabilitation programme in their centres, while CReab East there is no such distinction.

Another issue raised concerns the materials used to make the splints, mentioned by CSP:2, MSP:9, MSP:10, MSP:11. Funding for these materials comes from a separate budget from OPM list. All these participants mentioned they often run out of materials and the process to purchase more is very bureaucratic. Regarding the inclusion of splints and ADL in the list MSP:10 (32’-37’, Author translation) commented:

“…if they were included in the list I believe we would have much better material support, either to manufacture our own (splints) as for using ready-made industrialised ones. There are models on the market that satisfy us much better than those we build regarding durability, size adaptation, etc...The upper limb lesions are much more common than others and daily life function is very much conditioned to the use of the hands”.

Another type of AT mentioned by around one-third of participants were devices used to support standing position and perform standing activities with arms free, such as supine standers and standing frames. From the items offered in the list, none of them seems to cover this function. Three participants mentioned that often these items have to be purchased by SMSA-BH (ASP:1, MSP:4, MSP:12).
3.2.5.3 OPM items that need improvement

Table 3.6 reviews the answer’s categories for the AT that needs improvement. Despite the interview question did investigate items offered by the list, many participants mentioned items that need improvement to be included in the list as a priority.

Table 3. 6: Participant’s answer categories regarding AT offered that needs improvement

<table>
<thead>
<tr>
<th>Need Improvement</th>
<th>Sources</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offering better lower limb prosthetics to specific users</td>
<td>27% (N=4)</td>
<td>6</td>
</tr>
<tr>
<td>More functional upper limb prosthetics</td>
<td>27% (N=4)</td>
<td>5</td>
</tr>
<tr>
<td>Better prosthetics knees</td>
<td>20% (N=3)</td>
<td>4</td>
</tr>
<tr>
<td>Personalized bath chair</td>
<td>13% (N=2)</td>
<td>5</td>
</tr>
<tr>
<td>Better prosthetics Foot</td>
<td>7% (N=1)</td>
<td>2</td>
</tr>
<tr>
<td>Bath chair with push ring</td>
<td>7% (N=1)</td>
<td>1</td>
</tr>
</tbody>
</table>

Four out of the six items mentioned by the participants are related to prosthetics and the other two are related to bath chairs. The category offering better lower limb prosthetics was mentioned by around a third of the participants (n=4) and, interestingly, most mentioned that it should be offered just for specific users. The reason stated was that the current lower limb prosthetics offered suits the majority of users, but not all (ASP:1, 29'-35'; MSP:15, 29'-33'; MSP:8, 13'-15'). According to them, more active or sports users would benefit from better and lighter prosthetics and prosthetics parts.

Also mentioned by around a third of the participants (n=4) was the need of more functional upper limb prosthetics. Participants all mentioned that the models offered are mostly cosmetic and do not help users towards a more independent life.
Three participants (n=3) mentioned that better prosthetic knees are also needed. Participant MSP 12(16'-25', Author translation) mentioned:

“The (prosthetic) components are like this: when the list pays a good price in the market sometimes you give an expensive component, sometimes (Belo Horizonte) prefecture is short in resources and then buy a cheap component, you understand? It depends on how the list is, sometimes you give good knees [joints], sometimes you don’t.”

Both bath chairs mentioned by participants were included in the list according to the decree Nº 1.272, from 25th June 2013 (Brasil, 2013), around one year before the study has been conducted. However, not all items approved in the decree were supplied at CReabs. Coordination and administrative participants commented that the process to effectively provide new items approved in federal decrees takes time since new public tender needs to be created and AT devices from suppliers winning the tender needs to pass a quality inspection.

### 3.2.6 Providers Difficulties and Expectations

During the interviews all CReab participants (n=15) were asked the following question:

- What are the main difficulties faced to provide a quality AT service?

It is worth mentioning here that quality service was not previously defined at this point as the question intended to gather the provider’s impressions regarding their overall difficulties to deliver what they consider as quality services, or in another way a better service. Table 3.7 shows the answer’s categories that emerged from this question, the number of sources and references in each category.
Table 3.7: Participant’s answer categories regarding main difficulties to provide the AT service

<table>
<thead>
<tr>
<th>Answer categories</th>
<th>Sources</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of AT option to choose in the SUS list</td>
<td>53%</td>
<td>11</td>
</tr>
<tr>
<td>Lack of physical space</td>
<td>47%</td>
<td>8</td>
</tr>
<tr>
<td>Partaking in training</td>
<td>40%</td>
<td>15</td>
</tr>
<tr>
<td>Issues with public-private partnership</td>
<td>40%</td>
<td>10</td>
</tr>
<tr>
<td>Delay to receive an AT device</td>
<td>40%</td>
<td>6</td>
</tr>
<tr>
<td>Issues with wheelchair delivery</td>
<td>33%</td>
<td>6</td>
</tr>
<tr>
<td>Issues regarding orthotics material</td>
<td>27%</td>
<td>8</td>
</tr>
<tr>
<td>Lack of feedback about AT use</td>
<td>27%</td>
<td>4</td>
</tr>
</tbody>
</table>

After asking CReab participants about their difficulties, a question was made regarding their expectations towards the changes they would like to see in the service. This question was made to define the provider’s priorities according to the difficulties they reported. The question was:

- What changes would you make in order to enhance the quality of the AT service provided? (please cite three priority changes).

Table 3.8 shows the answer’s categories that emerged from this question, the number of sources and references in each category.
Table 3. 8: Participants’ answer categories regarding the priorities to improve the service

<table>
<thead>
<tr>
<th>Answer categories</th>
<th>Sources</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have more training/knowledge support</td>
<td>33%</td>
<td>13</td>
</tr>
<tr>
<td>Introduce user follow up</td>
<td>33%</td>
<td>7</td>
</tr>
<tr>
<td>Improve physical space</td>
<td>33%</td>
<td>7</td>
</tr>
<tr>
<td>Improve the AT list</td>
<td>27%</td>
<td>6</td>
</tr>
<tr>
<td>Access to new technologies available</td>
<td>27%</td>
<td>4</td>
</tr>
<tr>
<td>Access to better suppliers</td>
<td>20%</td>
<td>5</td>
</tr>
<tr>
<td>Build a public service AT workshop</td>
<td>20%</td>
<td>3</td>
</tr>
<tr>
<td>Change the functioning of the list</td>
<td>20%</td>
<td>3</td>
</tr>
<tr>
<td>Need to establish a common language</td>
<td>20%</td>
<td>3</td>
</tr>
</tbody>
</table>

The main topics that arose from the answer transcription to these two questions are discussed in the following sections.

3.2.6.1 Lack of AT Options on the OPM List

More than half of the participants commented that their difficulty to provide a better service was related to the lack of options on the OPM list. ASP:1, MSP:8, MSP:10 commented there is often demand for similar models or AT variations from what is offered on the list. ASP:1 mentioned that it is not that these items necessarily costs more but that they are not specified on the list, so they cannot be provided or contracted. The participant gave two examples: the cane and open sandals. She mentioned that both items cost less than the similar AT items offered on the list, are often required, but because they are not specified on the list they cannot be offered or contracted.
MSP:12 also relates the lack of options to the lack of flexibility of the list. She mentioned that the decree 1.272 already incorporates more possibilities for the wheelchair service. MSP:12 (67’-73’, author translation) said:

“... it will be possible for me now to take a standard chair, costing five hundred reais, and put two lateral trunk support, to avoid back deformities, instead of putting the user in a queue for a special wheelchair, totally bespoke, that can take up to two years process and cost three times more. I did not have that = I had what it was standard and what it was totally bespoke. But now the (health) ministry enables the possibility for us to have elements that I can add to a wheelchair, that I can personalise it without spending much or without having to wait for long.”

3.2.6.2 Lack of Physical Space

Another difficulty exposed by participants is related to the lack of physical space, mentioned by nearly half of CReab participants (n=7). This is something that was immediately recognised while visiting the CReabs (See Figures 3.6 and 3.7). Apart from CReab North that has a specific place to store the AT items delivered by contracted suppliers, the other two CReabs stock them throughout corridors and any space they have available. According to participants answers, the lack of physical space has a negative impact on:

- The service queue
- The contracted service
- Implementation of new stages
- User comfort while at CReab

The service queue is directly affected by the lack of space. The reason is that the contracted supplier has to provide part of their services at the CReab institution, under CReab staff supervision. Nonetheless, it is of concern that none of the CReab building was designed with this process in mind. In fact, most of the AT services offered now did not exist fifteen years ago. CSP:3, MSP:11, MSP:14 mentioned that often when a supplier comes to the service, they occupy rooms that are used daily by different practitioners, from different occupations, offer-
ing various services. When this supplier goes to CReabs, many of the service scheduled by CReab practitioners need to be re-scheduled, increasing the queue size and queue time.

Figure 3.6: Stock of adapted wheelchair at CReab East corridor

**MSP:12** mentioned that the lack of physical space has a negative impact on the service suppliers could offer. She said (44'-51', Author translation):

“We do not have room availability for a contracted supplier to come more times in a week, even now that they can come instead of once a week, come twice a week...even if we have ten suppliers, we do not have the conditions to host the ten suppliers on a daily basis.”

Another difficulty concerning the lack of space is related to the implementation of new services. CSP:2 (28'-30’) mentioned that they are planning to implement new services such as a therapeutic workshop, clay therapy, and capoeira – the last is a Brazilian martial art that combines elements of dance, acrobatics, and music, sometimes also referred as a game. However, she mentioned this is not possible with the current situation, so she was looking forward to being certified as a CER in order to have access to construction and refurbishing funding, which had not happened so far. MSP: 12 mentioned that due to the lack of space it is not possible to train end users to use the AT they receive; she stated (67'-73'):
“A third difficulty we have is space for user training, you know? To do training with the prosthesis, wheelchair training, raising the wheelchair, climbing a kerb, a stair. For that we need space, and if go to the ground floor you will see that we don’t have, none of the CReabs has.”

When talking about the lack of physical space, another theme emerging from participant’s answers is that it affects the end user’s comfort. MSP: 14 and MSP: 7 both mentioned that the wheelchair users do not have appropriate space to wait at the reception and to circulate inside the centre. Figure 3.7 illustrates that is not only the wheelchair user who is affected. The figure shows wheelchairs being stocked by the side of the rail bar at the entrance ramp. These wheelchairs are for users’ in need of one to circulate inside the CReab. It makes the rail bar unusable for those who need them. The same figure also shows the users in wheelchairs waiting at the edge of the ramp, putting in danger the safety of wheelchair users.

The lack of physical space has a snowball effect on the service quality. MSP:4 (28’-42’, Author translation) comment regarding her expected changes seems to express this:

“...we need more physical space because one thing leads to the other: we need more suppliers, however, we need more staff to accompany them... If you see our working conditions it’s all squeezed, and all that wheelchair patients squeezed there, It’s not ideal. Ideal is to have a better space to host these patients, to have more and good orthopaedic workshops to bring these technologies, to improve the list, because it’s a combination of factors.”
3.2.6.3 The Need for Training and Knowledge Support

More training and knowledge support is the major change expected from more than half of the participants (n=8). By training they mean overall training regarding AT prescription, learning to use existing assessment methods, learning about existing technologies. By knowledge support, they suggest the use of standardised assessment and measuring tools, knowledge support from university and consultancy services, access to tools and training and time available to study at work. It seems that no experience in assistive technology prescription is required from practitioners to work at SUS. MSP:11 (33'-35', Author translation) statement corroborate this fact:

“...something I miss here is specialised training. We have no specialised qualification when we join the service...I like the public service, but I just came to work here because I really wish for. I do not have training from SUS institution or from the government for these (AT) procedures. So I think we should have a more structured training, organised, invest in staff training. I think by doing this, we reduce the costs of inadequate prescription, user care without goals, consequently reducing costs. If the staff is well-trained, it can optimise the service.”

The training for staff joining SUS’s AT services happens mostly on an informal basis, from one practitioner to other. There is no formal training or certified training before or after staff join the AT service. This information was confirmed in the second study when 100% of the practitioners involved in the wheelchair prescription were interviewed and questioned about their training. The only preparation participants took part supported by service was two-day training provided by the suppliers. Some of the staff mentioned they took part in other external training and qualifications, which they paid themselves.

Often, participants cited they lack knowledge of existing good practices and protocols. CSP:2 (30'-31’) mentioned that: “we need to be more acknowledged of ICF model... a permanent consultancy regarding the changing from medical to social model is needed”. In a similar manner MSP: 10 (70'-74’) mentioned: “...it needs to approach the European model that we do not work with a list, changing the funding system. But nothing will work if all staff involved in the assessment and prescription of assistive technologies do not have sharp training.”
Figure 3.8 shows a Tag Cloud from the analyses of the 50 most frequent words from the coded categories related to training and knowledge support. Words with a minimum of three characters were included, excluding words that had no meaning alone, which were mostly articles, prepositions, conjunctions, numbers and some adverbs. The figure shows the translated words in English. A print screen of the original Tag Cloud in Portuguese produced by NVivo word frequency query can be seen in Appendix 8.

The five most frequent words cited were: *qualification, service, assistive technology, wheelchair, and assessment*. While qualification, service and assistive technology were expected to appear, wheelchair and assessment were not. A significant concern was raised from participants regarding the need for training and knowledge support specific to the wheelchair service offered at CReabs. This is explained in the following sections.

Figure 3. 8: Tag Cloud from coded categories related to training and knowledge support
3.2.6.4 The Need to Introduce a Follow-Up Stage

Another change expected by a third of participants interviewed was the introduction of the follow-up stage. According to all participants, there is no formal follow-up stage in the service. They all said they encourage the user to return in case they face any problem with the received device but that there is no systematic or compulsory follow-up stage. MSP: 6 (43’-45’, Author translation) commented about this:

“*We do not have patient follow-up. Ideally, we should have a follow-up to check from time-to-time how long this patient received the chair, if he is using it, how he is using it, how he is positioning, if he had grown or not, if the family is making chair adjustments and if the patient is doing rehabilitation and how he is improving or not.*

Participants MSP: 6, MSP: 11, MSP:12, MSP:15 mentioned the importance of the follow-up to make sure users are effectively using the device, or using them at all. Regarding this MSP:12 (29’-33’, Author translation) commented:

“*...because we find users that receive an orthotics but cannot wear it alone. He stops using it, and we have no control of that. We have diabetes patient that gets a shoe, but as he has sensibility alteration, he finds that shoes don’t work, which can end up in amputation. So I think all users need a systematic follow-up.*

MSP 12 (67’-73’, Author translation) also adds the economic importance of the follow-up:

“*What is the point of giving expensive devices and not having a follow-up? I think we are throwing money away by not accompanying these users...I think the follow-up is the SUS’s great difficulty in functioning as a whole. The user leaves the service with a prosthetics, use it once and put it inside the wardrobe because it hurts, instead of coming here and say: “I am not going to use that”, and then he put into the wardrobe, as we known it also happen with wheelchairs. So I believe that follow-up is a big issue.*"
3.2.6.5 Summary of Service Problems and Providers Expectations

Table 3.9 provides a summary of the main problems raised by providers and their expectations relating to each issue.

<table>
<thead>
<tr>
<th>Problems</th>
<th>Providers Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partaking in Training</td>
<td>1. Have more training regarding AT prescription,</td>
</tr>
<tr>
<td></td>
<td>2. Have access to tools and training,</td>
</tr>
<tr>
<td></td>
<td>3. More use of standardised assessment and measuring tools,</td>
</tr>
<tr>
<td></td>
<td>4. Have more time to study at work,</td>
</tr>
<tr>
<td></td>
<td>5. Have more knowledge support from universities and consultancy services.</td>
</tr>
<tr>
<td>Lack of physical space</td>
<td>1. CReab buildings were not designed for AT services.</td>
</tr>
<tr>
<td></td>
<td>2. Requires appropriate space to provide user training and other services.</td>
</tr>
<tr>
<td></td>
<td>3. Requires bigger and appropriate space to maximise providers and supplier work.</td>
</tr>
<tr>
<td></td>
<td>4. Requires bigger and appropriate spaces to store ATs to be delivered.</td>
</tr>
<tr>
<td></td>
<td>5. Requires bigger and appropriate space to provide comfort to users.</td>
</tr>
<tr>
<td>Lack of AT option to choose</td>
<td>1. OPM list should be more flexible on its specification.</td>
</tr>
<tr>
<td></td>
<td>2. Some items should have more options, models or variations to choose.</td>
</tr>
<tr>
<td></td>
<td>3. The list should be more flexible and incorporate more items.</td>
</tr>
<tr>
<td>Lack of Follow Up Stage</td>
<td>1. The service needs a systematic or compulsory follow-up stage to be implanted urgently.</td>
</tr>
</tbody>
</table>
3.2.7 Exploring The Service Gaps

During the interviews, a variety of questions had regard to the application of AT service provision good practices. The aim was to identify the major barriers to apply good practices in order to define a research focus. The questions were designed based on the AAATE service’ recommendations, more specifically on the user influence quality indicators applicable to the CReab level of care (see 3.1.4.1 Design of the interviews section for details).

The transcribed answers to those specific questions were coded using a pre-coded category scheme referring to HEART Study’ user influence quality indicators (See Appendix 1) as according to Figure 3.9. Findings with regards to each of the topics investigated are presented in this section.

![User Influence Categories for Study 1](image)

Figure 3.9: User influence categories for Study 1, adapted from Andrich, et al. (2013)

3.2.7.1 Assessing The User Goal

CReab participants were asked to provide information on how the end-user personal characteristics and personal goals are evaluated to match the technology to be prescribed. They were also inquired about the use of protocols such as assessment tools, forms and checklist.
According to participant answers, end users are assessed according to the AT prescribed in the primary care. Assessment occurs on an individual practitioner basis and there is no standardisation, formal use of guidelines or tools to assess user goals and user characteristics. Participants’ answer to this topic varied greatly. There were some (n=4) who mentioned that the goal assessment is mostly based on verbal and visual cues, others (n=4) said they are mostly based on the practitioner experience. Two participants mentioned the consideration of user lifestyle or daily life activities. One participant stated this investigation is made with the user and carer. Other participant said the assessment is mostly lead by the supplier staff and that CReab staff is just present to support the user. One participant mentioned the consideration of the environmental factors.

3.2.7.2 User Participation to Decide The Solution

CReab participants were asked to comment how end-users engage in the decision process of their AT solution and if there is a possibility to choose between different AT models and features.

Six (n=6) participants said there is a greater possibility for choices when the AT needed is a wheelchair. They mentioned the possibility for the end-user to decide for colour and participate in the decision for certain accessories and some of the chair configuration. Two (n=2) participants mentioned that options are limited when it comes to orthotics and prosthetics. Two participants said it would vary according to the items offered on the list, and if there are different AT models attending similar requirements. Two participants mentioned this is not for the end-user to decide, and one participant said the participation in the decision is just for experienced users.

Two participants quote were thought to translate well the differences between practitioners approach when it comes to the end-user participation. The first represents those practitioners who believe this is not the role of the end-user.

“It’s because is very technical, the patient doesn’t have this information, isn’t it? Unless it is a wheelchair, but there are different things=you can choose a blue, a red, (the colour). But (choosing) the device is not up to the patient because he does not know what is best for him, isn’t it?” (MSP: 4, 7-8’, Author translation).

The next quote represents those practitioners who believe it is possible to include the participant in the decision process.
“Yesterday we had a case that exemplifies it. He (the user) could benefit from an aluminium wheelchair, a lighter wheelchair. But this is a chair that does not accept impacts. Hence it is a weaker chair and the user lives in a shantytown area. He could choose this chair which is more expensive, and that would be adequate for his (physical) condition. However, there were aspects with regards to the architectural limitation at the place he lives so we did not induce but presented him the points why he should choose another chair that would be stronger though heavier. It would attend in the same way the positioning requirements, but it would offer more safety and comfort about the environmental aspects. So he took part in the decision, he was informed there was another option and that if it breaks the chassis there is no maintenance.” (MSP:11, 6'-8', Author translation).

3.2.7.3 Possibility to Test The Assistive Technology

CReab participants were asked to comment if there is an opportunity to test the AT before deciding on the final solution or equipment.

According to participants answer, there is no formal stage to test an AT device before deciding on a model, device characteristics, configuration or selecting the devices that will compose an AT solution. What participants mentioned was the possibility for the orthotics and wheelchair users to return to the service in case of a problem or the device not attending their needs.

When this happens with the splints internally made at CReab, this is dealt directly with the CReab staff. In the case of orthotics and wheelchairs provided by a supplier, the user will be re-scheduled to the day suppliers comes to the service.

Another case mentioned is the situation when a device doesn’t fit the user, and the supplier leaves the returned device at the CReab. CReab staff mentioned they could use that device to test with potential users before taking a decision.
3.2.7.4 Possibility to Change The Decisions Made

According to participants answers, there is a possibility for end-users and practitioners to change the decisions made regarding the AT at any time in the process if the reason is justifiable. However, this might involve the user having to start the process from the beginning and waiting even longer. MSP:10 (29’-32’, Author translation) commented on the circumstances that it often happens:

“In the case of the upper limb orthotics made from the (CReab) O.Ts for sure. In the case of the wheelchair, unfortunately, not in the same way. What happens is that if I request a model and that model doesn’t fit the user requirement, then I have to request another model. This is possible, either because of an improvement or worsening in the patient function, ..., (also) when there is an unfortunate change in the accessories that suppliers make without communicating us, ..., and sometimes, unfortunately, once tested the equipment I requested does not function as we imagined or expected, that means it also happens in the capacity of the practitioner.”

3.2.7.5 Usage of User Self-Assessment Report

CReab participants were asked to comment if there is an opportunity for the end users to make a self-assessment by means of a report or any other means.

It is clear from the participant answer that the service does not count with any kind of formal self-assessment report for the users to evaluate the effectiveness or impact of the provided AT device(s) in their life.
3.2.7.6 Usage of Feedback Mechanism

CReab participants were asked to comment if there are any user feedback mechanisms regarding the AT service offered.

It was clear from the participant answer that the service does not have any formal feedback or feedback mechanism apart from a verbal communication at the delivery stage inviting the users to contact the service in case of any problem or difficulty. Nonetheless, the users are not contacted or scheduled to return to the service.

What some participants said in various situations were that users taking part in any other rehabilitation service offered at CReabs are accompanied closer and have more opportunity to express their issues verbally.
3.2.8 Key Findings on The Gaps to Apply Best Practices

The main difficulties reported by CReab participants to apply the good practices recommended by AAATE’s user influence quality indicators are summarised in Figure 3.10. These are categorised according to the AT service stages suggested in Andrich, et al. (2013). The Swiss Cheese model for cumulative effects was used subsequently to data collection to organise and present the main findings. As previously mentioned, a Swiss Cheese model helps to identify cumulative failures in various stages of a process, or from a complex system that can lead to accidents. The holes represent active failures and latent conditions. A bad outcome occurs when the holes in various layers line up to permit a trajectory of an accident to occur (Reason, 2000). In this case, the accident was interpreted as the risk of the AT not fitting the user profile.

![Diagram showing main AT service failures to apply good practices]

Figure 3.10: Main service failure to apply good practices
3.2.9 Providers Emphasis on The Wheelchair

During the analysis of Study 1 data, the wheelchair stood out as the most mentioned AT device. Also, it was the AT device with the greater number of categories emerging from data. In many cases, it appeared as participants’ positive comments regarding the improvements in the service, and other times regarding the difficulties related to the service provision, the wheelchair prescription and others.

Figure 3.11 shows a Tag Cloud from the analyses of the 50 most frequent words with a minimum of three characters transcribed from interview audios, excluding words that had no meaning alone, which were mostly articles, prepositions, conjunctions, numbers and some adverbs. The figure shows the translated words in English. A print screen of the original Tag Cloud in Portuguese produced by NVivo word frequency query can be seen in Appendix 8. The word ‘chair’ refers to wheelchair or bath chair as in Portuguese both wheelchair and bath chair is a compound word.

As a consequence, many categories referring to the wheelchair were created during analysis. They are presented below in the order of the most cited categories:
• Power wheelchair
• Issues with the wheelchair delivery
• Wheelchair assessment
• Positive comments regarding AT offered/ wheelchairs offered
• Types of wheelchair offered
• Expected changes/wheelchair prescription certification
• Important items not offered by the list / activity table for wheelchairs
• Problem with wheelchair transportation
• Creation of wheelchair user assessment

More information about the key topics that contributed to deciding the research focus is provided next. Detailed information about the wheelchair service functioning is provided in Chapter 4.

3.2.9.1 Power Wheelchair

The power wheelchair was a hot topic since it was one of the next items to be implemented on the list, which it happened while Study 2 was being carried out. A great concern was regarding the user criteria needed to concede the power chair, which was not yet defined (MSP:4, 13.1’-18.1’/ ASP:1,47’-54.4’/ MSP:11,13.3’-11.1’/ MSP:12, 33.5’-43.3’). Because the government had publically advertised the inclusion of the power chair on the list, some participants commented about users claiming the right to one, demanding a power wheelchair; as mentioned in MSP:4 (13.1’-18.1’, Author translation) comments:

“... some patients arrive here and say: I want a power chair, for example...” “... it needs to have very established criteria, and we were not authorised yet. It’s a very expensive equipment and some people come here and say: - I need one! - and they bring a referral from anyone, but it's not like that. Even if they need it, we have still not clarified the demand, the suppliers, the criteria”.


3.2.9.2 Issues With The Wheelchair Delivery

The wheelchair seems to be the item with the most extensive waiting list from AT services provided at CReabs. To reduce the waiting time, the government has established a deadline for suppliers to deliver the AT from the moment of user assessment. The period varies according to each device. Nonetheless, despite many participants said the waiting queue had reduced significantly to most AT offered the wheelchair delivery was still a problem.

MSP: 5 said that according to the last internal survey in CReab East, 70 users were waiting to receive a completely bespoke wheelchair, 120 waiting to receive a partially bespoke wheelchair, and 120 waiting to receive a standard wheelchair. When inquired how long this process can take MSP: 5, MSP: 7 and ASP:1 said that after assessment, suppliers have 60 to 90 days depending on the chair to deliver the ready product. MSP:7 (26’-31’) and MSP: 13 (27’-31’) commented that this deadline could extend to five months or more. Nonetheless, the entire process can take a year or more considering there are other stages before the assessment. During the Study 2 and Study 3 observations, some users commented they were waiting for two or three years to receive a wheelchair.
3.2.9.3 The Wheelchair Assessment

Every wheelchair user is assessed and has their measurements taken by CReab practitioners in order to decide for the wheelchair. This can occur in users’ home environment depending on their restrictions and disability severity. However, there is no protocol to assess the user characteristics. MSP: 6 (29’-35’, Author translation) mentioned about the creation of one:

“Our occupational therapists are elaborating a protocol that we are thinking to use as a standard when assessing this wheelchair user. But is not based on any (existing) assessment. What we are doing is based on ICF with no doubt, but not based on the COPM (Canadian Occupational Performance Measure) or any of those others (assessments) you mentioned. We are doing based on our vision, on the patient requirements, on what it is important for us to be asking”.

Despite the fact that CReab staff was mobilising to create a protocol for assessing the wheelchair user, there was an indication that such protocol was to be created basing only on the practitioner expertise, not considering validated protocols or consulting the existing literature.

3.2.9.4 Positive Comments About The Wheelchairs Offered

For the CReab participants, the wheelchairs appear to be the most satisfactory AT item in OPM list to attend the user’s demands. This is due to the variety of wheelchairs types and wheelchairs configurations available on the list, while for other AT items, the options are quite restricted. Participants also made positive comments regarding the provision of power wheelchair in a near feature.

Besides the positives comments made about the wheelchairs offered, none of the CReab participants had mentioned the wheelchair or a wheelchair model as a necessary item to enter the list.
3.3 Discussion of Study 1 Findings

This section discusses the main findings of the first study in relation to the literature, initial research questions and initial hypothesis. It discusses aspects of the service, the OPM list, how the research focus was decided and the limitations recognised after the study.

3.3.1 Aspects of The Service

Assistive Technology provision in Belo Horizonte SUS conforms to the ‘medical model’ of service delivery, as defined by AAATE, in which the prescription of an AT device is the responsibility of a qualified professional and AT eligible for public provision is usually regulated by a list of products or product specifications, with or without established prices or reimbursement thresholds (Andrich, et al., 2013). It is likely that this is also true across Brazil as the public health service functions similarly throughout the country.

Confusion could arise with the definition of the disability medical approach cited in the literature review (Clarkson, et al., 2003) which describes an outdated societal approach to disability. Nonetheless, this does not mean that Brazil adopts the so-called “medical” model of disability. On the contrary, the publication of UN CRPD as a federal decree and the VSL investments in the areas of social inclusion, access to education, accessibility and healthcare give reason to believe that Brazil is moving towards the ‘social’ model of disability as defined by Clarkson, et al. (2003).

Despite the improvement towards a more inclusive society, CReab services still lack essential stages suggested on good practices, such as: testing the device before taking a decision, providing users with appropriate training with the device, and having feedback mechanisms regarding service evaluation and user self-evaluation.

With regards to the assistive solution provided, concerns were raised regarding both internal and external aspects to CReabs. One internal concern is that the
service lacks a mechanism to guarantee and stimulate that a multidisciplinary team assesses users’ requirements, as suggested on good practice (AAATE, 2003; Andrich, et al., 2013). Another internal concern relates to the lack of mechanisms to assure those user requirements are assessed beyond the AT device prescribed when they arrive at CReab service, ensuring they will benefit from all OPM items they might require. An external concern about the assistive solution provided is that it should be more integrated with other AT services available through VSL, such as accessibility and access to education. Users are assessed separately, and the service seems to lack practical mechanisms to exchange and integrate providers knowledge towards defining an assistive solution.

Although the three CReabs are responsible for covering different geographic locations of Belo Horizonte Municipality they are all located in a relatively central region of Belo Horizonte (see Figure 3.3, p.117). A reason that might explain this is the better access to public transport lines in central areas. Nonetheless, there is no CReab close to the north or south-west region of Belo Horizonte. Users from these areas would benefit from a better geographic distribution of the CReabs.

Overall, CReab service seems to lack protocols to assess the users’ characteristics and requirements to define their assistive solution. Without these, non-clinical aspects of the assessment such as environmental and personal factors are often ignored (WHO, 2008; WHO 2012; WHO, 2013b).

### 3.3.2 Is The OPM List Effective?

Findings reveal that more than half of the CReab participants relate their difficulty to provide a better service to the lack of options on the OPM list. Similarly, improving the AT list was considered a priority for nearly one-third of CReab participants when inquired about expectations.

Considering the large population SUS service has to care for, restrictions by means of an AT list is understandable and might be the only way to make the AT service financially feasible. However, there are no indications of the effectiveness of the service. HEART study recommendations suggest that an efficient system is based on features like low costs for the end user, direct involvement in all
procedures, no bureaucracy, accessibility to information, the existence of feedback mechanism and the user follow-up stage. Although the CReab service has no cost to the end user, the other aspects of an efficient service seem all to be missing.

The high level of OPM specification list gives little room for providing the necessary AT, with the required characteristics. Apart from the wheelchair, the practitioners have barely any choice to choose a different model of AT for a similar function. Hence, available devices and models might not represent many of the end users’ requirements. When that happens, CReab practitioners are discouraged from informing other alternatives to end users. This contradicts the recommendation to provide information and consultation to enable end-users to make responsible choices (Andrich, et al., 2013). One example to illustrate this situation is the stander device. Stander was mentioned by participants as the second most urgent AT device to be included in the list (See Table 3.5, p.122). End users end up requesting them by legal means. When the need of a stander is identified, CReab practitioners could at least inform the users about the device functionality, explain it is not included in the OPM list, inform potential suppliers, funding schemes provided by government specific to acquire AT, and the pros and cons of acquiring themselves or via legal means.

3.3.3 Defining The Research Focus

There were various reasons for choosing the wheelchair as the research focus after concluding Study 1 data analyses. First, the wheelchair was the most mentioned AT device during interviews, bringing the attention to various concerns related to the wheelchair service provided. Second, CReab practitioners considered the wheelchair the OPM item with the greatest variety of types and configurations available. This makes the assessment of the users’ characteristics and requirements a crucial stage to select the appropriate wheelchair and wheelchair characteristics. Nonetheless, findings indicate there is no use of protocols or evidence-based practice in the process of matching user’s characteristics to the AT device as recommended in the literature (WHO, 2012; WHO, 2013b; Andrich, et al., 2013).

Additionally, CReab practitioners had pointed the need for knowledge support as the most urgent service change. By knowledge support, they mean the use of
protocols, standardised assessment and measuring tools, knowledge support from university and consultancy services, access to tools and training and time available to study at work. A research opportunity was reinforced by the fact that one CReab were already mobilising to create a protocol for the wheelchair service with no proof to be evidence-based, based on validated protocols or the existing literature, but based only on the practitioner expertise. To use the CReab practitioner expertise in SUS services to develop contextual-based protocols and tools to the wheelchair service based on validated protocols, existing literature, and supporting the practitioner and users to make informed decisions seems to be a natural path after the first exploratory study.

3.3.4 Limitations Recognised After Study

Some limitations were recognised after the conclusion of Study 1. One regards to the translation of the user influence quality indicators into research questions in order to assess the service. After analysing all interviews, the impression was that some questions made to the practitioner and technical staff were difficult to understand or their content misunderstood, such as question 8 and question 10 (see Appendix 3). More time and more pilot study were thought to be necessary so that these interview questions could be better understood by the participants for them to provide more accurate answers to those matters.

Following studies in this research should include additional methods, such as observations, in order to triangulate the collected information and ground a more accurate picture of the service state.
3.4 Conclusion

This chapter presented the first exploratory study, which aimed to understand the functioning of current AT services provided by SUS in Belo Horizonte city, and how this contributed to the research focus. Qualitative data were collected by visiting the main institutions providing AT services in Belo Horizonte city (n = 5) and conducting semi-structured interviews with stakeholders directly involved in these services (n= 28).

Regarding the functioning of the service, it was found that AT services provided by SUS in Belo Horizonte city, Brazil fit the organisational ‘medical model’ of service delivery, defined by AAATE. It is likely that this is also true across Brazil, as the public health service functions similarly throughout the country. Nonetheless, this does not mean that Brazil adopts the so-called ‘medical’ approach to disability. On the contrary, the current policies give us reason to believe that Brazil is moving towards a ‘social’ approach to disability.

It was also found that the service still lacks essential stages suggested in the good practice literature, such as testing the device before taking a decision, providing end users with AT training and having feedback mechanisms. From the perspective of service providers, more knowledge support is necessary, a follow-up stage should be introduced and rehabilitation centres’ physical space should be improved. The OPM list is considered rigid, and the procedure to request devices not offered on the list are bureaucratic and time-consuming.

With regards to the research focus, the providers’ major expectation towards improving the service were concerned with knowledge support. Most participants were eager to have more access to training, tools and more time available to study at work. The wheelchair was a hot topic being the most commented AT device.

Literature indicates that failure to employ recommended good practices expose the process to the risk of wrong or ineffective intervention, abandonment of the devices provided and a waste of resources. It was clear by the end the study that the service lacks mechanisms to assess users beyond the clinical perspective and involve them in the decision making. It was also clear that the wheelchair, due to its complexity and a greater possibility of choices, poses higher dangers of mismatching the user with the selected wheelchair and wheelchair characteristics within current service conditions. Hence, the subsequent research focus was dedicated to wheelchair services.
Defining the research

Chapter 1 Introduction

Chapter 2 Literature Review

Exploratory stage

Chapter 3 Finding a Research Focus

Understand Belo Horizonte AT services
Find a research focus

Chapter 4 The Wheelchair Service at CReabs

Understand the Wheelchair Service

Preparatory stage

Define the Interventions
CHAPTER 4

STUDY 2: THE WHEELCHAIR SERVICE AT CREABS

After Study 1, the research focus was clarified and an overall understanding of the AT services in Belo Horizonte acquired. A second study was then elaborated, divided into two parts, each having a different purpose and research questions. Study 2.1, of which still has an exploratory purpose aimed to expand the understanding of the focused area, the wheelchair service. Study 2.2 initiated the preparatory stage and intended to collect the necessary information to design a context-based and collaboratively designed intervention. Study 2 was conducted between early September and early December 2014 at Belo Horizonte city, Brazil, and aimed to provide information to answer the following research questions presented in Table 4.1.

Table 4.1: Rationale for Study 2

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Research Stage</th>
<th>Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>What are the characteristics of the existing wheelchairs services provided by SUS in Belo Horizonte city?</td>
<td>Study 2.1 Understanding the focused area</td>
<td>Participant Observation at the WC service stages</td>
</tr>
<tr>
<td>How secondary care’ practitioners from SUS assess and record wheelchair user’ information?</td>
<td>Study 2.2 Defining the Interventions</td>
<td>Semi-structured Interviews with the staff involved in the WC service.</td>
</tr>
<tr>
<td>How to implement user-centred protocols at Belo Horizonte SUS’ current wheelchair service provision?</td>
<td></td>
<td>Participant Observation at the wheelchair service stages</td>
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<td></td>
<td></td>
<td>Task Analysis of the activities performed at the wheelchair service stages</td>
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<td></td>
<td></td>
<td>Structured Interview with the staff involved in the wheelchair service.</td>
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</tbody>
</table>
4.1 Research Design

The research design is further detailed following the structure used in Chapter 3, adapted from Robson (2011, p.71). The components are those influencing and be influenced by the research question, or research problem (See Figure 3.1, p.102) with other aspects added as according to the study complexity.

4.1.1 Conceptual Framework

Assistive technology services in Brazil have improved considerably in the past ten years. Some significant advancement was the increase in the number and type of items provided, also the accreditation of various rehabilitation centres (CERs) and AT workshops throughout the country. Still, findings of the exploratory study (See Section 3.2) confirm there is no CER in Belo Horizonte city, and only recently the first AT workshop was certified by the government. Also, AT services have been provided by rehabilitation centres that were not initially designed to embrace the various stages required in AT service provision, for example, testing an AT device. The main difficulties reported by AT services providers in Study 1 were:

1. insufficient staff and suppliers to serve the restrained AT demand, overloading current staff and creating a long waiting list;
2. unsatisfactory wheelchair suppliers that can provide products under government specifications and established price to attend the restrained demand, making the wheelchair the item with the longest waiting list;
3. lack of access to knowledge and training, especially regarding formal certifications, AT prescriptions and use of protocols;
4. lack of time to study, use assessment tools and other protocols.

Study 1 indicates that current service lacks mechanisms to ensure that users are involved in decisions and are assessed beyond the clinical perspective.
Literature indicates that failure to employ recommended good practices expose the process to the risk of wrong or ineffective intervention, abandonment of the devices provided and a waste of resources. It was also clear that the wheelchair service, due to its complexity, the possibility of choices and lack of good practices, poses severe risks of mismatching the user to the selected wheelchair.

4.1.2 Purpose

The Study 2.1 still had an exploratory purpose as it aimed to expand the understanding of the focused area: the wheelchair service provided at the CReabs. Review of the literature specific to the wheelchair service in Brazil (See Section 2.3.7 Wheelchair Services In Brazil) revealed that there is very few information published. Further investigation was seen necessary to comprehend the wheelchair services at Belo Horizonte CReabs. The following research question guided the Study 2.1 development:

**What are the characteristics of the existing wheelchairs services provided by SUS in Belo Horizonte city?**

The purpose of Study 2.2 was to understand the process of fitting the wheelchair to the user requirements along the service stages. In other words, it seeks to evaluate the type of user information collected to identify the user' characteristics and wheelchair goals that influence the choice and customisation of the equipment.

According to Robson’s classification on evaluation research (Robson, 2011, p.181) this study is a formative evaluation as it is intended to evaluate the actual service but also to help to improve it. In the sense of evaluating the current services, the following research question guided the study development:

**How do SUS’s CReab practitioners’ assess and record wheelchair user information?**

As for the concerns to improve the service, the following research question guided the study development: **How to implement user-centred protocols at Belo Horizonte SUS’ current wheelchair service provision?**
4.1.3 Objectives

Specific objectives for this research stage were delineated to accomplish the research purpose and provide answers to the research question set for the study. The Study 2.1 objectives were:

- present to CReab participants a summary of previous study results and introduce the study rationale, giving them opportunities to clarify any concerns;
- identify what wheelchair service SUS provides in Belo Horizonte city;
- identify the pathway taken by end users to access the wheelchairs;
- identify opportunities to implement user-centred and participatory good practices;
- define the context for which interventions will be designed.

The intended outcome of Study 2.2 was to delineate the type of interventions necessary to improve the service from a user-centred perspective. This part of the study focused on investigating the applicability of WHO Forms and Checklist Basic level as a starting point to design context-based participatory-designed tools. Specific objectives for Study 2.2 were delineated to accomplish the research purpose. The objectives were:

- Investigate how CReab practitioners assess and record wheelchair users’ characteristics and requirements.
- Identify if there is any significant difference between the CReabs in the process of user’ assessment and wheelchair fit.
- Identify the applicability of the World Health Organization Forms and Checklist Basic level.
- Delineate the type of interventions necessary to improve the service from a participatory and user-centred perspective.
- Identify opportunities to implement user-centred good practices.
- Design interventions grounded in the study results.
Table 4.2 provides the objectives set to answer Study 2.1 and 2.2 research questions.

Table 4.2: Study 2.1 and Study 2.2 Objectives concerning the research question

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Objectives</th>
<th>Study</th>
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<tbody>
<tr>
<td>What are the characteristics of the existing wheelchairs services provided by SUS in Belo Horizonte city?</td>
<td>1. Present to participants a summary of previous study results and introduce the study rationale.</td>
<td>Study 2.1</td>
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<td></td>
<td>2. Identify what wheelchair service SUS provides in Belo Horizonte city.</td>
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<td>3. Identify the pathway taken by end users to access the wheelchairs.</td>
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<td></td>
<td>4. Identify opportunities to implement user-centred and participatory good practices.</td>
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<tr>
<td></td>
<td>5. Define the context for which interventions will be designed.</td>
<td></td>
</tr>
<tr>
<td>How secondary care’ practitioners from SUS assess and record wheelchair user’ information?</td>
<td>1. Investigate how CReab practitioners assess and record wheelchair users’ characteristics and requirements.</td>
<td>Study 2.1</td>
</tr>
<tr>
<td></td>
<td>2. Identify if there is any significant difference between the CReabs in the process of user’ assessment and wheelchair fit.</td>
<td></td>
</tr>
<tr>
<td>How to implement user-centred protocols at Belo Horizonte SUS’ current wheelchair service provision?</td>
<td>1. Identify the applicability of the WSTP Forms and Checklist Basic level.</td>
<td>Study 2.2</td>
</tr>
<tr>
<td></td>
<td>2. Delineate the type of interventions necessary to improve the service from a participatory and user-centred perspective.</td>
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<tr>
<td></td>
<td>3. Identify opportunities to implement user-centred good practices.</td>
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<td></td>
<td>4. Design interventions grounded on results.</td>
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4.1.4 Methods

A variety of methods were considered at this stage of the research in order to achieve the study objectives. The considered methods and the reasons for their inclusion or exclusion in the study were:

- **Participant Observation – Observer as participant.** In this approach, the researcher has its identity revealed and fully engages in the life and activities of the participant without taking part on them (Saunders, 2007; Coffey, 2006). Also known as unobtrusive observation, this approach seems to be pre-eminently the appropriate technique for getting at ‘real life’ in the real world (Robson, 2011, p.316). The primary method for recording observations is through field notes. These are notes that are preferably taken in situ, and then expanded upon after the fieldwork encounter (Coffey, 2006). Participant observation seemed to be a suitable approach to understand the current wheelchair service process and find opportunities to recognise service modifications. This method was selected as a supportive method to the providers’ interview.

- **Fully Structured Interviews with providers.** This type of interview has predetermined questions with fixed wording, usually in a pre-set order. The use of a higher number of open-response questions is the only essential difference from interview-based survey questionnaire (Robson, 2011, p.279). This approach was found to be unsuitable as the research still had an exploratory purpose. At Study 2.1 a less structured interview schedule was thought to be necessary to allow unplanned questions that might be necessary to comprehend the service functioning. For Study 2.2 this approach was found useful as it provides to participants equal opportunities to contribute with their feedback to delineate the type of necessary interventions. This approach was selected for Study 2.2 and is discussed in further detail.
• **Semi-structured interviews with service providers.** In this type of interview, the interviewer has an interview guide that serves as a checklist of topics to be covered and a default wording and order for the questions. The wording and order are often modified based on the flow of the interview, and additional unplanned questions are asked to follow-up on what the interview says (Robson, 2011, p.280). This approach was thought to be ideal for the exploratory purpose of the Study 2.1, allowing a minimum structure to cover the intended topics but with the flexibility to add unplanned questions that might be necessary to the comprehension of the service. Initially, this approach seemed to be useful to be used with the participant observation in Study 2.2, giving the researcher the chance to clarify why practitioners do the assessments the way they do, gathering insights on how the process can be improved and good practices implemented. Similarly, it enables the researcher to investigate the opportunities for improvement from the providers perspective. This approach was rejected for Study 2.2 after piloting the interview schedule. The main reasons were, firstly, because the researcher had the chance to confirm most of the desired information through informal talks during observation stages. Also, it was thought that a more structured interview and interview probes would give equal opportunities to the participants to delineate the type of necessary interventions.

• **Focus Group.** A focus group is a group interview on a specific topic, which is where the ‘focus’ comes. The group dynamics help to focus on the most important topics, and it’s relatively easy to assess the extent to which there is consistent and shared view (Wilkinson, 1998; Robson, 2011). A significant concern is that conflicts may arise between personalities. Power struggles may detract from interview and status may conflict within the procedure (Robson, 2011, p.295). This was thought to be a concern considering that the research context is public service in Brazil, where considerable attention is given to hierarchical position. As the main point of the interviews was to give voice to participants with regards to the implementation of existing good practices, it was thought that one-to-one interview would provide a more appropriate environment for the participant to share information than in a group interview. Those were the mains reasons for rejecting this approach.
• **Delphi technique.** The Delphi technique is a series of sequential questionnaires or ‘rounds’ combined with controlled feedback, which seek to gain the most reliable consensus of a group of experts (Linstone and Turoff, 1975 in Powell, 2003). The main advantage of Delphi is reported to be the achievement of consensus in a given area of uncertainty of lack of empirical evidence (Powell, 2003). The Delphi technique seemed not appropriate to this stage of the research since the main issue was not lacking agreement or empirical evidence in the wheelchair assessment but the lack of use of existing evidence-based good practice for different reasons than agreement. There was great interest from practitioners to start using protocols if more time and training was provided. The time required to plan Delphi technique was also found unrealistic to this research’ time constraint. Nonetheless, Delphi was found as a potential technique to the following research stage of testing the implementations and co-designing the necessary modifications with the service stakeholders.

• **Task Analyses.** Task analysis is a way of breaking the task down into its component parts. It is used to gain an understanding of what people do in the tasks and jobs they carry out and how people interact with equipment and with various aspects of their working environment (Shepherd and Stammers, 2005). Task analyses can be used as both an interview method (‘to ask’) and an observational method (‘to observe’), depending on what type of information needs to be collected and what is to be done with it. Using both interview and observation leads to richer data, especially when combined with other user research methods (Dong, et al., 2007). Task analysis was selected as a method to be used in conjunction with the participant observation to investigate how SUS CReab practitioners assess and record WC users’ characteristics and goals.
4.1.4.1 Design of the Observations

Observer as a participant was the approach designated for the participant observations. This approach enabled the researcher to fully engage in the life and activities of the participant without taking part on them. The observation was designed to provide answers to both parts of Study 2. As for Study 2.1, the observations aimed to investigate how does the wheelchair service provided at the CReab function. For this, an observation schedule was designed and piloted. The observation schedule for Study 2.1 aimed to:

1. Take notes of the service functioning.
2. Take notes of participants’ answer to questions made during idle times.
3. Take notes of the conditions of the environment and resources available.
4. Take notes of the practitioners’ observations, complaints, and suggestions for the service improvement.
5. Take note of the positive and negative comments that the service users had spontaneously made during observations.

The observations for Study 2.2 aimed to investigate how practitioners’ assess and record the wheelchair user information. To do that, a task analysis of the activities performed in Belo Horizonte SUS wheelchair service stages was conducted in conjunction with the observations. Study 2.2 observation schedule was used to collect the following type of data:

1. Take note of all the activities performed at each observed stage,
2. Take notes of the measured time practitioners engaged with the user at each observed stage.
3. Take notes of the conditions of the environment and resources available.
4. Take notes of basic demographics regarding the people involved in the observations.
The translated and the original Portuguese version of the observations schedule sheets can be found in Appendix 9 and 10 respectively. Figures 4.1 and 4.2 show a copy of a filled observation schedule. They represent a translated version of the original observations schedule that can be found in Appendix 11.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Measurement &amp; User Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>Start: 9:10 END: 9:33</td>
</tr>
<tr>
<td>People involved</td>
<td>CREAB:</td>
</tr>
<tr>
<td></td>
<td>Supplier:</td>
</tr>
<tr>
<td></td>
<td>User:</td>
</tr>
<tr>
<td></td>
<td>Other:</td>
</tr>
</tbody>
</table>

**What is being done?**

- Ask documents and adapt filling APAC chapter
- Ask if user has wheelchair (C) needs referral and does bring user (C) ask how long user don’t walk (C) ask if can stand by himself on straight legs (C) ask about ability to speak and communicate and about surgery (C) ask about ambulation mobility which way is penalized (C) ask origin of current wheelchair (C) ask if user struggle to swallow if user tube feeding have been it feed (C) ask to move on digital GASTRO (C) ask have long user stays at home (C) ask about surgery (C) ask about head control (C) ask control

CNS warns with HIV (C) ask about the mobility of the knees and to move them (C) hemiplegic user

- Confirm paralysis side (C) ask if user has both chain and the conditions of it (C) ask if it able perform (C) (looks from ICD at Data SUS) (C) ask user to seat at specific place to take measure

**Objects**

**Space**

*Child physiotherapy room, One computer to be other by 2 practitioners (C) said to refine*
With regards to other bias likely to occur when conducting participant observation (See Section 2.4.4.3 Observations), these were acknowledged throughout the study.
Similar to Study 1, to reduce the participant bias likely to produce the Hawthorne effect, just part of the research goals were declared previous to the observations. Hence, only the exploratory purposes of the research were declared at this point. This was particularly important at Study 2.2 as the task analyses of the activities performed intended a direct comparison with good practices. The researcher also avoided talking with participants at this point to avoid influencing their performance.

Verbal protocol analysis was used in conjunction with the observations. A verbal protocol analysis (VPA) is a think-aloud method of eliciting cognitive and physical process descriptions from the participant (AHRQ, n.a). The descriptions are of processes that are performed by the participant to complete a specific task (AHRQ, n.a). When unsure about what was happening, the researcher took note on the observation schedule and enquire the participant after the user care or when opportune. This avoided the researcher to influence the recorded care time.

### 4.1.4.2 Design of the Interviews

The period of observations enabled various information with regards to the wheelchair service functioning to be clarified. However, the time for asking direct questions and explanations to the participants during the observations was limited, requiring further investigation using personal interviews.

The interview questions for Study 2.1 were mostly grounded from the observations or analyses of data collected during this period. Two semi-structured interview schedules were designed specifically for Study 2.1: one for CReab participants and other for Coordenação da Reabilitação participants. While the interview questions to CReab participants aimed to clarify information from the observations, interview questions for Coordenação da Reabilitação participants aimed the comprehension of current barriers and opportunities to incorporate specific good practices suggested from AAATE and WHO. The original and translated version of the interview schedule designed for the CReab participants can be found in Appendix 12 and 13 respectively. The original and translated version of the interview schedule for the Coordenação da Reabilitação participants can be found in Appendix 14 and 15 respectively.

Interviews for Study 2.2 were produced with three goals in mind. First and most important was to investigate the applicability of WHO Forms and Checklist Basic level
as a starting point to design context-based participatory-designed tools. Secondly, the interview aimed to identify the priority of the forms to be implemented at the service. Thirdly, the interview aimed to assess if participants had been enrolled in any training regarding wheelchair prescription, assessment or wheelchair fitting.

At the time of Study 2 planning, WHO Forms and Checklist Basic level were not available in the Portuguese language. WHO was contacted for requesting permission to translate the documents. WHO referred to Sao Paulo State Disability Rights Office, the institution that first translated the documents. The forms and checklist were acquired in time for the study. Nonetheless, only the Basic level forms and checklist had been translated by the time of the study. Neither the WSTP Basic and Intermediate level or the Guidelines on the provision of Manual Wheelchairs were available in Portuguese at that time.

As mentioned earlier, for Study 2.2 the choice was made for fully structured interviews as it allowed participants equal opportunities to contribute to their feedback to delineate the type of the necessary interventions. The interview routine was planned in the following manner:

1. Provide participants with the WHO Forms and checklist in advance with a small questionnaire to be brought completed on the interview day.
2. Conduct the interview questions and probe questions according to participant’s answers to the questionnaire.

The questionnaire required the participants to select between statements that best represent their belief about the applicability of each WHO Forms and Checklists at CReab service. The statements were:

- the form/checklist does not apply to the service offered at CReabs;
- the form/checklist apply to the service offered at CReab without the need for modifications;
- the form/checklist apply to the service offered at CReab, but modifications are needed;
- it would be better to improve the current form/checklist/tool used for the service;
- it would be better if a form/checklist/tool were specifically designed for the service.

The interview schedule consisted mostly of probe questions according to participants’ answer to the questionnaire. The questions had regards to necessary
modifications needed, the format of changes, possible resistances to implement the forms and checklist, and possible ways to mitigate the resistances. The original and translated version of the Study 2.2 interview schedule can be found in Appendix 16 and 17.

4.1.4.3 Sources of material

Data collection methods included data obtained specifically for research purposes, including:

- Collection of forms and other material used to assess and record user information at the different service stages.
- Note taking from the users care’ observed procedures.
- Audio recorded from interviews.
- Diary from fieldwork activities.
- Photographs.
- The collection of rehabilitation centre's internal surveys and other data available regarding the wheelchair service.

4.1.4.4 Sample and Sampling strategy

Interviews followed the non-probability purposive sampling strategy, also called theoretical sampling (Robson, 2011,p.275). Purposive sampling uses the selection principle characterised by the researcher's judgment as according to the research interests or emerging theory (Robson, 2011,p.275). Glaser and Strauss (1967 in Birks and Mills, 2011, p.69) define theoretical sampling as:

“... the process of data collection for generating theory whereby analyst jointly collects, code and analyses his data and decides what data to collect next and where to find them, in order to develop his theory as it emerges.”

Theoretical sample differs from others research strategies when it comes
to defining the sample characteristics. While research strategies sample is often set in early stages to test a theory or describe a phenomenon, research using theoretical sampling theory is built through constructions of categories grounded from data collected. Hence, it is not possible to know at the earlier stages of the study the number of participants needed, the nature and type of the data required to develop a theory or when, where or how data will be collected and generated (Birks and Mills, 2011).

For the observations, the sample was defined from the analyses of data collected in the first study. They were defined on three levels, which were: the institutions providing public wheelchair service, the main procedures involved in the service delivery and the staff directly involved in those procedures. The sample characteristics are demonstrated in Table 4.3.

<table>
<thead>
<tr>
<th>Sample Characteristics</th>
<th>Institutions</th>
<th>Procedures</th>
<th>Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Centro Geral de Reabilitação – CGR.</td>
<td>The User Assessment.</td>
<td>CReab's Occupational therapist staff.</td>
</tr>
<tr>
<td></td>
<td>Centro de Reabilitação Noroeste – CRAB NO.</td>
<td>The Adapted Wheelchair Fitting.</td>
<td>CReab's Physiotherapist staff.</td>
</tr>
<tr>
<td></td>
<td>Centro de Reabilitação Leste – CREAB LE.</td>
<td>The Wheelchair Delivery.</td>
<td>CREAB’s Administration staff.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Wheelchair supplier staff.</td>
</tr>
</tbody>
</table>

Data was collected and analysed simultaneously. A total of 142 user’s care observations were conducted regarding the three wheelchair procedures. From this, 44 were conducted at CReab 1, 49 at CReab 2 and 49 at CReab 3. An extra 11 user’s care observations regarding an additional procedure were included. After initial observations, it was found necessary to conduct additional observations regarding the first user contact with the service, the screening stage. Despite observations aimed Study 2.1 and Study 2.2, cases were included and excluded conforming the study aims. The eleven cases observed at screening stage were mainly for study 2.1 aim of better understanding the service. For Study 2.2, from the total of 142 users-care observations, 37 were excluded for various reasons such as:
• care was not related to wheelchair service;
• care was conducted in a group (e.g. when visiting a care-home);
• care was not concluded (e.g. when the wheelchair was not selected during the assessment stage, or delivered at the delivery stage).

Excluded cases were still valid for the better understanding of the service functioning, as aimed at the Study 2.1 goals, but were not valid for Study 2.2. A final sample of 105 user care was explicitly analysed for Study 2.2 (See Table 4.4). It was not possible to observe the same user at the different stages as the whole process can take more than a year to complete. However, many users were observed at more than one stage. Hence, despite there were a hundred fifty-three (n=153) users-care observations, it does not necessarily mean they were conducted with 153 different users.

<table>
<thead>
<tr>
<th>Sample of users observed at each stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>CReab</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td><strong>Assessment</strong></td>
</tr>
<tr>
<td>Observed</td>
</tr>
<tr>
<td>Excluded</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td><strong>Adapted Wheelchair Fitting</strong></td>
</tr>
<tr>
<td>Observed</td>
</tr>
<tr>
<td>Excluded</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td><strong>Delivery</strong></td>
</tr>
<tr>
<td>Observed</td>
</tr>
<tr>
<td>Excluded</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td><strong>Total per centre</strong></td>
</tr>
<tr>
<td>Observed</td>
</tr>
<tr>
<td>Excluded</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

It was not possible to calculate a representative sample between procedures related to the standard wheelchair and the adapted wheelchair due lack of data to estimate this sample. Also, CReab service was still adjusting to new procedures implemented in OPM list, making the sample calculation difficult.
For the interviews that were specific to Study 2.1, the sample was defined during the observations when key participants were identified. A total of 9 persons (n=9) were interviewed. Five participants (n=5) were service administrators or service coordinators at their CReabs, two (n=2) were staff involved in the screening process and two (n=2) were staff from Coordenação de Reabilitação, which coordinates the three CReabs.

For the interviews that were specific to Study 2.2, the sample was also defined from the analyses of first data collected and confirmed at the pilot stage. The sample was defined as the CReab staff directly involved in the mains stages of the wheelchair service delivery at SUS’s rehabilitation centre, which are restricted to physiotherapists and occupational therapists.

Study 2.2 Interviews targeted collecting providers opinion to delineate the type of necessary interventions to improve the service from a participatory and user-centred perspective. Hence, 100 % (n=12) of the staff directly working with wheelchair service at the moment of the study were set as an initial goal and then interviewed.

4.1.4.5 Piloting

The observation schedule was piloted during the participant observation of the first five users (n=5). The entire process of analyses was simulated to verify the effectiveness of the observation schedule. Concluding this process the observation schedule was modified before the start of main data collection. Modifications were mainly to facilitate the note-taking and to define strategies to do it more efficiently.

It was found unnecessary to pilot the interview schedule for Study 2.1 and also unlikely to find additional participants for a pilot test. The reason is that the questions were grounded from the observations or analyses of data collected during the period of observations. The questions were related to the participant’s daily routine so chances were minimal not to be understood. During the interviews, participants could also clarify any possible misinterpreted question or vocabulary used in the interview schedule.
The interview schedule for Study 2.2 and the questionnaire related to it were piloted, transcribed, analysed and modified after first two interviews (n=2). A question with regards the staff training was added at the beginning (see Appendix 17) and the strategy regarding how the questionnaire should be filled modified. Participants of the first two interviews were revisited to be inquired about the added question.

4.1.4.6 Ethical considerations

Participants in this study were healthy individuals, aged 18-65 years, working as occupational therapists and physiotherapists, service administrators, service coordinators and wheelchair supplier’s staff. The population studied was from Belo Horizonte city in Minas Gerais estate, Brazil, except participants from one wheelchair supplier that were from Araras, São Paulo, Brazil. Participants were required to meet the criteria described in sampling strategy and piloting section.

Overall, due to the non-invasive character of this second study, potential risks associated with participation were unlikely and of low risk. The risks to the human participants were assessed, and ethics approval was conceded from Loughborough University Ethical Advisory Committee, Belo Horizonte Municipal Department of Health and at Plataforma Brasil, which regulates research in Brazilian public health institutions as mentioned previously. The study was submitted for ethical approval at Plataforma Brasil on 15th of May, 2014 and final approval came only on 30th of January 2015. All necessary approvals can be found in Appendix 6.
### 4.1.4.7 Risks to the Participants

The physical, psychological and social likely risks associated with participation and the precautions taken in order to reduce them are described in Table 4.5.

<table>
<thead>
<tr>
<th>Type of Risk</th>
<th>Likelihood and Precautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Risk</td>
<td>There was little likelihood of any physical risk as a result of participation in this research stage. The participants were not asked to perform any tasks as a part of the observations and interviews undertaken that could result in physical harm.</td>
</tr>
<tr>
<td>Psychological risks</td>
<td>The evaluative character of this research stage had a small likelihood of psychological risk as participants could feel the quality of their work was being assessed. To reduce this risk, all participants were invited to a presentation preceding their participation where the research purpose and methods were clarified. An opportunity was given to make questions about the research process and their participation. The presentation was given at all CReabs and had the support of the coordination staff. Adding to that, the potential risks, resume of the research, research methods and research question were all presented in the informed consent form, delivered and agreed in advance to their participation.</td>
</tr>
<tr>
<td>Social risks</td>
<td>There was a small likelihood of vulnerability of the wheelchair users that participated indirectly at the observation stage. Obtaining anticipated formal consent was impractical considering the research design. Exemption of the informed consent form was required and approved by all ethical committees. Even though, CReab participants were asked to introduce the researcher to the users, resume the research intentions and ask the user’s free consent. The presentation made at CReab revealed to be an effective strategy to gain staff support regarding this point.</td>
</tr>
</tbody>
</table>
4.1.4.8 Analysis of Data

Similarly to Study 1, data collected were analysed using the thematic analysis approach and making use of a variety of grounded theory strategies. By the end of each fieldwork day, data collected in the form of audio, picture, note taking, documents and forms used in wheelchair service were all imported into NVivo software for analysis. A series of memos were created to record the thinking process (see Table 4.6). Important to mention is that a diary was added to Study 2 memos, as a supportive memory aid. For the same reasons mentioned in the first study, despite interviews were conducted in the Portuguese language, the categories, memos and names of folders in NVivo were mostly created using the English language.

Table 4.6: Memos created for Study 2

<table>
<thead>
<tr>
<th>Memos</th>
</tr>
</thead>
<tbody>
<tr>
<td>Codes, categories and developing theory</td>
</tr>
<tr>
<td>Comparison between WHO INTERMEDIATE and BASIC forms and checklist</td>
</tr>
<tr>
<td>Diary</td>
</tr>
<tr>
<td>Feelings and assumptions</td>
</tr>
<tr>
<td>Initial Findings</td>
</tr>
<tr>
<td>Musing on books and papers</td>
</tr>
<tr>
<td>Philosophical positions</td>
</tr>
<tr>
<td>Possible Recommendations</td>
</tr>
<tr>
<td>Questions to make after initial analysis</td>
</tr>
<tr>
<td>Reflection on Research Process Procedural and decision making</td>
</tr>
<tr>
<td>System vocabulary and Translated terms</td>
</tr>
</tbody>
</table>

The notes from each user procedure observed and the digital audio recorded from each participant interview became cases to be analysed. The attributes of occupation and institution were associated with each case to allow further analyses. The digital audio files recorded at the interviews were all transcribed using transcriptions convention adapted from Josetti (2011, See Appendix 7).

Data from Study 2.1 and 2.2 were analysed in conjunction, aiming data triangulation.
4.1.4.9 Analyses of Participant Observations Cases

Notes from participant observation were analysed using an inductive approach, in which the creation of the categories was strongly linked to data. The coding process was conducted in three phases, as defined in Braun and Clark (2008), which were:

- Searching for themes.
- Reviewing themes.
- Defining and naming themes.

First, initial codes were generated, with a review, assessment, and identification of the underlying patterns in the data. Here, the themes were created, which took into account and represented the most fundamental element of the raw data. The aim was to identify the specific features of data, which appeared relevant to the research questions. Several potential themes were created at this stage. Figure 4.3 shows an example of initial codes with regards to the observation of the user care at the assessment stage.

![Initial coding nodes regarding the assessment stage.](image-url)

**Figure 4.3:** Initial coding nodes regarding the assessment stage.
On completion of the initial coding analyses of all cases, the phase of reviewing themes was initialised. Extracts in each theme were revised to check coherence with the theme definition. This involved the exclusion of extracts, which demonstrated a non-compliance with the overall theme definition, thereby, creating new themes to host them or move these non-compliant extracts to other most suited existing themes. This process proved to be a time-consuming process, as more than two hundred categories were created during this step. The second stage of analyses consisted of identifying the essence of each theme, ensuring minimal overlap between themes. Also, sub-themes were created, giving structure to particularly large or complex themes or to establish a hierarchy of meaning within the data. The last stage of analyses was performed in two different manners: First, categories were grouped according to the staff performing the observed activities in each service stage (See Figure 4.4 example). This allowed a detailed understanding of the activities performed and the different roles played between CReab and supplier staff at each service stage.

![Figure 4.4: Later coding nodes regarding the assessment stage.](image-url)
Secondly, the activities performed by CReab and supplier staff were grouped into main types of activities performed in each service stage and the main types of user data collected by participants in each of this events, thus, providing a summary of each service stage (See Figure 4.5).

---

**Summary of Assessment Stage**

- **Assessment Interview**
  - Environment
  - Life Style & Activities

- **Physical Assessment**
  - User Measure
  - Pressure sore
  - Lower limb
  - Upper limb
  - Measure current wc
  - User back

- **AT Definition**
  - Other AT Characteristics
  - Bath Chair Characteristics
  - Wheelchair Characteristics

---

Figure 4.5: Summary of activities performed and user data collected at assessment stage
During the process, whenever possible, the names of categories were matched with the nomenclature suggested by WHO (WHO, 2012; WHO, 2013b) to facilitate comparison with good practices. A formula was created to determine the significance of each category and build a doughnut graph (See Figure 4.6). First, a recurrence factor was calculated for each category by using the rule of three between the total of user-care observation at each stage and the number of times a given category was present in those user observations. The result was then multiplied by the number of references, i.e. the number of times that category appeared in the collected data, creating each category recurrence factor.

\[
CRF = \frac{n. \text{ of user observations a given category was present [Sources]}}{n. \text{ of times that category appeared in the collected data [References]}} \times \frac{n. \text{ of user-care observation at each stage}}{x}
\]

Figure 4.6: Formula to calculate a category recurrence factor

Figure 4.7 illustrates how a doughnut graph was calculated. The recurrence factor from subcategories was summed to determine the 100% reference regarding each main activity. Then the rule of three was used to determine each subcategory percentage.

Physical Condition RF=\(\frac{100 \times 33 \times 209}{36} = 19,158\)

Life Style & Activities RF=\(\frac{100 \times 30 	imes 110}{36} = 9,166\)

Environment RF=\(\frac{100 \times 21 \times 52}{36} = 3,033\)

Assessment Interview =\(19,158+9,166+3,033=31,357\)

Assessment Interview =31,357=100%

Physical Condition =19,158=61%

Life Style & Activities =9,166=29%

Environment =3,033=10%

Figure 4.7: Example of doughnut graph calculation
4.1.4.10 Analyses of Interview cases

Each interview conducted with a participant became a case and were analysed using both deductive and inductive approaches. For Study 2.1 only the inductive approach was used as the questions asked were grounded from data. Hence, Study 2.1 categories were created from the analyses of transcribed interviews. For study 2.2, first, the categories were created previous to participant answer analyses, hence using a deductive approach where categories were related to the applicability of each WHO form and checklist. Category related to each form contained pre-defined subcategories related to the context in which participants believe the forms and checklist would best apply (See Table 4.7). Next, categories were created to organise the participants’ feedback regarding the likely problems and resistance to implement the forms and checklist in the service and how to mitigate such resistance. Data coded inside these categories were then analysed and coded using an inductive approach so that the subcategories were created grounded on participant’s answers regarding each specific topic.

Table 4.7: Example of categories and subcategories created for the interviews analyses

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUESTION 1 WC service training</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>QUESTION 2 Applicability of Referral Form</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>QUESTION 3 Applicability of Assessment Form</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>1 It does not apply to the service offered by CReab</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2 It applies to the service offered by CReab without the need of modifications</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3 It applies to the service offered by CReab but modifications are needed</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>4 It would be better to improve the current form or checklist</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5 It would be better if a form OR checklist OR tool is specifically designed to the service</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6 PROBLEMS &amp; RESISTANCE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difficulty to evaluate pressure sore</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Lack of time</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Natural resistance to change</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Staff cannot see how it would benefit service</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>7 MITIGATE Resistance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Add information to current forms</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Flexibility to use as a guide</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Provide training to evaluate pressure sore</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
4.1.4.11 Presentation of Data

For confidentiality purpose, the participant's names were replaced by a corresponding alphanumeric abbreviation as presented in previous chapters (See Table 3.4, p.113). A random number was given to each participant added to the time slot from which the citation was transcribed. A new random number was allocated for those participants that took part in the previous study.

The tables that contain data source presented in Section 4.3 use the term 'sources' in the header of the table to represent the number of observed cases or user care procedures in which a specific theme was observed (See Table 4.12 example). The themes, as mentioned before, represent an observed activity conducted by CReab providers. The term 'references' were used to represent the number of times that an activity was repeated during the observations (See Table 4.12 example). The number of references and sources regarding the data collected during observations was used as a parameter to quantify the observed activities when comparing with existing good practices.

Differently, the tables presented in Section 4.4, use the term 'sources' to represent the number of interviewed participants responding as according to a specific answer category. The term 'references' represents the number of times that a category was repeated during the interview (See Table 4.7 example). The number of references and sources regarding the data collected during the interviews was used as a parameter to identify the level of applicability of each WSTP forms and checklist. This was used with other parameters to design the interventions (more details in section 4.4.2. Procedures and Rationale).
4.1.4.12 Limitations

Similar to Study 1, a specific aspect that grounded the limitation of this study was the fact the researcher was conducting the data collection abroad and on his own. Hence, not all the stages of service provision could be observed, e.g. user referral at of the primary healthcare level. As a consequence, the data collection was restricted to the service provided CReab staff in Belo Horizonte city. The service provided at primary care was planned to be included initially and ethical clearance was obtained to do so. As data collection progressed, it was thought to be impractical to include them in the study due to time constraints. Another limitation had regards to the lack of information available to select a sample that was closest to the CReabs routine as possible. First, the lack of information available regarding CReabs capacity and procedures made it hard to calculate a representative sample. Second, the time limitation made it difficult to collect a similar amount of data between the CReabs.
4.2 Findings of Study 2.1

Study 2.1 aimed to expand the understanding of the focused area, the wheelchair service provided by SUS through the CReabs at Belo Horizonte cit. The key findings of the Study 2.1 are presented in this section.

4.2.1 Characteristics of The Wheelchair Service

Presently, the wheelchair services provided at Belo Horizonte SUS are delivered mainly at the three CReabs centres after the user is referred from a primary care unit with a wheelchair prescription. To understand the functioning of the service is first necessary to understand the types of wheelchair offered. This is because the service varies as according to the type of wheelchair to be delivered. Wheelchairs offered are classified internally into two different categories: standard wheelchairs and adapted wheelchairs.

Standard wheelchairs are the models that do not need to be adapted to accommodate a user deformity or that do not require the supplier staff to participate in the fitting process. This means that the users in need of standard wheelchair will be assessed, measured and have their wheelchair delivered by a CReab staff, without the need to involve the supplier staff (See Figure 4.8). All standard wheelchairs have their structure available in different sizes and have various features that can be selected as according to user requirements.

![Figure 4.8: Standard wheelchair provision logic at CReabs](image)

If the CReab staff recognises that the standard wheelchair features and sizes available do not or may not fit the users’ profile, then an option is made for an
adapted wheelchair. Next, a supplier staff is invited to help to reassess the user, take necessary additional measures, decide the wheelchair model and make the necessary adjustments to accommodate user’ existing deformity and other requirements (See Figure 4.9). The fact that these wheelchairs are named ‘adapted’ does not mean that all wheelchairs will suffer modifications. What differentiates a standard to an adapted wheelchair, in fact, is the presence or not of the supplier staff during the service stages. One example that illustrates this well is the prescription of wheelchairs for users over 90kg, considered an adapted wheelchair in the service logic. Whether a user in need of these wheelchairs requires an adaptation or not, they are only prescribed with the presence of the supplier staff. The types of wheelchair offered are detailed in Section 4.2.3.

Figure 4.9: Adapted wheelchair provision logic at CReabs

4.2.2 Wheelchair Service Stages

Three stages are common to both standards and adapted wheelchair. They are the screening, the assessment and the delivery.

The screening stage is the first step for all CReab users. At the screening, users bring their referral, have their requirements quickly assessed and are scheduled to the necessary services. In the case of users in need of a wheelchair, they are scheduled to an assessment stage.

For the wheelchair user, following the screening stage is the assessment stage. At this stage users are assessed, have their measurements taken and a decision is made about their wheelchair. Therefore, at this stage, it is decided if the wheelchair will be standard or an adapted. If an option is made for an adapted wheelchair, the CReab staff schedule another assessment to be conducted in conjunction with the selected supplier staff at the CReab.
For the adapted wheelchairs in need of adjustments to accommodate the user deformities or specific requirements, there is an additional stage, which is the *adapted wheelchair fitting stage*. At this stage, the users are fitted in a partially made wheelchair and the supplier staff makes bespoke adjustments to the wheelchair PSD, accompanied by a CReab staff. The CReab practitioner at this stage is not necessarily the same that accompanied the user in the previous stages (screening and first assessment).

The final stage is the *delivery stage*. At this stage, the end user is evaluated for the wheelchair fit, reason why the user must be present to receive the wheelchair. In the case of the adapted wheelchair, the supplier must also be present. Similar to previous stages, the CReab practitioner accompanying the end user is not necessarily the same from previous stages. Should the wheelchair have no problems and fit the user, he or she signs the delivery of the wheelchair and receive a guarantee, ending the service cycle. If the CReab staff, the supplier staff, or the user detects any problem with regards to the wheelchair fitting or any other problem with the wheelchair, then a decision is made. This can vary from a simple on-spot adjustment to the complete change of wheelchair model. Figure 4.10 shows a flowchart of the necessary steps for the user to receive a wheelchair at the CReabs.

---

**Figure 4.10: Flowchart for receiving a wheelchair at Belo Horizonte CReab**
Despite the fact that this research had focused on the CReab services, it is important to make the reader aware of the existence of previous stages and service structure in the primary level of care that is directly related to the wheelchair service. This includes the identification of the need for a wheelchair, that can occur in various settings. It can occur spontaneously by the user going to the closest health centre to communicate its need. It can be identified by one of the primary care teams, the ESF and NASF. Or it can occur from a private care system, that refers the user to a SUS primary healthcare unit. The primary healthcare staff will then refer the user to the CReab covering the user’s postcode region.

Figure 4.11 illustrates the dynamic between the user, the health centres and staff from the primary and secondary level of care with regards to the wheelchair service provided at Belo Horizonte SUS.
4.2.3 Types of Wheelchair Offered

The SUS, hence the CReab services, are supposed to provide different types of wheelchairs to its end user as according to the OPM list, which contained specifications for five \((n=5)\) different types of wheelchairs and eight \((n=8)\) different types of wheelchair adaptations. Suppliers are supposed to comply with the list specifications to take part in the public tender and provide the services.

It was noted during Study 2 data collection that the three CReabs were providing all the wheelchairs and wheelchair adaptations listed on OPM list. Table 4.8 lists the five different types of wheelchair supplied at CReabs, providing a photo taken during Study 2 and the price in Brazilian reais established at OPM list to be paid to the supplier.

<table>
<thead>
<tr>
<th>Wheelchair Type</th>
<th>Price (R$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult/Infant wheelchair (standard type)</td>
<td>R$ 571,90</td>
</tr>
<tr>
<td>Standard</td>
<td>R$ 1,170,00</td>
</tr>
</tbody>
</table>

Table 4.8: Five different types of wheelchair offered at CReabs
<table>
<thead>
<tr>
<th>Wheelchair Type</th>
<th>Photo</th>
<th>Price (R$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigid Wheelchair</td>
<td><img src="image1" alt="Image" /></td>
<td>R$ 900,00</td>
</tr>
<tr>
<td>Adaptation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adapted Wheelchair for over 90kg user</td>
<td><img src="image2" alt="Image" /></td>
<td>R$ 1,649,00</td>
</tr>
<tr>
<td>Power wheelchair Adult/Infant</td>
<td><img src="image3" alt="Image" /></td>
<td>R$ 4,999,00</td>
</tr>
</tbody>
</table>
Table 4.9 provides information on the wheelchairs features from each wheelchair type offered as according to the OPM list specifications. A translated version of the OPM specifications for the wheelchair, bath chair, and wheelchair adaptation is provided in Appendix 18.

<table>
<thead>
<tr>
<th>WC</th>
<th>Chassis</th>
<th>Wheels</th>
<th>Pushing Method</th>
<th>Backrest</th>
<th>Seat</th>
<th>Cushion</th>
<th>Armrest</th>
<th>Footrest</th>
<th>Straps</th>
<th>Headrest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult/Infant</td>
<td>Foldable, made of aluminium/alloy/steel tube</td>
<td>Large rear wheel</td>
<td>Pushing rings</td>
<td>Standard in nylon or resistant leader</td>
<td>Standard in nylon or resistant leader</td>
<td>High density foam (3 cm thickness)</td>
<td>Removable</td>
<td>Height adjustable pedal and removable or swing away</td>
<td>Calf support and/or back to the heel.</td>
<td></td>
</tr>
<tr>
<td>Quadruplegic</td>
<td>Foldable made of aluminium/alloy/steel tube</td>
<td>Large rear wheel</td>
<td>Pushing rings and projection hand rims</td>
<td>High and reclining in nylon or resistant leader</td>
<td>Standard in nylon or resistant leader</td>
<td>High density foam with (3 cm thickness)</td>
<td>Removable</td>
<td>Adjustable footrest (until complete knee extension) swivel function or removable</td>
<td>Large strap (12-15cm) adapted to the backrest, calf support and/or back to the heel.</td>
<td></td>
</tr>
<tr>
<td>Rigid</td>
<td>Foldable into L shape made of aluminium tube</td>
<td>24&quot; rear wheels, with or without anti-tippers, Optional camber, quick-release in the four wheels</td>
<td>Push rings with or without projection hand rims</td>
<td>Standard in nylon or resistant leader</td>
<td>Standard in nylon or resistant leader, with retractable skirt guard with flaps or mudguard style</td>
<td>High density foam (5 cm thickness)</td>
<td>Removable or retractable or with no armrest</td>
<td>Fixed or removable ergonomic footrest with adjustable and height and tilt</td>
<td>With or without pelvis strap</td>
<td></td>
</tr>
<tr>
<td>For over 90kg</td>
<td>Rigid or foldable into X shape, made of aluminium/alloy/steel tube</td>
<td>24&quot; rear wheels, quick-release feature in the large wheels</td>
<td>With push rings with or without projection hand rims</td>
<td>Standard in nylon or resistant leader</td>
<td>Standard in nylon or resistant leader, with skirt guard</td>
<td>High density foam (5 cm thickness)</td>
<td>Removable or retractable foam with optional height adjustment</td>
<td>With or without thoracic strap (5-7cm), with or without pelvic strap, with or without calf support</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For power wheelchairs, Made of Duralumin tube welded chassis, foldable into X shape, with injected aluminium connections, 12" rear wheels and 8" front wheels with nylon rims. Two anti-tippers wheels (when reclining backrest) Joystick installed in the right or left side own module joystick, or by mental foramen or by head control or by suck-blow switch Fixed without screws, padded and lined. May have reclining backrest. May or may not have tilt adjustment in the infant models Fixed without screws, padded and lined. Nylon upholstery. May or may not have tilt adjustment in the infant chairs Fixed without screws, padded and lined. Nylon upholstery. May or may not have tilt adjustment in the infant chairs Fixed without screws, padded and lined. Nylon upholstery. May or may not have tilt adjustment in the infant chairs

Table 4.9: Comparison of the features between the wheelchairs offered, based on the OPM list specifications.
Table 4.10 provides information about the different types of wheelchair adaptation offered, its aims according to OPM list, an illustrative photo taken during Study 2 data collection, and the established price to be paid to the supplier for each adaptation.

Table 4.10: Different types of wheelchair adaptation offered in OPM list

<table>
<thead>
<tr>
<th>Adaptation</th>
<th>Aim*</th>
<th>Photo</th>
<th>(R$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seat adaptation for hip deformity</td>
<td>To reduce the tonus, with better hip positioning. Favour a correct positioning and pressure distribution, should prevent deformity and pressure sores, or fit, through contoured foam-cushions, existing deformities.</td>
<td></td>
<td>136.34</td>
</tr>
<tr>
<td>Backrest adaptation for trunk deformity</td>
<td>Used to prevent and/or fit deformities</td>
<td></td>
<td>132.00</td>
</tr>
<tr>
<td>Footrest adaptation</td>
<td>Stabilize the lower limbs. Indicated for patients who requirements are not met by the original wheelchair footrest.</td>
<td></td>
<td>62.5</td>
</tr>
<tr>
<td>Adaptation</td>
<td>Aim*</td>
<td>Photo</td>
<td>(R$)</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>------------------------</td>
<td>------</td>
</tr>
<tr>
<td><strong>Trunk side pads at 3 or 4 points</strong></td>
<td>Used to prevent and/or fit trunk deformities. Indicated where there is a trunk balance deficit or kyphotic posture. Indicated for the patient safety and trunk positioning.</td>
<td><img src="image" alt="Trunk side pads" /></td>
<td>90.5</td>
</tr>
<tr>
<td><strong>Pelvis side pad</strong></td>
<td>To position the lower limbs in a neutral position, restraining an excessive abduction and external rotation. To position correctly the seating patient.</td>
<td><img src="image" alt="Pelvis side pad" /></td>
<td>90.5</td>
</tr>
<tr>
<td><strong>Shaped headrest</strong></td>
<td>Indicated to patients with cervical control deficit.</td>
<td><img src="image" alt="Shaped headrest" /></td>
<td>82.8</td>
</tr>
<tr>
<td><strong>Adaptation to armrest</strong></td>
<td>To position user upper limbs on the wheelchair.</td>
<td><img src="image" alt="Adaptation to armrest" /></td>
<td>132</td>
</tr>
<tr>
<td><strong>Knee separator pad</strong></td>
<td>To position the lower limbs (to restrict the adduction and internal rotation).</td>
<td><img src="image" alt="Knee separator pad" /></td>
<td>57</td>
</tr>
</tbody>
</table>

*Adapted from OPM List*
It is important to state that it was not within the scope of this study to find whether the provided wheelchairs were complying or not with the list specifications. However, it was noticed during observations that suppliers often granted users with additional or superior features not included in their contract by the time of the study was conducted. Examples to cite were: A 5cm cushion for standard wheelchairs, a headrest for the quadriplegic wheelchairs, and an activity table for some adapted wheelchair users (see Figure 4.12). One supplier, whose contract was to provide only the quadriplegic wheelchairs, was offering all the necessary adaptations without being paid for it (see Figure 4.13). Still, a report had shown that none of the wheelchairs supplied at SUS complies with the Brazilian standards for wheelchairs ABNT NBR ISO 7176:2009 (see section 2.3.7).

Figure 4.12: Activity table offered by a specific supplier with no cost to the service
4.2.4 Condition of the Users’ Wheelchairs

SUS users can change their wheelchair every two years in the case of the offered wheelchair no longer meets their requirements. CReab staff often gave this information to users and carers during the accompanied stages of wheelchair delivery. Whether the users’ wheelchair at the observed stages were offered or not by CReabs, it was noticed that the condition of these wheelchairs was often worn out or inappropriate (See Figures 4.14, 4.15 and 4.16). Various users claimed to be using donated or loaned wheelchairs from institutions such as churches and charities. In those cases, it was common to see inappropriate wheelchair size and adjustments (See Figure 4.14).
Others using wheelchairs in bad conditions claimed to be using wheelchairs from SUS. Various of these users were operating their wheelchair for a period longer than two years. Some CReab participants (MSP:19, MSP:22) commented that this is especially the case of the wheelchairs made from steel, produced by one of the few local suppliers (See Figure 4.15). They claim that these wheelchairs can function up to ten years, causing or worsening user’ deformities because of changes in users’ body without modifying the wheelchair. They say it also causes problems in the arm and shoulders from those pushing the wheelchairs due to its heavy weight.
4.2.5 Conclusion

Section 4.2 had presented information about Study 2.1, which aimed to deepen the understanding of the wheelchair service provided by Belo Horizonte SUS. Data were collected using participant observation of a hundred fifty-three users (n=153) at the various service stages. Several informal interviews were conducted with practitioners and suppliers during the observations and nine (n=9) formal interviews were later conducted with practitioners, service coordinators and service administrators.

It was noticed that the service varied according to two main types of wheelchair offered: the standard wheelchair and the adapted wheelchair. Standard wheelchairs were assessed, ordered and delivered by CReab staff. There were two main types of standard wheelchairs available in OPM list. All had their structure available in different sizes and also various features that could be selected according to user needs. The adapted wheelchair was assessed, fitted and delivered by CReab staff in conjunction with the supplier staff. There were three different types of adapted wheelchairs and eight different types of adaptations available in OPM list. Belo Horizonte SUS service offered all the different types of wheelchairs and wheelchair' adaptation listed in OPM list.

End users could change their wheelchair every two years in the case of the offered wheelchair no longer fits their requirements. Whether the wheelchairs used by users at the observed stages of assessment were offered or not by CReabs, it was noticed that the condition of these wheelchairs was often worn out or inappropriate.
4.3 Findings and Discussion of Study 2.2 Results

This section presents the key findings on how providers assess and record user information through the wheelchair service. It starts providing information on the current systems and forms used and then gives details on the type of information collected by the wheelchair service staff through the various stages. Discussion of results is presented at the end of each section.

4.3.1 Forms and Systems Used in the Wheelchair Service

A series of forms and systems were identified to record user information and organise the service functioning. One is the Sistema de Informação de Regulação das Ações de Saúde – SISREG, a system created at a national level to regulate the request for hospital and outpatient services. It aims to speed up the population access to health services through the data interconnectivity between regional health units through the Internet. In a local level, the Sistema Sáude em Rede-SISREDE is an intranet system implemented by SMSA-BH since 2002 with the aim to manage and integrate the user information. A sample of the forms and electronic system print screen was collected during observations. Table 4.11 provides information on when these forms and electronic systems are used in the wheelchair service.

The forms used in the CReab wheelchair service are usually gathered in a physical folder available to the practitioners directly involved in the service. This folder also contains information and photos about the wheelchair supplied. This folder is mentioned in the thesis as the **wheelchair service folder**.
### Table 4.11: How information was recorded at CReabs

<table>
<thead>
<tr>
<th>Stage</th>
<th>Activity</th>
<th>How information is recorded</th>
</tr>
</thead>
</table>
| Primary Care                 | AT is prescribed | Reference guide *Solicitação OPMAL*  
|                              |          | Or Third-Party form         |
|                              | CReab service is prescribed | Reference guide *Guia de referência* |
| Screening                    | User is referred to a rehabilitation service | *Form Solicitação de tratamento fisioterápico AND Eletronc System SISREG* |
|                              | User is referred to assessment stage | Assessment Waiting list spreadsh* |
|                              | User is returned to the referring institution | Reference guide *Guia de contra referência* |
| Assessment                   | CReab staff interview the user | Eletronc System SISREDE  
|                              |          | or  
|                              | CReab staff measure the user | *Form Ficha de Evolução Manual*  
|                              |          | *Form Dimensões Básicas do Cliente*  
|                              | CReab staff specify the wheelchair characteristics | *Form Especificação da Cadeira de Sistema Postural*  
|                              |          | Authorization report *Laudo para autorização de procedimentos de reabilitação física e OPMAL*  
| Secondary Care (at CReab)    | CReab Staff authorize the AT purchase |  
| Assessment with supplier     | Supplier interview the user | Eletronc System SISREDE  
|                              |          | Or Form Ficha de Evolução Manual  
|                              | Supplier staff measure the user | Form vary according to supplier  
|                              | CReab and/or supplier staff specify wheelchair characteristics |  
|                              | CReab Staff authorize the AT purchase | Authorization report *Laudo para autorização de procedimentos de reabilitação física e OPMAL*  
| Adapted Wheelchair Fitting   | CReab staff accompany the supplier | Eletronc System SISREDE  
|                              |          | Or Form Ficha de Evolução Manual  
| Delivery                     | CReab staff record the procedure | Eletronc System SISREDE  
|                              |          | Or Form Ficha de Evolução Manual  
|                              | User sign the receiving of the AT | Authorization report *Laudo para autorização de procedimentos de reabilitação física e OPMAL*  

* Name and form vary slightly between CReab
4.3.2 Activities Performed at Assessment Stage

The activities performed at the assessment stage of the wheelchair service provided at CReabs were identified and separated according to the staff performing them. It was identified activities performed solely by CReab participants, by CReab staff in conjunction with supplier participants or exclusively by the supplier participants.

4.3.2.1 Activities Performed by CReab Participants

A total of thirty-six (n=36) cases were analysed at the assessment stage. From these, nine (n=9) were considered adapted wheelchair and twenty-seven (n=27) considered standard wheelchair as according to Table 4.8 classification (p.182-183). Table 4.12 shows the activities performed by the CReab participants during the assessment stage, followed by the number of sources and references. The number of sources represents the number of cases or user-care that an activity was observed. The references represent the number of times that the activity was performed through those observed cases.

Table 4.12: Activities performed by CReab staff during the assessment stage

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 ASSESSMENT STAGE</td>
<td>36</td>
<td>184</td>
</tr>
<tr>
<td>CREAB Staff</td>
<td>36</td>
<td>185</td>
</tr>
<tr>
<td>ASK Questions to user or carer</td>
<td>35</td>
<td>157</td>
</tr>
<tr>
<td>RECORD User and WC Information</td>
<td>35</td>
<td>136</td>
</tr>
<tr>
<td>INFORM Users</td>
<td>34</td>
<td>76</td>
</tr>
<tr>
<td>CHECK User and WC information</td>
<td>28</td>
<td>52</td>
</tr>
<tr>
<td>DISCUSS with USER or CARER about WC</td>
<td>16</td>
<td>35</td>
</tr>
<tr>
<td>EVALUATE User</td>
<td>13</td>
<td>17</td>
</tr>
<tr>
<td>TEST WC and other ATs</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>CREAB &amp; Supplier Staff</td>
<td>16</td>
<td>34</td>
</tr>
<tr>
<td>SUPPLIER Staff</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Asking question to the user or carer was the most performed activity by CReab participants during the assessment stage. A total of fifty-four (n=54) different questions were asked. Table 4.13 shows the questions made in at least 30% of the cases. The most asked question was if the user has a bath chair or how bath was given, made in around 75% of cases. This question was done to investigate the need for new bath chair, which could be assessed and arranged with the wheelchair. Questions investigating another treatment made were observed in around 64% of the cases. Questions investigating the context of the wheelchair use were made in around 58% of the cases. Questions investigating how user stay seated or positioned at home and questions investigating the user colour preference were made in about 53% of the cases.

Table 4.13: Type of question made by CReab participants during assessment stage

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ask if the user has a bath chair</td>
<td>35</td>
<td>157</td>
</tr>
<tr>
<td>Ask how bath is given</td>
<td>27</td>
<td>34</td>
</tr>
<tr>
<td>Ask about other treatment made</td>
<td>23</td>
<td>29</td>
</tr>
<tr>
<td>Ask about context of use</td>
<td>21</td>
<td>35</td>
</tr>
<tr>
<td>Ask how user stay seated or positioned at home</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>Ask about user’s colour preference</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>Ask if user have any question</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>Ask about current or previous WC</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>Ask about user’s weight</td>
<td>16</td>
<td>19</td>
</tr>
<tr>
<td>Ask about seated stability or trunk and cervical control</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>Ask about pushing capability</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>Ask about other AT usage</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>Ask about user’s height</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Ask about lesion and diagnosis</td>
<td>14</td>
<td>18</td>
</tr>
<tr>
<td>Ask about hip dislocation, surgery or fracture</td>
<td>14</td>
<td>19</td>
</tr>
<tr>
<td>Ask about WC’s goal</td>
<td>14</td>
<td>13</td>
</tr>
<tr>
<td>Ask about ADL and dependence</td>
<td>12</td>
<td>18</td>
</tr>
</tbody>
</table>
Second most recurrent activity from CReab participants observed at the assessment stage was recording information of the user and the wheelchair (See Table 4.14). These relate to staff recording the user measurements, inserting information at the authorization report forms, inserting information in the service system called SISREDE, and inserting information in the wheelchair and PSD specification form.

Table 4.14: Categories regarding information recorded by CReab participants at assessment stage

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RECORD User and WC Information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Take user measure</td>
<td>32</td>
<td>33</td>
</tr>
<tr>
<td>Insert info at Authorization Report form</td>
<td>23</td>
<td>32</td>
</tr>
<tr>
<td>Insert info at Gestao</td>
<td>22</td>
<td>48</td>
</tr>
<tr>
<td>Insert info in WC and Postural System specification</td>
<td>18</td>
<td>23</td>
</tr>
<tr>
<td>Insert info in HARDCOPY GESTAO</td>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td>Take current WC measure</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Insert info in a Word document</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Take measure of doors at users’ residence</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Weight user</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Make note of user request</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Measure is not taken due change of supplier</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Weight user’s chair</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

The following most recurrent activity observed at the assessment was informing the user (See Table 4.15). Recurrence of similar information passed to users was considerably low. Informing the user about next stage was observed in approximately 61% of the cases. In approximately 52% of the cases, participants were witnessed informing the user about the wheelchair specification, or about other AT device or about specific parts or PSD that was to be requested. In nearly 25% of the cases, it was observed that CReab participants informed the user or carer about the end of the budget with specific AT supplier and the consequences about that. In similar percentage of cases, the CReab participants informed the user or carer about the ATs and CReab service offered.
Table 4.15: Categories regarding information passed by CReab participants at assessment stage

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFORM Users</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inform about next stage</td>
<td>34</td>
<td>76</td>
</tr>
<tr>
<td>Inform about specific WC’s, AT’s parts and specifications (when requested)</td>
<td>22</td>
<td>26</td>
</tr>
<tr>
<td>Inform about end of AT supplier budget and consequences</td>
<td>19</td>
<td>31</td>
</tr>
<tr>
<td>Inform user or carer about AT and CReab services offered</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>Inform pros and cons of possible WC’s</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Inform pros and cons of possible straps</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Inform current WC problems</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Next, the most recurrent activity from CReab participants’ observed at assessment stage was **checking information about the user and the wheelchair** (See Table 4.16). Most common of these activities was **reading the medical record or other available information** at CReab systems. Whenever necessary, staff also **verified information in the wheelchair service folder**, e.g., the available sizes and model characteristics. A less common but often conducted activity was **checking the medical report brought by the user and confirming information and contacts**.

Table 4.16: Categories regarding CReab participants checking wheelchair and user information

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHECK User and WC information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Read medical record and other user info</td>
<td>28</td>
<td>52</td>
</tr>
<tr>
<td>Verify WC info at WC Service Folder</td>
<td>23</td>
<td>24</td>
</tr>
<tr>
<td>Check report brought by user</td>
<td>13</td>
<td>16</td>
</tr>
<tr>
<td>Confirm user information and contacts</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>Check WC available in stock</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td>Check specific WC feature with supplier</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Google disability for finding ICD</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Less common activity but often conducted was the **discussion with the user or carer** about the wheelchair to be selected, observed in approximately 44% of the cases (See Table 4.17). These included showing the picture of possible wheelchairs to be selected and discussing the parts, specification and dimensions of the wheelchair parts.
The physical evaluation of the user was observed in around 36% of the cases (see Table 4.18). Evaluation concerned mostly the user back (about 22% of the cases) and the upper limbs (around 17% of the cases). The last was performed with the intention to evaluate the need for hand orthotics.

Lastly, CReab practitioners could test a wheelchair with users during the assessment on the occasion where there was a wheelchair left at CReab from another user, due to reasons such as the wheelchair not fitting the intended. This was observed in four cases (see Table 4.19).
4.3.2.2 Activities Performed by CREab in Conjunction with Supplier Staff

It was noted in around 44% of the cases that CREab participants discussed the assessment with other CREab staff or the supplier staff. In most of the times, the discussion was held between the staff present at the room. In rare occasions (n=2) the staff invited some else not present to participate and discuss the case. Topics discussed varied between the wheelchair size, the wheelchairs parts and configuration, the type of wheelchair to be prescribed or the discussion of the user’s case.

Table 4.20: Type of activities performed by CREab in conjunction with and supplier staff

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CREAB &amp; Supplier Staff</td>
<td>16</td>
<td>34</td>
</tr>
<tr>
<td>Discuss WC size with staff or supplier</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Discuss case with staff or supplier</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Discuss WC parts with staff or supplier</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Discuss WC types with staff or supplier</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>
4.3.2.3 Activities Performed by Supplier Staff

Assessment with the supplier staff (n=6) represented only 17% of the total cases. In those instances, supplier staff participation in the evaluation was minimal (See Table 4.21). Their participation resumed in taking user measurement (n=5), asking questions about user preference (n=3) and modifying the position of wheelchair cushions from user current wheelchair (n=1).

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUPPLIER Staff</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Take user measurement</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>ASK Questions to user or carer</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Ask user colour preference</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Ask about preference of handle position</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ask about wheel size preference</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ask user WC arm preference</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ask how bath is given</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>MODIFY current WC</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

4.3.2.4 Summary of Assessment Stage and Discussion of Findings

This section provides a summary of the main findings of assessment stage, discussing and relating it to the literature.

The wheelchair assessment stage at CReabs contained the following three main activities: (i) the assessment interview, (ii) the physical assessment of the user and (iii) the AT definition (See Figure 4.17).
Most of the effort was spent in the assessment interview, with the majority of the questions investigating the physical condition of the user. It was observed that no similar type of question was asked in all the observed cases and there was a low recurrence of similar questions asked between participants. Also, recurrence of similar information passed to the user was considerably low. This
shows a lack of consensus between the CReab participants on how to conduct the assessment, although one exception was CReab 3, which had developed a list of guideline for the interview questions. Hence, CReab 3 was the only service, which demonstrated a good recurrence of similar questions asked to the user or carer. Nonetheless, CReab 1 and CReab 2 failed to apply any uniform protocols to assess the user and none of the CReabs assessments were based on existing good practices. As a consequence, essential questions suggested in the WHO assessment form were barely made.

Good practice investigations such as bladder and bowel problems were asked only in 16% of the cases. Suggested investigation of user’ frail condition was, in addition, not observed in any case. The questions regarding the user lifestyle and activities were secondary. The questions suggested in WHO forms such as distance travelled per day and hours per day using wheelchair were, also not taken into account. Questions with regards the user goals were asked in only 13 cases, thus representing only around 36% of the cases. Questions with regards to activities of the daily living-ADL were asked just in 12 cases, thus, representing approximately 33% of the cases.

Questions regarding the user environment were also secondary and failed to provide adequate data to inform optimal decision-making. This could be attributed to the fact that most of the environmental investigation pertained to the user environment door size and bathroom size, without collecting precise measure. Because the decision of the wheelchair and other AT devices such as bath chair, is taken during the assessment stage, it was clear that measurements from the environment had to be collected before the assessment. Most of the users did not know the specific measures of their doors when asked. Also, questions with regards to the type of transport suggested in WHO assessment form was barely made.

The physical assessment involved mainly taking the users anthropometric measures. During this assessment, it was noticed that the user measurements taken at the assessment stage are more comprehensive than those suggested in WSTP Basic level assessment form and similar to those indicated in the WSTP Intermediate form.

Other types of user physical evaluation were observed only in around 36% of the cases (see Table 4.18). Although a more comprehensive physical assessment is recommended mostly to the adapted wheelchair, WHO suggests that all wheelchairs users should be assessed with regards the presence, risk of or history of pressure sores. Physical evaluation of pressure sore by CReab partici-
pants was observed only in one case and verbal inquiry in just four cases during the assessment.

Specific to the assessment of users, requiring an adapted wheelchair, WSTP suggests conduction of a physical assessment to:

- identify the presence, risk of or history of pressure sores;
- identify the method of pushing;
- finding out the sitting posture of the wheelchair user and the required additional postural support by the user.

These are achieved by:

- Observing sitting posture without support.
- Carrying out a pelvis and hip posture screen.
- Carrying out hand simulation.
- Taking measurements.

At CReab, these were currently under the responsibility of the adapted wheelchair supplier. In the few cases, which were observed at the assessment stage, the supplier participants conducted all the suggested activities, apart from carrying out a pelvis and hip posture screen. Even though, the activities were conducted mostly to identify the PSD and not to evaluate pressure sore or method of pushing.

The definition of the required ATs takes around one-quarter of the assessment, according to the recurrence factor calculated (See Figure 4.17). Thus, the majority of the investigation, as regards the wheelchair characteristics, was followed by the bath chair characteristics and lastly by other ATs characteristics. Considering that there is no specific stage for assessing the user assistive solution at CReab services, other AT services, which may be required by the user are identified at the assessment of the prescribed AT. Apart from the bath chair, very few cases were available, where other AT devices offered in OPM list were assessed and prescribed during the wheelchair assessment. Apparently, in many cases, it was evident that user might have benefited from a transfer board or a walking frame but were not assessed for these.
AAATE suggests that multidisciplinary team approach is the most appropriate for identifying the assistive solution. It was observed in around 44% of the cases that CReab participants discussed the assessment with other CReab staff or the supplier. This, though does not necessarily means a multidisciplinary team, as those involved often have similar occupations. In the majority of the circumstances, the discussion was revealed to be inclined more towards the prescribed wheelchair or bath chair rather than the assistive solution.

Although multidisciplinary discussion does happen at CReabs, it was found that it should be encouraged between staff with diverse areas of expertise than the wheelchair. Also, all CReab staff should be more aware of other items from OPM list that might be of benefit to the user. Some evident opportunities for multidisciplinary collaboration were:

- The existing weekly meetings between departments. Though this constituted a regular observation only in CReab 1, their service coordinators could share the experience and help to implement the positives in other CReabs.

- Encourage staff to work in pairs. CReab 1 and CReab 3 had two professionals working together. CReab 1 team pointed out that they were more productive working in pairs. CReab 3 had one trainee working with one of the staff. These pairs could share their experiences and help to implement the same in other CReabs.

- Strengthening the relation with NASF team. This in the author’s opinion is the most efficient and vital opportunity, which can be optimally leveraged. As mentioned in the literature review, NASF is a multidisciplinary team working closely with the user context. However, the contact between NASF and CReab teams was observed in only one assessment. Some participants mentioned it does happen on rare occasions but recognises the need for increased collaboration. Some CReabs staff also works in NASF, which can further help in strengthening the collaboration.

Another important aspect of the assessment suggested in good practice literature is the user involvement in the process. Discussion with the user or carer about the wheelchair to be selected was observed in approximately 44% of the cases. This shows the potential scope of improvement in the user engagement during the assessment stage, especially with regards to the provision of key information and encouraging users to make informed decisions.
4.3.3 Activities Performed at the Adapted Wheelchair Fitting stage

Adapted wheelchairs provided at CReab need all to be tested and the necessary modifications arranged previously to the delivery. Usually, the supplier goes to the CReab, test a partially made wheelchair, set the PSD and mark the changes required. Then, a different date is arranged to deliver the completed wheelchair. However, an exception occurs with a specific wheelchair supplier, to be referred in this document as Supplier 1. Their staff work as an itinerant workshop and perform both test and delivery on the same day.

Activities performed during the test of the adapted wheelchair were identified and separated according to the staff performing them. Similar to the assessment stage, it was identified activities performed solely by CReab participants, by CReab participants in conjunction with supplier participants or exclusively by the supplier. A total of thirty-two (n=32) cases were analysed at this stage.

4.3.3.1 Activities performed by Supplier Staff

Table 4.22 shows the activities performed by the supplier participants during this stage, followed by the number of sources and references.

Table 4.22: Activities performed by the supplier staff at the adapted wheelchair fitting stage

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST of Adapted WC</td>
<td>32</td>
<td>88</td>
</tr>
<tr>
<td>SUPPLIER Staff</td>
<td>32</td>
<td>85</td>
</tr>
<tr>
<td>PREPARE WC to be tested</td>
<td>32</td>
<td>85</td>
</tr>
<tr>
<td>TEST WC &amp; MARK Modifications</td>
<td>31</td>
<td>87</td>
</tr>
<tr>
<td>INFORM Users</td>
<td>20</td>
<td>31</td>
</tr>
<tr>
<td>CHECK user positioning in the WC</td>
<td>20</td>
<td>28</td>
</tr>
<tr>
<td>ASK Questions to users or carer</td>
<td>19</td>
<td>27</td>
</tr>
<tr>
<td>CONFIRM WC Specifications</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>RECORD User &amp; WC Information</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>DISCUSS WC feature with User</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Ask CREAB staff if there is something to add</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>CHANGE prescribed WC</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>CREAT &amp; Supplier Staff</td>
<td>32</td>
<td>73</td>
</tr>
<tr>
<td>CREAB Staff</td>
<td>31</td>
<td>82</td>
</tr>
</tbody>
</table>
Usually, before the user is invited to the room, the supplier brings the wheelchair and prepares it to be tested, assembling the PSDs and adjusting the necessary features. Another activity observed in all cases with one exception was testing the wheelchair and marking the necessary modifications. The exception was due to a need to change the wheelchair prescribed because the user has grown and the wheelchair size became inappropriate. Table 4.23 provides information about the various types of test observed.

Table 4.23: Types of test conducted at the adapted wheelchair fitting stage

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 TEST of Adapted WC</td>
<td>32</td>
<td>88</td>
</tr>
<tr>
<td>SUPPLIER Staff</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PREPARE WC to be tested</td>
<td>32</td>
<td>85</td>
</tr>
<tr>
<td>TEST WC &amp; MARK Modifications</td>
<td>31</td>
<td>87</td>
</tr>
<tr>
<td>Test or adjust FOOTREST position</td>
<td>21</td>
<td>30</td>
</tr>
<tr>
<td>Test footrest build up</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Test SEAT parts or modifications</td>
<td>17</td>
<td>25</td>
</tr>
<tr>
<td>Test pelvis side pad</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>Test seat depth</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>Test build up under pelvis</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Test outside thigh pads</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Test knee separator pad</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Test or adjust HEADREST position</td>
<td>16</td>
<td>22</td>
</tr>
<tr>
<td>Test BACKREST parts or modifications</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td>Test trunk side pad</td>
<td>21</td>
<td>27</td>
</tr>
<tr>
<td>Test memory foam</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Test carved backrest</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Test trunk side wedges</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Test rear pelvis pad</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Mark backrest modifications</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>Mark seat modifications</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>Test or adjust ARMREST position</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Test or adjust STRAP position</td>
<td>8</td>
<td>17</td>
</tr>
<tr>
<td>Mark strap position</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Mark trunk side pad modifications</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
Following, another recurrent activity performed by supplier participants at adapted wheelchair test stage was informing the users. Topics informed by suppliers and their frequencies are presented in Table 4.24. Recurrence of similar information passed to user or carer was considerably low.

Table 4.24: Topics informed by suppliers at adapted wheelchair fitting stage

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFORM Users</td>
<td>20</td>
<td>31</td>
</tr>
<tr>
<td>Inform about next stage</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>Inform carer about positioning and WC features</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Inform about tilt feature</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Inform modifications from what it was agreed in assessment</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Supplier reads final modification</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Checking the user positioning in the wheelchair, observed in around 62% of the cases. This included checking the frontal positioning, observed in about 44% of the cases, and checking lateral positioning, seen in approximately 19% of the cases. Checking user positioning is one the activities suggested in the WSTP. Despite this activity was a difficult one to be recorded at observations – as staff could quickly glance at the position without reporting to the researcher – it was clear that not every user positioning was thoroughly checked.

Another frequent activity performed by suppliers at this stage was asking questions to the user or carer. Table 4.25 shows that most of the questions were asked few times apart from asking the carer to take user clothes to see the positioning better, which was asked in around 37% of the cases.
Another activity observed in 37% of the cases was confirming the wheelchair specifications agreed on the assessment and taking user measures during the test (See Table 4.26).

Table 4.25: Example of questions made by suppliers at adapted wheelchair fitting

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASK Questions to users or carer</td>
<td>19</td>
<td>27</td>
</tr>
<tr>
<td>Ask carer to take user clothes to see better</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Ask about orthotics or shoe usage</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Ask about other treatment made</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Ask user if WC is comfortable, if there is pain or if like it</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Ask about hip dislocation, surgery or fracture</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Ask user to push the WC</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ask if user or carer wants to have a break</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ask about seated stability or trunk and cervical control</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ask about PUSHING capability</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ask about pressure sores</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Ask about CURRENT or previous WC</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 4.26: Type of information confirmed by supplier staff at the adapted wheelchair fitting stage

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONFIRM WC Specifications</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>Confirm colour choice</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Confirm WC specifications agreed in the assessment</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Confirm WC measures from specifications</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
Table 4.27 presents information about the activities observed in less than 20% of the cases. This included recording information about the user or the wheelchair (around 19% of the cases), discussing wheelchair feature with the user or carer (seen in 17% of the cases), asking the CREab staff if there was something to add to the test (around 11% of the cases). Not necessarily an activity but importantly noted during the observations were the cases where suppliers decided to change the model of the prescribed wheelchair during the test stage (n=2).

Table 4.27: Activities observed in less than 20% of the cases at the adapted wheelchair fitting stage

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RECORD User &amp; WC Information</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Take strap measure</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Take measure of respiratory support</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Take user’s seated measurement</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>DISCUSS WC feature with User</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Discuss Head support with user</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Discuss STRAP with user</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Discuss CARVING backrest with user or carer</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Discuss backrest hight with user</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Ask CREAB staff if there is something to add</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>CHANGE prescribed WC</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
4.3.3.2 Activities Performed by CReab Staff in Conjunction with Supplier Staff

At this stage supplier and CReab participants often discussed the user fit while sitting the user in a partially made wheelchair. This was observed in around 91% of the cases. Table 4.28 presents information about the topics discussed. Most had regard to the headrest, the straps, the carved backrest and trunk side pad.

Table 4. 28: Topics discussed between CReab and supplier staff at the adapted wheelchair fitting stage

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CREAB &amp; Supplier Staff</td>
<td>32</td>
<td>73</td>
</tr>
<tr>
<td>SEAT &amp; POSITION user in the WC</td>
<td>32</td>
<td>95</td>
</tr>
<tr>
<td>DISCUSS the user FIT</td>
<td>29</td>
<td>73</td>
</tr>
<tr>
<td>Discuss HEADREST need &amp; type</td>
<td>14</td>
<td>19</td>
</tr>
<tr>
<td>Discuss STRAP need &amp; type</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>Discuss OVERAL POSITIONING &amp; modifications</td>
<td>13</td>
<td>19</td>
</tr>
<tr>
<td>Discuss CARVED BACKREST need &amp; modification</td>
<td>9</td>
<td>17</td>
</tr>
<tr>
<td>Discuss TRUNK SIDE PAD need &amp; position</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Discuss FOOTREST position &amp; type</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Discuss OUTSIDE THIG PADS need &amp; position</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Discuss KNEE SEPARATOR PAD need</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Discuss BUILD-UP need &amp; modifications</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Discuss BACKREST type &amp; modifications</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Discuss needs to change WC PRESCRIPTION</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Discuss SEAT DEPTH modifications</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Discuss RAISED SEAT FRONT need</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Discuss PELVIS SIDE PAD need</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Discuss TRUNK SIDE WEDGE modifications</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Discuss possible BATH Chair</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
4.3.3.3 Activities Performed by CReab Staff

At the adapted wheelchair fitting stage, it was observed that CReab participants performed different types of activities. These are described in Table 4.29. Most frequent activities were *informing and demonstrating to the user, asking questions to the user or carer and confirming specifications about the wheelchair and/or the user*.

Table 4.29: Activities performed by CReab participants at the adapted wheelchair fitting stage

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CREAB Staff</td>
<td>31</td>
<td>82</td>
</tr>
<tr>
<td>INFORM &amp; DEMONSTRATE Users</td>
<td>19</td>
<td>29</td>
</tr>
<tr>
<td>ASK Questions to user or carer</td>
<td>18</td>
<td>39</td>
</tr>
<tr>
<td>CONFIRM User and WC specifications</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>CHECK user positioning in the WC</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>TEST WC</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>RECORD User &amp; WC Information</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>DISCUSS WC feature with User</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

*Informing and demonstrating to the user* was an activity observed in about 59% of the cases. Table 4.30 provides details of the type of information passed. Most recurrent information passed was *informing the carer how to position the user in the wheelchair*, observed in 25% of the cases.

Table 4.30: Information passed to the users by CReab participants at the adapted wheelchair fitting stage

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFORM &amp; DEMONSTRATE Users</td>
<td>19</td>
<td>29</td>
</tr>
<tr>
<td>Inform carer about positioning and WC features</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Inform about next stage</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Inform user or carer about AT and CREAB services offered</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Inform user &amp; carer about WC modifications &amp; specifications</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Inform about bath chair</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Demonstrate therapeutic exercises</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
Another recurrent activity performed by CReab participants at the fitting stage was *asking questions to the user or carer*, observed in about 56% of the cases. Table 4.31 provides a list of all type of questions made.

### Table 4.31: Common activities performed by CReab participants at the adapted wheelchair fitting

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASK Questions to user or carer</td>
<td>18</td>
<td>39</td>
</tr>
<tr>
<td>Ask about seated stability or trunk and cervical control</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Ask about CURRENT or previous WC</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Ask about CONTEXT of use</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Ask about BATH chair</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Ask how user stay seated or positioned at home</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Ask about other treatment made</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Ask user if WC is comfortable, if there is pain or if like it</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Ask carer to take user clothes to see better</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Ask about other AT usage</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Ask about orthotics and shoe usage</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Ask about VISION capabilities</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Ask about spastic movement or seizure</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Ask about PUSHING capability</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Ask about hip dislocation, surgery or fracture</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Ask user if different COLOR or other feature than asked is a PROBLEM</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ask if user have any question</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ask if user have ACTIVITY TRAY</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ask about pressure sores</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

*Confirming information about the user and the wheelchair specifications* was observed in about 50% of the cases (See Table 4.29). This was made by reading the medical records and other sources information about the user (seen in 44% of the cases) and confirming the wheelchair specification agreed in the assessment (seen in 41% of the cases).

*Checking the user positioning in the wheelchair* was observed in around 41% of the cases (See Table 4.29). A compound analysis of all the cases where CReab participants or supplier participants had checked the user position shows a result of twenty-eight cases, representing about 87% of the cases. A similar analyse considering only the cases where the *lateral positioning* was clearly checked shows a result of only ten cases, representing around 31% of the total cases.
Testing the wheelchair or the wheelchair feature, despite being a responsibility of the supplier staff, was an activity also observed in few cases by the CReab participants (n=7). Table 4.32 shows the types of tests conducted by CReab participants at this stage.

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST WC</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Test footrest position or modifications</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Check the seat depth</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Test seat adjustments or modifications</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

The CReab participants were observed recording user information at this stage in only six cases (n=6) (See Table 4.29), despite this should be compulsory to all stages. Information recorded were mostly related to the modifications to the specifications agreed in the assessment stage (n=5). The reason participants gave for this behaviour was that they try to finish these evaluations as soon as possible, so users and carers don’t have to wait longer, especially considering that many of these users have a severe disability and need particular attention. Waiting long periods can pose these users at risk. CReab participants mentioned they insert a summary of each user care in SISREDE in another opportunity, often later in that day or the following day, when information still fresh in their memory.

Lastly, in only one case CReab participant was observed discussing a wheelchair feature with the user at this stage (See Table 4.29).
4.3.3.4 Summary of Adapted Wheelchair Fitting Stage and Discussion of Findings

This section provides a summary of the main findings of the adapted wheelchair fitting stage, discussing and relating it to the literature.

The adapted wheelchair fitting stage at CReabs contained the following three main activities: (i) the wheelchair test, (ii) the assessment interview and (iii) the AT definition (See Figure 4.18).

Figure 4.18: Summary of adapted wheelchair fitting stage activities and type of user data collected
As mentioned previously, in Belo Horizonte’ SUS the service provision of the adapted wheelchair was primarily the responsibility of suppliers under the supervision of CReab staff. Most of the effort was spent in the wheelchair test, testing the wheelchair features and the PSD, checking the posture and marking modifications on the chair.

Similar to the assessment stage, hand simulation was often performed in order to identify and locate the PSDs. Hand simulation means using hands to act as the support that a wheelchair and additional postural supports may provide (WHO, 2013b, p.62). It was observed that suppliers recorded the hand simulation results according to the required PSD and failed to account if each part of the body was neutral or not, as suggested by WHO (WHO, 2013b).

In addition, checking the user’ frontal positioning was observed in the majority of the cases, while checking the lateral positioning was demonstrated only in around 31% of the cases. This indicated clearly that positioning was not thoroughly checked as recommended.

Moreover, checking whether the pressure is safe under the seat bones and in any other area at risk (e.g., under hip joint or tail bone), as is suggested in WHO (2013b), was not performed in any of the observed cases.

However, checking the fit while the wheelchair is mobile, as suggested in WHO (2013b), was observed in few cases.

Discussion between supplier and the CReab participants about the user fit was observed in 91% of the cases, which evidenced a high interaction between the two staffs at the adapted wheelchair fitting stage.

Less relevant at this stage but frequently occurred was the assessment interview. Majority of the questions pertained to the physical condition of the user. Also, it was observed that several of the questions asked to the user or carer, at this point were similar to those asked at the assessment stage. The assumption to explain the repetition was the lack of inquiries or recording during the previous stage. In addition, the CReab practitioner accompanying the user and the supplier was not necessarily the same as the former stages. This is in contradiction with the WHO guideline, which recommends that same practitioner should accompany the user through the service delivery stages (WHO, 2012; WHO, 2013b). Contributing is the fact as the variance in assessments, which are not standardised and suppliers staff conduct these as per their individual knowledge, some using own protocols and some not. Likely that for these same reasons, the recurrence of similar information passed to user or carer was considerably low.
Another activity common to most cases was the definition of the AT devices to be ordered, of which the majority of the investigation relates to the wheelchair characteristics, other AT features and lastly the bath chair characteristics. Opposite to the assessment stage, it was observed that investigation pertaining to the other types of ATs was relatively higher than the bath chair. The assumption was that the bath chair was already defined in the previous stage. Confirming the wheelchair specifications were previously agreed - one of the activities recommended at WSTP – was evidenced in around 43% of the total cases. The significance of this stage was apparent after observing the delivery stage in order to avoid frustration either to the end user, the CReab, and the supplier staff.
4.3.4 Activities Performed at Delivery Stage

The last stage of the wheelchair service cycle provided at CReabs is the wheelchair delivery. The wheelchair can be delivered by CReab staff on its own or in conjunction with the supplier if it is an adapted wheelchair. The end user has to be present to test the wheelchair fit and sign the authorisation report.

Activities performed at the wheelchair delivery stage were identified and separated according to the staff performing them. Similar to the previous stages, it was identified activities conducted solely by CReab staff, by CReab staff in conjunction with supplier staff or exclusively by the supplier staff. A total of thirty-seven (n=37) cases were analysed at this stage. From these, thirty-one (n=31) had regard to adapted wheelchairs and six (n=6) had regard to standard wheelchairs as according to Table 4.8 wheelchair classification.

4.3.4.1 Activities Performed by the Supplier Staff

Table 4.33 provides a list of the activities performed by the supplier participants at the delivery stage in order of the most performed activities.

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUPPLIER Staff</td>
<td>31</td>
<td>83</td>
</tr>
<tr>
<td>INFORM &amp; TEACH Users or carer</td>
<td>31</td>
<td>73</td>
</tr>
<tr>
<td>TEST &amp; ADJUST WC</td>
<td>26</td>
<td>41</td>
</tr>
<tr>
<td>ASK users or carer</td>
<td>20</td>
<td>24</td>
</tr>
<tr>
<td>Check overall positioning</td>
<td>12</td>
<td>17</td>
</tr>
<tr>
<td>ADAPTATION is made on the spot</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>SUGGESTS further WC adaptations</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
With regards to the *supplier informing or teaching the user or carer* at the delivery stage, thirty different types of information were identified. Table 4.34 reports the type of information given in around 25% of the observed cases. The entire list is given in Appendix 19.

Table 4.34: Information passed to users by the supplier staff at the delivery stage

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFORM &amp; TEACH Users or carer</td>
<td>31</td>
<td>73</td>
</tr>
<tr>
<td>Give WARRANTY and explain</td>
<td>27</td>
<td>28</td>
</tr>
<tr>
<td>Give flyer with CONSERVATION and POSITIONING tips</td>
<td>22</td>
<td>23</td>
</tr>
<tr>
<td>Teach by doing how to DISASSEMBLE the WC</td>
<td>17</td>
<td>21</td>
</tr>
<tr>
<td>Teach by doing how to adjust the SHOULDER HARNESS strap</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>Teach by doing how to adjust ANTI-TIP bar function and adjustment</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Teach by adjusting the PELVIC STRAP</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Teach by doing how to adjust TILT function</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>Inform about SHOULDER HARNESS function and adjustment</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

When providing information to the user or carer, it was observed that sometimes supplier taught by showing and other times taught by asking the carer or the user to do themselves (See Appendix 19). The last was less frequent when the suppliers were late concerning the CReab working schedule.

Following, the second most performed activity by the supplier at the delivery stage was *testing and/or adjusting the wheelchair*. Table 4.35 shows all the different types of tests supplier participants performed.

Table 4.35: Types of tests performed by the supplier staff at the delivery stage

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST &amp; ADJUST WC</td>
<td>26</td>
<td>41</td>
</tr>
<tr>
<td>TEST or ADJUST SHOULDER HARNESS strap</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td>TEST or ADJUST PADS position</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>TEST or ADJUST PELVIC STRAP</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>TEST or ADJUST FOOREST position and FOOT STRAP</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>TEST or ADJUST HEADREST position</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>TEST or ADJUST ARMREST position</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>TEST or ADJUST seat DEPTH</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>TEST or ADJUST ACTIVITY TRAY</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>
Asking questions to the user or carer were also observed in twenty cases (n=20). The most asked question was if the user had a wheelchair before and known how to adjust it (See Table 4.36). The impression was that this investigation was conducted to avoid according an explanation to the users and carers on how to adjust and maintain the wheelchair. The second most asked group of questions made by supplier participants (observed in six cases) had regard to the user comfort in the wheelchair.

Table 4.36: Questions made by the supplier staff at the delivery stage

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASK users or carer</td>
<td>20</td>
<td>24</td>
</tr>
<tr>
<td>Ask if user had WC before and known how to adjust</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Ask user if WC is comfortable, if there is pain or if like it</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Ask if uses other AT with the WC</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Ask about hip dislocation and surgery</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ask about pushing capabilities</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ask care to take user clothes to see better</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Checking the user positioning was observed only in twelve cases, of which just three had the lateral positioning clearly checked. As mentioned before, this activity was a difficult one to be recorded at observations as staff could quickly glance at the position without reporting to the researcher.

Table 4.37 presents information about the activities observed in less than 18% of the cases where supplier participants were present. It represents activities related to adaptations made on the spot and suggestions for further adjustments.

Table 4.37: Activities performed by supplier staff observed in less than 18% of the cases

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADAPTATION is made on the spot</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>STRAP is adapted or changed</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>PAD is adapted</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Support for BREATHING OR FEEDING DEVICE is adapted in WC</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>SUGGESTS further WC adaptations</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>suggest further adaptation for ACTIVITY TRAY</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Suggest to sew SHOULDER HARNESS to appropriate height</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Suggests to remove the FOOTREST STRAP</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Suggest to cover SHOULDER HARNESS with swimming spaghetti fo</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
4.3.4.2 Activities Performed by Supplier Staff in Conjunction with CReab Staff

During the delivery of the adapted wheelchair, supplier and CReab participants performed some activities in conjunction. It was observed that CReab and the user carer present at the delivery regularly helps to seat and position the user in the wheelchair. In some cases, six persons were necessary to perform this activity for reasons such as user overweight or because they were too agitated and did not cooperate. In twelve cases, representing around 39% of the cases, the supplier and the CReab participants discussed the user fit. The topics discussed are presented in Table 4.38.

Table 4.38: Activities performed by supplier in conjunction with CReab staff at delivery stage

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CREAB &amp; Supplier staff</td>
<td>31</td>
<td>59</td>
</tr>
<tr>
<td>SEAT &amp; POSITION user in the WC</td>
<td>31</td>
<td>87</td>
</tr>
<tr>
<td>DISCUSS the user FIT</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>Discuss AGREED MODIFICATIONS in previous stages</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Discuss OVERALL positioning</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Discuss about HEADREST position</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Discuss the need of further adaptations with SUPPLIER staff</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Discuss FURTHER ADAPTATIONS with user</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Discuss SHOULDER Harness STRAP position</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Discuss the need of Seat DEPTH adjustments</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>COMMENT user case</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

4.3.4.3 Activities Performed by the CReab Staff

The four most performed activities by CReab participants at the delivery stage were found to be similar to those executed by supplier participants (See Table 4.33 and 4.39). CReab participants were observed checking the user’ overall positioning in the wheelchair more frequently, while supplier participants were found to inform the user or carer more regularly and also to test or adjust the wheelchair more often. Both staffs asked questions with similar frequency. CReaf staff asked more diverse types of questions and in more quantity. Different activities performed by CReab at this stage were: confirming the user and the
wheelchair specifications, requesting wheelchair modifications to the suppliers and recording information about the user and the wheelchair.

Table 4.39: Activities performed by CReab staff at delivery stage

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CReab Staff</td>
<td>34</td>
<td>99</td>
</tr>
<tr>
<td>INFORM &amp; TEACH Users</td>
<td>26</td>
<td>57</td>
</tr>
<tr>
<td>ASK user or carer</td>
<td>22</td>
<td>41</td>
</tr>
<tr>
<td>TEST &amp; ADJUST WC</td>
<td>17</td>
<td>22</td>
</tr>
<tr>
<td>CHECK user positioning in the WC</td>
<td>16</td>
<td>19</td>
</tr>
<tr>
<td>CONFIRM User &amp; WC specifications</td>
<td>12</td>
<td>17</td>
</tr>
<tr>
<td>RECORD User &amp; WC Information</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td>PREPARE the wheelchair to test</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>REQUEST WC modifications</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Open WC box and assemble WC</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>SUGGESTS further adaptations</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>FIX an identified problem</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Similar to supplier participants, CReab participants passed information to the user or carer verbally, by showing how to do a specific adjustment or wheelchair function, and by teaching the user or carer how to do it themselves. CReab participants passed twenty-nine different type of information at this stage. Table 4.40 shows the most common knowledge passed (See Appendix 20 for the full list). CReab participants passed similar information at most in 21% of the cases.

Table 4.40: Information passed to users by CReab staff at the delivery stage

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFORM &amp; TEACH Users</td>
<td>23</td>
<td>53</td>
</tr>
<tr>
<td>Inform user or carer about AT and CREAB services offered</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Teach by doing how to DISASSEMBLE the WC</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Inform about usage time and changing wheelchair procedure</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Inform about new WC adjustment service</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Teach by doing how to POSITIONING user in the chair</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Give and inform about WARRANTY</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Inform about PELVIC STRAP function and adjustment</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Teach by doing how to adjust the PELVIC STRAP</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Teach CONSERVATION tips</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>
Table 4.41 shows the most frequent questions made by CReab staff to the user or carer at delivery stage. CReab participants asked similar questions at most in 21% of the cases.

Despite testing and adjusting the wheelchair are activities to be performed by supplier staff, in the cases of adapted wheelchairs CReab participants were observed assisting in half of the cases (See Table 4.39). In the case of the standard wheelchairs, CReab participants were found to adjust the wheelchair after the user had sat on it in three of the six cases observed.

CReab participants were observed checking the user position only in sixteen cases, of which just four had the lateral position clearly checked.

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASK user or carer</td>
<td>22</td>
<td>41</td>
</tr>
<tr>
<td>Ask about CURRENT or previous WC</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Ask if user have any question</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Ask if uses other AT with the WC</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Ask about ORTHOTICS use</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Ask about DIAPER USE</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ask user if WC is confortable, if there is pain or if like it</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Ask about BATH chair</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>ask about the CONTEXT OF USE</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Ask if user goes to school</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>ask about acesibility of user environment</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Ask about TREATMENT or MEDICINE taken</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Ask about HIP DISLOCATION or SURGERY</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Ask user to SIT or POSITION in the wheelchair</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Ask user to PUSH the wheelchair</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Ask about physical condition and DIAGNOSTICS</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Ask how user stay seated or POSITIONED AT HOME</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Ask about WALKING CAPABILITY</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Ask if user know hot to DISASSEMBLE</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ask if user prefer another chair</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
CReab participants were observed confirming the information about the user or the wheelchair in around a third of the cases. Confirming the wheelchair specification agreed at the previous stage was the most common information verified, despite it was clearly observed in only seven cases (See Appendix 21 for the full list).

Recording information about the user and the wheelchair was observed in eleven cases. Inserting information in the SISREDE system was observed in seven cases. The reason for such low recurrence for inserting information into the system, which is a compulsory activity at all stages, were similar to those explained in the test of adapted wheelchairs.

A common activity performed by CReab participants when delivering standard wheelchairs was preparing the wheelchair to test. In three cases, this included opening the box and assembling the wheelchair in front of the user (observed in two cases) or just before the user enter the room (seen in one case).

Requesting a wheelchair modification was observed in seven cases, being one request related to a standard wheelchair and the other requests related to the adapted wheelchair. Table 4.42 shows what the different types of requests observed.

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>REQUEST WC modifications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ask supplier to change seat depth</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Ask supplier to put knee separator pad</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Ask supplier to adjust Trunk side pad position</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ask supplier to add pushing ring</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ask supplier to adjust footrest position</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ask supplier to adjust footrest strap</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>ask supplier to adjust headrest position</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

In two cases the CReab participants were observed suggesting the user to make further adaptations in the wheelchair. In one example CReab participants were found fixing a problem in the wheelchair identified during the delivery.
4.3.4.4 Summary of the Delivery Stage and Discussion of the Findings

This section provides a summary of the main findings of the delivery stage, discussing and relating it to the literature.

The adapted delivery stage at CReabs contained the following three main activities: (i) the fitting, (ii) the assessment interview and (iii) the delivery (See Figure 4.19).

Figure 4.19: Summary of the delivery stage activities and type of user data collected
During the delivery stage, the participants spent most effort on delivering' and the fitting' activities. At the fitting, the user was positioned in the chair and supplier, in conjunction with the CReab staff, tested the wheelchair and PSD fit, checked the posture and adjusted the wheelchair features and the PSD, until the satisfactory result is achieved. It was not possible to make inferences about the wheelchair fit results as a supplier would only adjust the feature they considered necessary to promote a better fit. However, notably, the process highlighted a lack of consensus towards the process to conduct the user fit. Also, neither supplier nor CReab participants used a checklist when testing the wheelchair fit, as recommended by WHO. Similar to what was observed in the fitting stage of the adapted wheelchair, checking the user positioning was not thoroughly checked.

Similar to the findings of the adapted wheelchair fitting stage, checking whether the pressure is safe under the seat bones and any other risk area, as suggested in WHO (2013b), was not performed in any of the observed cases. Checking the fit while the wheelchair is moving, as also indicated in WHO (2013b), was observed only in few cases.

The assessment interview plays a minor role in the delivery stage at CReabs. The majority of the questions pertained to developing a construct of the previous wheelchair experience if any by the user. The impression was that this investigation was conducted to avoid according an explanation to the users and carers on how to adjust and maintain the wheelchair. An important question during delivery stage: Assess the user’s comfort in the wheelchair, was observed in less than 30% of the observed cases. Overall, the questions made to the user or carers at the delivery stage were similar to those made in previous stages and with little recurrence between the observed cases. Two facts contribute to this scenario: The fact that CReab staff accompanying the delivery was not necessarily the same from the previous stages and the fact that there was an apparent lack of consensus on how to conduct the wheelchair delivery and fitting process.

During the delivery, most of the effort revolved around the explanation on how to adjust the wheelchair and the PSDs and informing users on other various matters (See Figure 4.19). Overall, there was no agreement on what kind of information should be passed and who should pass it, which showed a lack of defined information sharing by responsible and qualified personnel. Due to this, the majority of users end up not being informed with regards to various subjects. Between cases, similar information was sometimes given by supplier participants, other times by CReab participants, and in some situations not passed.
by either staff. Besides, for features specific to a wheelchair model, the common
information was also not shared with all the users in certain cases. Examples
include: informing carer or user how to position the wheelchair (informed in
around 38% of the cases), informing or teaching how to adjust the footrest (ob-
served in approximately 24% of the cases) and informing about pressure sore
(seen in just 8% of the cases).

WHO recommends that every user should: Have the pushing ability assessed, be
tested with regards to the wheelchair fit before delivery, trained with regards to
adjusting and assembling the wheelchair and also about the necessary skills to
push the wheelchair. At Belo Horizonte’ SUS, it was found that only the wheel-
chair fit and the user training with regards to the wheelchair adjustment and
assembly were achieved.

4.3.5 Care Time in Each Stage

The time spent with the user and carer was measured in each stage. Also, CReab
participants were asked how many users care per four hours shift they think it
was ideal to conduct. This question intended to compare their reality to their
expectations. Figure 4.20 shows the results of the average time spent with user
and carer in each stage and at each CReab.

![Figure 4.20: Average care time CReab participants spent with user](image)
Staff in CReab 2 and CReab 3 spent eleven to fourteen minutes more time with the user at the assessment stage than CReab 1 staff. This was found to have a direct impact on the quality of CReab 1 assessment. One example had regards to the questions asked to investigate the users’ independence level. Figure 4.21 shows that the greater the assessment time, the higher were the number of cases where this investigation was observed. The exception had regard to one question, on which CReab 2 had more cases than CReab 3. Notwithstanding, both CReabs 2 and 3 spent more time with the users and asked more questions than CReab 1.

![Figure 4.21: Questions CReab participants made regarding user independence](image)

It was not possible to make further comparisons between CReabs results regarding the adapted wheelchair fit stage as the time spent with user and carer was impacted by many variables, such as different supplier staff and different level of user deformity. Because most of the wheelchair delivered during the period of observations were adapted wheelchairs, it is also not possible to make further comparisons between CReabs results regarding the delivery stage. Yet, the results were relevant to discover that the time spent with users and carer is far less than CReab staff expected. When inquired about the ideal number of users care per four hours shift, the average response was 4.9 users, which implies spending an average of 49 minutes with each user care.
4.3.6 Type of Information Passed to Users

To better understand the type of information passed on to the users between stages, information passed by CReab and supplier staff was grouped into categories. Figure 4.22 summarizes the main type of information given between service stages.

Figure 4.22: Type of information passed to user or carer between service stages
In the assessment stage, the majority of information passed to the user or carer pertained to the wheelchair and other AT devices, and also necessary information about the next stage. Important information such as the pros and cons of wheelchair models was minor discussed.

In the adapted wheelchair fitting stage, the majority of information passed to the user or carer pertained to the PSD and user posture in the wheelchair and information about the next stage.

It was predominantly during the delivery stage that informing the user or carer step, constituted part of the planned activities. Majority of the information passed considered how to adjust the wheelchair and the PSD, followed by information about the wheelchair warranty, information about the wheelchair conservation, information about the wheelchair function and lastly information about other services.

Overall, recurrence of information passed to the user was considerably low, and there was lack of agreement if this was a CReab or supplier staff role. Due to this lack of clarity on specific responsibility, the users and carer ended up not receiving complete and necessary information throughout the service stages.
4.3.7 Providers Training

CReab participants were asked if they had any certification or had undertaken any specific training related to wheelchair services or wheelchair prescription. Table 4.43 shows the results.

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUESTION 1 WC service training</td>
<td>12</td>
</tr>
<tr>
<td>0 Hours of formal training</td>
<td>2</td>
</tr>
<tr>
<td>04 – 16 Hours of formal training</td>
<td>3</td>
</tr>
<tr>
<td>16 – 48 Hours of formal training</td>
<td>3</td>
</tr>
<tr>
<td>48 – 80 Hours of formal training</td>
<td>3</td>
</tr>
<tr>
<td>80 – 140 Hours of Formal Training</td>
<td>1</td>
</tr>
</tbody>
</table>

Two participants have mentioned they had no formal training and learned from observing the staff in daily practice. Three other participants said they received between four to sixteen hours of training provided by one the SUS wheelchair’s supplier. Other three participants said they enrolled in training lasting between sixteen to forty-eight hours. The Coordenação da Rehabilitação provided the training they received in conjunction with an experienced occupational therapist working with wheelchair fitting in Belo Horizonte. Other three participants said they enrolled in training lasting between forty to eighty hours. The type of training undertaken varied between those supported by government and private training enrolled without financial support. One participant was enrolled in around eighty to a hundred and forty hours of wheelchair training, provided by the government, the suppliers and from the same experienced occupational therapists working with wheelchair fitting in Belo Horizonte.
4.3.8 Key Findings on the Gaps to Apply Good Practices

The main challenges encountered to apply the good practices recommended by WHO and AAATE are summarised in Figure 4.23. These were categorised according to the WHO wheelchair service stages suggested in WHO (WHO, 2012; WHO, 2013b). The Swiss Cheese model for cumulative effects was used subsequently to data collection to organise and present the main findings.

![Figure 4.23: Main failures to apply the wheelchair service good practices](image)

- Lack of communication between referral team and CREabs
- Information from user environment is not collected regularly by ESF and NASF
- Lack protocols to assess user goals and characteristics
- Presence, risk and history of pressure sore are not assessed
- Most lifestyle and environmental information suggested by WHO are not collected
- Users are not assessed for all AT items they can benefit
- Lack multidisciplinary approach to identify user needs for wheelchair and other AT
- Few user involvement to select the wheelchair and other prescribed AT
- Complex authorization procedure for AT not included in the list
- Long time is taken to renew the supplier’s contract, stopping the service
- Wheelchairs and PSDs are not regularly checked for safety
- Lack of protocols to assess the fitting
- Pressure is not checked
- Posture is not thoroughly checked
- Users skills are not assessed
- Users are not trained
- There are no formal user follow-up procedures
- There is no feedback mechanism

Figure 4.23: Main failures to apply the wheelchair service good practices
4.4 Designing the Interventions

After concluding most of Study 2.2 data analysis, the research focus shifted to designing the interventions to be tested in Study 3. This section details the procedures used to design these interventions. Results from the interviews made with the providers with regards to the applicability of WHO forms and checklists are presented in this section.

4.4.1 Conceptual Framework

Results from Study 2 provided the requirements for designing a set of evidence-based interventions adapted to wheelchair service context in Belo Horizonte’ CReabs. These interventions were to be grounded on existing good practices but also to consider participants’ views, local culture and the current state of the services. The CReab service coordinators had required that the interventions should consider the current service stages and resources. The findings related to them are summarised in Table 4.44.

The previous study had revealed several reasons for the selection of the forms and checklists from WHO WSTP basic level to ground the interventions instead of using the forms and checklists from the Intermediate Level. Primarily, at CReabs, the service regarding the adapted wheelchair for which the WSTP intermediate level was indicated was mostly at the responsibility of the supplier staff. However, the interventions aimed at the CReab staff essentially, who deals with the assessment and delivery of standard wheelchair, for which the WSTP basic level is indicated. Secondly, the studies revealed that the CReab staff had limited formal training and no support of the evidence-based practice. Thirdly, the WSTP intermediate level forms and checklists have been designed assuming that practitioners can demonstrate the competencies taught in the WSTP Basic Level (WHO, 2013b), which is not the case of the CReab participants. Additionally, only the basic level forms and checklists were officially translated at the time of the study time, and there was insufficient time to propose a formal translation to the intermediate level before the study arrangements. Lastly, the time necessary to evaluate the applicability of both levels of forms and checklists was unrealistic to the research context.
Table 4.44: Study 2 summary of findings

<table>
<thead>
<tr>
<th>Service Stage</th>
<th>Summary of the stage</th>
<th>Summary of findings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Screening</strong></td>
<td>Users brings their referral, have their requirements quickly assessed and are scheduled to the necessary services. In the case of users in need of a wheelchair, they are scheduled to an assessment stage.</td>
<td>Referral form used does not consider the wheelchair users requirements. Hence, information regarding the characteristics of user environment is not collected previously or requested at this point. The screening was found to be the last opportunity to obtain or request this type of information.</td>
</tr>
<tr>
<td><strong>Assessment</strong></td>
<td>Users are assessed, measured and a decision is made about the wheelchair.</td>
<td>There is no consensus in how to conduct the assessment and, apart from CReab 3, there is no protocol to assess user requirements. User goals were assessed in only 36% of the observed cases. Only on rare opportunities user can test a wheelchair before a decision is made. User abilities to push a wheelchair are not assessed. The presence, risk of or history of pressure sores is hardly assessed.</td>
</tr>
<tr>
<td><strong>Adapted Wheelchair Fitting</strong></td>
<td>This stage is exclusive for the adapted wheelchairs aimed at severely disabled users or those who profile does not fit the standard wheelchairs offered. The user is fitted on a half-made wheelchair and bespoke adjustments are made by the suppliers staff.</td>
<td>The user is fitted with a half-made wheelchair and bespoke adjustments are made by the supplier's staff.</td>
</tr>
<tr>
<td><strong>Delivery</strong></td>
<td>The user must be present to test the wheelchair fit and to sign the receiving of the wheelchair, ending the service cycle.</td>
<td>The test conducted is essentially a fitting test and users are not trained on how to use the wheelchair, neither there is a later stage for that. Also, there is no consensus in how to conduct the wheelchair fit, and there is no use of protocols. Staff accompanying this process are not necessarily the same from previous stages.</td>
</tr>
</tbody>
</table>
During participant interviews, they were asked to rank the priority order of WHO forms and checklist in case they were to be implemented in the service, considering the existing service stages. Then they were asked to rank the priority order if they have the liberty to add the additional stages suggested in the forms and checklists. The order of highest priority when considering their application on existing service stages was:

1. **Wheelchair Referral Form:** 58% of the participants (n=7) responded this form applies to the service offered at CReab without the need for modifications. The other 42% of participants (n=5) replied this form applies to the service offered at CReab, but modifications are needed.

2. **Wheelchair Assessment Form:** 100% of the participants (n=12) responded this form applies to the service offered at CReab, but modifications are needed.

3. **Wheelchair summary form and wheelchair Prescription (Selection) Form:** These forms are merged at CReab services. Hence, similar answers were given to both forms. 92% of the participants (n=11) replied it would be better to improve the current forms used at the service while 8% (n=1) responded that these forms apply to the service offered at CReab without the need of modifications.

4. **Wheelchair fitting checklist:** 67% of the participants (n=8) responded this form applies to the service offered at CReab without the need for modifications. The other 33% of the participants (n=4) replied this form applies to the service offered at CReab, but modifications are needed.

Three of the five forms listed were selected as a starting point to design the interventions to the current service stages. The forms *Wheelchair Summary and Wheelchair Prescription (Selection)* were excluded from the intervention mainly because the service already has forms for these tasks. Despite the fact that most participants ranked their implementation priority higher than the fitting checklist, the implementation of the last was found to be essential towards one of the research aims: to implement user-centred protocols at Belo Horizonte SUS’ current wheelchair service provision. It was thought that implementing all the five forms regarding current service stages would be unrealistic considering the research limitations.
4.4.2 Procedures and Rationale

The interventions were designed as a result of a triangulation process between:

- Evaluating the provider’s feedback on the WHO forms and checklist Basic Level.
- Evaluating the provider’s feedback on the current barriers and opportunities.
- Considering the gaps to apply the good practices guidelines.
- Recognizing the differences between the WHO Basic and Intermediate form to evaluate applicability.

This process clarified what information was important to be added, excluded or modified from WHO forms and checklist and how they should be organised to constitute the intervention package. The procedures and rationale used are detailed in the following sections.

It was predefined that each form or checklist should have at most two pages. The reason was due CReabs’ printing financial restrictions, also to avoid the impression of a long document, what could create additional resistance. The layout was improved from WHO forms and checklist to enable easier and quicker recognition of the content, considering that time is an issue at CReab. Minimum font size 11 was set to avoid illegibility. A study from Fuchs, et al.(2008) shows that the participants’ ability to locate information printed in 9 to 12 pt font sizes was greater and faster than with smaller or larger print versions. Also, the gestalt principles were used to increase overall document readability. The German word gestalt is translated as “shape” or “form”. The term refers to how visual input is perceived by human beings (Brandley, 2010). Gestalt psychology was founded by Max Wertheimer and has been improved over the years by other authors. The key idea behind the gestalt principle is that “The whole is other than the sum of the parts” (Kurt Koffka, in Brandley, 2010). In other words, what we perceive as a whole is the sum of individual visual elements with specific characteristics that make us perceive as a whole.
Most used gestalt principles to design the interventions were *proximity* and *common regions*. In the principle of proximity, “*Objects that are closer together are perceived as more related than objects that are further apart*” (Brandley, 2010). Figure 4.24 shows an example of the proximity principle applied.

![Figure 4.24: Example of the Gestalt principle of proximity applied](image)

In the principle of common regions, “*elements are perceived as part of a group if they are located within the same closed region*” (Brandley, 2010). Figure 4.25 shows an example of the common region principle applied.

![Figure 4.25: Example of the common region principle applied](image)

All Interventions were designed using Adobe In Design software, version CS6. The software was selected as it allows professional editing.
4.4.2.1 Evaluating the Providers Feedback on the WHO Forms and Checklist

During Study 2, providers were asked to comment on the applicability of WHO Forms and Checklist Basic Level into the service.

Participant feedback with regards to the applicability of each WHO forms and checklists were separated by form, and according to the context in which they believe it would best apply (See Table 4.7 example). The content of participant answers was then grouped according to each form and checklist’ section as a document annotation. This facilitated the consideration of all participants insights when modifying the forms and checklists. Figure 4.26 exemplifies how participant comments were organised concerning each of the form section.

Figure 4.26: Example of how participant comments were organised regarding the protocols
### 4.4.2.2 Evaluating the Providers’ Feedback on Current Barriers and Opportunities

Additionally, participants’ answers with regards to the potential issues and likely resistance to apply each of the forms and checklists were grouped into pre-defined categories. Similar was arranged with the information collected on how to mitigate the anticipated resistance. The content of these pre-defined categories was then coded in sub-categories grounded on the participant answer (See Table 4.45).

#### Table 4.45: Example category organisation regarding the providers feedback on current barriers and opportunities

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUESTION 3 Aplicability of Assessment Form</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 It does not apply to the service offered by CREAB</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2 It applies to the service offered by CREAB without the need of modifications</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3 It applies to the service offered by CREAB but modifications are needed</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>4 It would be better to improve the current form or checklist</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5 It would be better if a form OR checklist OR tool is specifically designed to the service</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6 PROBLEMS &amp; RESISTANCE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difficulty to evaluate pressure sore</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Lack of time</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Natural resistance to change</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Staff cannot see how it would benefit service</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>7 MITIGATE Resistance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Add information to current forms</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Flexibility to use as a guide</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Provide training to evaluate pressure sore</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
4.4.2.3 Considering the Gaps to Apply the Good Practices Guidelines

During observations, participant’s main activities performed at every user observations were listed in the observation schedule. These were scanned, inserted in Nvivo and the activities coded using thematic analysis (See Figure 4.27 and Section 4.3.2. to 4.3.4).

The analyses of participant observations data resulted in the identification of the performed activities through the service stage.

The participants’ activities were then compared to those suggested in WHO WSTP (WHO, 2008, WHO 2012, WHO 2013b). The number of participants covering the recommended activities was noted at each part of the form in NVivo to facilitate further comparisons with good practices guidelines (see Figure 4.28). Additional contextual information noted in the observation schedule and diary memo were added to these Nvivo annotations (see Figure 4.28).
The gap between current service activities and existing good practices is provided in sections:

- 4.3.2.4 Summary of Assessment Stage and Discussion of Findings
- 4.3.3.4 Summary of Adapted Wheelchair Fitting Stage and Discussion of Findings
- 4.3.4.4 Summary of the Delivery Stage and Discussion of the Findings
- 4.3.8 Key Findings on the Gaps to Apply Best Practices

These were key findings that informed the design of the interventions.
4.4.2.4 Comparison Between WHO Basic and Intermediate Forms

A specific memo was created in NVivo to insert the information concerning the differences in the content between the basic and intermediate level of WHO forms and checklist (See Figure 4.29). All additional information added in the intermediate level were noted and differentiated, also the information contained on the basic level form that was excluded from the intermediate level version. The additional information added to the intermediate form was considered when designing the interventions.

![Comparison of WHO WSTP basic and intermediate forms]

Figure 4.29: Example of comparison between WHO WSTP basic and intermediate forms
4.5 Interventions for Study 3

This section provides details about the interventions designed to Study 3. It describes the information added, excluded or modified from WHO forms and checklist. The interventions consisted of:

- A referral form
- An entry form collecting information about the user environment
- A measurement tape to be given to the user
- An assessment form
- A wheelchair fitting checklist
- A leaflet for the user about pressure sore prevention and care

The intervention was designed to work according to the CReab service functioning. Table 4.46 provides information about the CReab service stages and the interventions designed to each of these stages.
<table>
<thead>
<tr>
<th>Service Stage</th>
<th>Summary of the stage</th>
<th>Suggested Intervention</th>
<th>Intervention Goal</th>
</tr>
</thead>
</table>
| Referral      | Users are referred by primary attention or private care to the CReabs. | • Apply the Referral Form.  
• Handle the User-Environment Information Entry Form and measurement tape. | Standardise information brought by the user to CReabs.  
Collect information from the user environment. |
| Screening     | Users bring their referral, have their requirements quickly assessed and are scheduled to the necessary services. In the case of users in need of a wheelchair, they are scheduled to an assessment stage. | • Apply the Referral Form (if user does not bring one).  
• Handle the User-Environment Information Entry Form and measurement tape (if user does not bring one). | Standardise information brought by the user to CReabs.  
Request information from the user environment (last opportunity to require this information). |
| Assessment    | Users are assessed, measured and a decision is made about the wheelchair. | • Apply the Assessment Form.  
• Receive the User-Environment Information Entry Form. | Identify and record the user clinical, lifestyle and environmental requirements affecting the wheelchair choice. |
| Delivery      | User is fitted in the wheelchair, receive additional information and sign papers to bring wheelchair home should everything is ok. | • Apply the wheelchair fitting checklist.  
• Handle the leaflet for the user about pressure sore prevention and care. | Verify wheelchair fit, register required actions in case wheelchair do not fit, access user pressure sore and provide guidance. |
4.5.1 Interventions for the Referral and Screening Stages

Interventions designed to the referral and screening stage consisted of applying the Referral Form and handling a User Environment Information Entry Form. The referral form (See Figure 4.30) intended first the primary care that refers the users to the CReabs. In case the user arrives at CReab without the suggested Referral Form and the User Environment Information Entry Form, CReab staff should apply these forms at the screening stage. The goal was to standardise the information that user brings to CReabs and support staff to collect information about the user environment that is currently not registered. The Referral Form was divided into five parts, which are:

1. Checklist of CReabs to refer to
2. Information about the person referring
3. Information about the user being referred
4. Information about the reasons for referring
5. Information about the user environment

The Referral Form was adapted from the WHO Wheelchair Referral Form (See Appendix 22). During interviews, 58% of the participants (n=7) responded this form applies to the service offered at CReab without the need for modifications. The other 42% of participants (n=5) responded this form applies to the service offered at CReab, but modifications are required.

The order of the fields follows the WHO Wheelchair Referral Form. It started with a checklist of the three possible CReabs to refer to, followed by their address and contact telephone. WHO WSTP (WHO, 2012) suggests providing the referral sources to the referral form. This field was added to facilitate users to locate the CReabs and remind them to bring the referral, thinking they would need to look for the address.

Following was the field requesting information about the referral person. Adapted from the WHO form was: a field to insert the name of the primary care health unit, and the name of the NASF supporting that unit. This information was added so providers could track and contact primary care staff responsible for the
user care in case additional information was required, facilitating the exchange of information between primary and secondary care.

Next, was the field *information about the user*. The information added was: a field for inserting the user’s *cartão nacional de saúde* number (SUS identification card) and the *prontuário na unidade básica* (the medical record number from basic healthcare unit). These were information frequently collected by CReab staff to locate user information in their systems. Also, a question was added regarding the user ability to sit upright. The last was suggested by participants and added with the intention to facilitate the selection of adapted wheelchair users so that these users could be schedule directly to the adapted wheelchair assessment, avoiding them to attend twice the stage of assessment as it was observed. The option to be contacted by post suggested in WHO form was excluded as CReab service does not contact users by post.

Following was the field requesting *information about the reasons for referring*. A question not included in WHO form was added asking if the user’s current wheelchair was provided by SUS and, if yes, for how long was the wheelchair provided. This question was added to facilitate the service administrators to check the user eligibility for a new wheelchair.

Next, there was a field requesting *information about the user environment*. The entire field was added to the intervention form. It required the user to provide information about the *door size from its residence main entrance, the main bathroom, and the user bedroom*. Also, it investigated if the user residence has access ramp, adapted toilet, stairs and any loose carpet. CReab participants suggested including this information during interviews and were observed asking this type of information during screening and assessment stages. However, the user hardly ever knew the precise measures of doors. Requested by most CReab participants during the interviews, the field asking if the user has agreed to be referred (suggested on WHO form) was excluded from the intervention form.

A warning was inserted in the left margin informing this was a pilot form, asking participants not to reproduce it or use it out of SUS service without previous authorisation. The Portuguese version of the referral form can be found in its original size at Appendix 23.
Figure 4.30: Referral Form designed for Study 3 intervention
The User Environment Information Entry Form (see Figure 4.31) was designed to both primary and secondary level of care. The goal was to use it as a hand out so that user can register the information about their environment requested at the referral form, considering the situation when they cannot provide this information when required, then bringing it to the next service stage. CReab staff was encouraged to deliver the form with a measuring tape (See Figure 4.32) and teach the user or carer how to take the measurements. This information was found to be extremely important as often users and staff participant commented that a delivered wheelchair or bath chair was abandoned or could not be used as intended because it did not pass through the entrance door or other doors inside the house. Two hundred and fifty (n=250) measuring tapes were donated to the CReabs to be used during the intervention test (See Figure 4.32). Besides requesting similar environmental information from the referral form, the entry form contained a reminder for users to bring to the assessment stage the following information about their health condition:

- X-ray from the back and/or the hips
- Medical report about the user diagnostic and/or previous hospitalisation report
- List of medications taken regularly

These were suggested by CReab participants to facilitate the understanding of the user physical condition as many of them does not know how to explain this accurately. A note followed informing users to bring this information just in case they already have them. Lastly, a reminder was added for users to bring their current wheelchair, if they have one. Participants found important to ask for this information to evaluate positive and negative aspects of user's current chair, also to evaluate if they are eligible for a new wheelchair. In case the user chair was provided by SUS within two years, was in good conditions and was still attending the user's requirements, the user might not have the eligibility criteria required by SUS.

The Portuguese version of the User Environment Information Entry Form can be found in its original size at Appendix 24.
Figure 4.31: User Environment Information Entry Form designed for Study 3 intervention

Figure 4.32: Example of measuring tape provided to users
4.5.2 Intervention for the Assessment Stage

The intervention for the assessment stage consisted in applying the *Assessment Form* (See Figures 4.33 and 4.34). This form aimed to identify and record the user’ clinical, lifestyle and environmental requirements affecting the wheelchair choice. Study 2 had revealed that, currently, the service assessment focus on the collection of information regarding the user physical condition. Few useful information that can inform decisions is collected with regards to the user lifestyle and environment (See section 4.3.2.4 Summary of Assessment Stage and Discussion of Findings).

The Assessment Form was adapted using either basic and intermediate version of WHO WSTP Wheelchair Assessment Form. During the interviews, 100% of the participants (n=12) responded that the WHO WSTP Wheelchair Assessment Form basic level applies to the service offered at CReab, but modifications are needed.

Similar to WHO assessment form (See Appendix 25), the assessment form designed for the intervention was divided into two parts: an interview assessment, and a physical assessment. First, it contained a field for the person conducting the assessment to insert its name and the assessment date. Then initiates with the interview assessment, which is divided into the following subjects:

- Information about the user
- Physical condition
- Lifestyle and environment
- Existing wheelchair and bath chair (if a person already has a one)

The field *information about the user* requested minimal information as this should have been collected previously. The information added beyond those in WHO form was the *medical record number from basic health unit*, the *name of the person accompanying the user* and a question *asking if this person is considered the user carer*. The medical record number was added, as it is the user reference number in the service and used to locate user information in the systems used at CReabs. Information about the user carer was added as it was observed a great level of interaction with the person accompanying the user without knowing if they were the user’ carer; and often without asking their names. This question was thought to provide insights on the reliability of the information provided by the accompanying person, hence encouraging the staff to direct the assessment questions
to the user when unsure about the reliability of the information provided by the accompanying person, as suggested in WHO (2012). It was excluded from WHO form information about the user age, gender, phone number and address as these were to be collected in previous stages. The question about the goal, present in this field on WHO form, was moved to lifestyle and environment field, as suggested by many CReab participants.

Following was the field about the user physical condition, divided into the following subjects: diagnosis, level of amputation, and physical issues. All diagnostics contained in both WHO Basic and Intermediate forms were included as CReab staff assesses all users before deciding the need for a standard or an adapted wheelchair. Additional diagnostics added, as suggested by CReab participants, were arthritis and fracture/post-surgical. The last was suggested by participants who mentioned that some users come straight from a hospital stay for fracture/surgery, with little information about a wheelchair and great chances to require an additional referral, such as social service and physiologist. Next, it investigated the levels of amputation. Added to the information from WHO form were the clinical names of the amputations: the disjoint of the knee (removal of the all knee joint and below), the disjoint of the hip (removal of the all hip joint and below). CReab participants suggested identifying a specific clinical level of amputation, which was useful information for other services provided. Following was the physical issues field, which was a field contained only in the WHO intermediate level form. Issues added beyond WHO form was if the user makes use of tracheostomy, gastrotomy, and oxygen. This information was considered important as there were many cases observed where supplier participants had to adapt the wheelchair during the delivery to accommodate devices related to feeding, breathing and speaking.

Following was the field of lifestyle and environment, divided into the following topics: activities/goals, independence, locomotion. This division was new to WHO forms which gather all information under the lifestyle and environment tab. It started with a question regarding the user activities/goals, asking the users to describe why they demand a wheelchair and what activities they seek to achieve with it. The last is suggested in WSTP material but it does not appear in the WHO form. Participants found necessary to add probe questions about the goal as many users struggle to verbalise their aims. The goal investigation is suggested by the WHO forms via an open field called goals at the field information about the user. Participants found this confusing and suggested moving it close to lifestyle field. Added to the independence field were: other independent activities,
other dependent activities, as suggested by CReab participants. They mentioned this investigation helps them identifying the need for additional services, such as rehabilitation, and other ATs offered, such as transferring board.

In the locomotion field, while in WHO form the question asking to describe where the user will use their wheelchair is an open one, in the intervention form this was a close question, as suggested by most participants. The following options were included: internal environment, external environment (with options for rural and urban areas), and other (with a field to describe). Participants thought this would help users with probes and speed up the assessment interview as they mentioned users often do not know what to say. Added to WHO form information was the public transport option by subway. The question of WHO form asking for the type of toilet was deleted in the Study 3 Intervention form, suggested by most CReab participants. They claimed that culturally in Belo Horizonte and probably in most of Brazil, toilets are western style, and SUS does not provide options to adapt the toilet but provides bath chair to be used with the toilet.

Following was the existing wheelchair field. All WHO form questions were maintained and a series of extra questions were added. Questions were added regarding the existing bath chair as this was the most investigated topic by CReab participants during the observed assessments. A question was added asking if the user has a wheelchair and/or a bath chair at home. In the case of a positive answer, a question followed asking for how long the chair is being used. Another question was added asking if the user has a wheelchair at school/care home/other. The following question was added asking if such chair belongs to the user or to the school/care home/other. Next added question was if the user could transport the wheelchair to the school/care home/other. The following question was added asking the characteristics of the wheelchair at school/care home/other. These questions were suggested to predict the need for a bath chair, the age of existing wheelchair, if the user has a spare wheelchair in a different environment than home, and ownership of this wheelchair. Some CReab participants recommended these questions as users might benefit from more than one type of wheelchair as according to their activities and difficulties to transport the wheelchair from main places of activity.

As with regards to the WHO form section to assess the existing wheelchair, a field was added so that the existing bath chair could also be assessed.
The second part of the assessment, the physical assessment, was divided into the following subjects:

1. Presence, risk of or history of pressure sores
2. Seating Posture Control
3. Sensory Information
4. Method of pushing

The field presence, risk of or history of pressure sores contained the same information from WHO form, apart from the question asking if the user is at risk of a pressure sore, which was excluded from Study 3 Intervention form. This was deleted mainly as CReab participants thought this information would not make a difference in the service provision considering the long time a wheelchair deliver can take, hence the risk situation at the delivery would probably be different than the assessed. Also, the information took a large space in the form and was considered less important than other information to be added.

The field seating posture control was entirely developed to Study 3 Intervention form. It contains questions about the user head control, trunk control, and condition of the back and pelvis. These questions were suggested by participants to predict the need for an adapted wheelchair or the need for a PSD. They were adapted from the CReab 3 assessment form.

The sensory information field was also entirely developed to Study 3 Intervention form. It has note fields for inserting any disability the user might have related to vision, hearing, tactile and mental. A close question was added with regards to the user level of cognition, with following options: is lucid/conscious, communicate verbally, communicate with gestures/face expressions, understand what is said to him or her/ sense what is happening in the surroundings, does not interact. These questions were adapted from the CReab 3 form and were suggested by participants to provide insights into the user conditions to operate a powered wheelchair.

The method of pushing contained all the options from WHO form added the methods listed on the OPM list.

The field measurement, contained in the WHO assessment form was excluded as CReabs already had their own measurement form.

The Portuguese version of the referral form tested can be found in its original size at Appendix 26.
## Wheelchair Service Assessment Form

### Part 1: Interview Assessment

#### Information about the user
- **Name:**
- **Medical record n:**
- **Parent / carer’s name:**
- **Is the person accompanying the user carer?** Yes [✓] No [✗]

#### Physical condition
- **Diagnostic**
  - Cerebral palsy [✓]
  - Spinal cord injury [✓]
  - CVA/cerebral thrombosis [✓]
  - Brain injury [✓]
  - Spina bifida [✓]
  - Polio [✓]
  - Muscular Dystrophy [✓]
  - Fracture/post-surgical [✓]
  - Arthritis [✓]
  - Other [✗]

- **Levels of amputation**
  - Transfemoral (above knee: L / R) [✓]
  - Transtibial (below knee: L / R) [✓]
  - Disjoint of the knee (removal of the all knee joint and below: L / R) [✓]
  - Other [✗]

#### Physical issues
- **Spasms or uncontrolled movements** [✓]
- **Muscle tone (high/low)** [✓]
- **Frail** [✓]
- **Hip dislocation** [✓]
- **Fatigue** [✓]
- **Epilepsy** [✓]
- **Pain** [✓], describe location:
- **Bladder problems** (is this managed? Y/N) [✓]
- **Bowel problems** (is this managed? Y/N) [✓]
- **Make use of:**
  - Tracheostomy [✓]
  - Gastrostomy [✓]
  - Oxygen [✓]
  - Other:

#### Lifestyle and environment
- **Activities/goals**
  - Describe why you demand a wheelchair and what activities you seek to achieve with it.

- **Independence**
  - Transfer:
    - Independent [✓]
    - Assisted [✓]
    - Standing [✓]
    - Non Standing [✓]
    - Lifted [✓]
    - Other [✗]
  - Other dependent activities:
  - Other independent activities:

#### Locomotion
- **Where will the user use the wheelchair:**
  - Internal environment [✓]
  - External environment:
    - Rural area [✓]
    - Urban area [✓]
    - Other
- **Distance travelled per day:**
  - Up to 1 km [✓]
  - 1 - 5 km [✓]
  - More than 5 km [✓]
- **Hours per day using wheelchair:**
  - Less than 1 [✓]
  - 1-3 [✓]
  - 3-5 [✓]
  - 5-8 [✓]
  - More than 8 hours [✓]
- **Does the wheelchair user often use public/private transport?** Yes [✓]
  - No [✗]
- **If yes, then what kind:**
  - Car [✓]
  - Taxi [✓]
  - Bus [✓]
  - Subway [✓]
  - Other [✗]
- **When out of the wheelchair, where does the user sit or lie down and how (posture and the surface)?**

### Existing wheelchair, WC, and existing bath chair, BC (if a person already has one of these)
- **Has a bath chair at home?** Yes [✓]
  - No [✗]
- **Has a wheelchair at home?** Yes [✓]
  - No [✗]
  - Use it for how long?
- **Has a wheelchair at school/care home/ other?** Yes [✓]
  - No [✗]
- **WC belongs to the user** [✓]
  - WC belongs to school/care home/ other [✗]
- **Can you transport the WC to the school/care home/ other?** Yes [✓]
  - No [✗]
- **Characteristics of the WC at school/care home/ other:**

---

**Figure 4.33:** Page 1 of the Assessment form designed for Study 3 intervention

---

p. 1/2
### Existing wheelchair condition

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the wheelchair meet the user’s needs?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Does the WC meet the user’s environmental conditions?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Is the wheelchair safe and durable? (Check if there is a cushion)</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Does the wheelchair provide proper fit and postural support?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Does the cushion provide proper pressure relief (if user has pressure sore risk)?</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Comments/Characteristics of the existing WC:

---

If yes to all questions, the user may not need a new wheelchair. If no to any of these questions, the user needs a different wheelchair or cushion; or the existing wheelchair or cushion needs repair or modifications.

### Part 2: Physical Assessment

#### Presence, risk of or history of pressure sores

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous pressure sore?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Current pressure sore?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>If yes, is it an open sore?</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

(Stage 1-4)

Duration and cause:

---

#### Seating/Posture Control

<table>
<thead>
<tr>
<th>Description</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has head control?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Has trunk control?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Situation of femur in relation to the pelvis</td>
<td>Neutro</td>
<td>Anteversion</td>
</tr>
<tr>
<td>Rotation with adduction of the lower limbs</td>
<td>Side inclination to the: right</td>
<td>left</td>
</tr>
<tr>
<td>Situation of the back: Normal</td>
<td>Scoliosis</td>
<td>Is the scoliosis structured?</td>
</tr>
<tr>
<td>Gibbosity</td>
<td>Kyphosis</td>
<td>Is the kyphosis structured?</td>
</tr>
</tbody>
</table>

Comments:

---

#### Sensory information

<table>
<thead>
<tr>
<th>Description</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vision</td>
<td>Obs.</td>
<td></td>
</tr>
<tr>
<td>Hearing</td>
<td>Obs.</td>
<td></td>
</tr>
<tr>
<td>Tactile</td>
<td>Obs.</td>
<td></td>
</tr>
<tr>
<td>Mental</td>
<td>Obs.</td>
<td></td>
</tr>
<tr>
<td>Level of cognition:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is lucid/conscious?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Communicate verbally</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Communicate with gestures/face expressions</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Understand what is said to him/her/sense what is happening in the surroundings</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Does not interact</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

---

#### Method of pushing

<table>
<thead>
<tr>
<th>Description</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>How will the wheelchair user push their wheelchair?</td>
<td>Both arms</td>
<td>Left arm</td>
</tr>
<tr>
<td>Both legs</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Power Wheelchair:</td>
<td>Joystick on the left side</td>
<td>Joystick on the right side</td>
</tr>
<tr>
<td>Chin control</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Head control</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Suck and Blow Switch</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Pushed by a helper</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Finish time:

---

Figure 4.34: Page 2 of the Assessment form designed for Study 3 intervention
4.5.3 Interventions for the Delivery Stage

Interventions designed for the delivery stage consisted in applying the wheelchair-fitting checklist (See Figures 4.35 and 4.36) and handling the leaflet for the user about pressure sore prevention and care (See Figures 4.36 and 4.37). Study 2 results had revealed that: no evidence-based protocols were used by CReab staff at this stage, user posture was not consistently checked, fitting information was hardly recorded, the pressure under the seat bones was not checked and there was no consistency of information passed to users. Interventions aimed to verify the wheelchair fit, register required actions in case wheelchair do not fit, check whether the pressure is safe under the seat bones and any other area at risk, and guide the user regarding both the delivered wheelchair and preventing or treating pressure sores.

The wheelchair-fitting checklist was adapted from the basic version of the WHO WSTP wheelchair fitting checklist (See Appendix 27). During Study 2 interviews, 67% of the participants (n=8) responded this form applies to the service offered at CReab without the need for modifications. The other 33% of the participants (n=4) responded this form applies to the service offered at CReab, but modifications are needed.

The wheelchair-fitting checklist was formed by six tasks or areas to be covered, which were:

- Is the wheelchair ready?
- Check size and adjustments
- Check posture
- Check pressure
- Check fit while the wheelchair is moving
- Action?

These areas were the same from WHO checklist, with few changes made. Initiating with the section ‘is the wheelchair ready?’ While in WHO checklist this topic consists of the single question: ‘Has the wheelchair been checked to make sure it is safe to use and all parts are working?’, in the Study 3 Intervention checklist other two specific verifications were added. One was verifying if the brakes are working. The other was to confirm if the wheelchair was build conforming to the specification regarding head support (headrest), straps, lateral support (trunk side...
pads), and functioning side (in the case of a hemiplegic user). These verifications were added as it was observed that CReab participants did not check systematically if the wheelchair was produced according to the specification, activity suggested by WHO (2012). Also, the wheelchair delivered was not checked for safety and specifications agreed on previous stages.

The next section was ‘check size and adjustments’, divided into the following wheelchair features: seat width, seat depth, footrests height, backrest height, rear wheels position (for hand propelling), seat height (for foot propelling). These were kept similar to WHO checklist apart from the question ‘are the brakes working?’, moved to the section ‘is the wheelchair ready’. Following were the tasks to check posture, check pressure, and action, all kept identical to WHO checklist. Added to the end of the Study 3 Intervention checklist was a reminder to handle the leaflet for the user about pressure sore prevention and care (See Figures 4.36 and 4.37). The leaflet was designed based on the information from chapter 5: pressure sore in the WSTP reference manual for participants, basic level (WHO, 2012). The material content, intended for the wheelchair service personnel, was adapted to a layperson language. The leaflet contains pressure relief techniques and tips on how to prevent pressure sores. This leaflet was included in the Delivery stage intervention as it was observed that most of the CReab participants did not assess or informed users about pressure sores (See Section 4.3).

The Portuguese version of the wheelchair fitting checklist form can be found in its original size in Appendix 28.

The Portuguese version of the leaflet for the user about pressure sore prevention and care can be found in its original size in Appendix 29.
Wheelchair fitting checklist

**Practitioner name:**

**Date of fitting:**

**Starting time:**

### Information about the user

**Name:**

**Medical record n:**

#### 1. Is the wheelchair ready?

- Has the wheelchair been checked to make sure it is safe to use and all parts are working? ☒
- Are the brakes working? ☒
- Was the wheelchair produced as specified? Check: Hearest ☒ Straps ☒ lateral support (trunk side pads) ☒ functioning side (in the case of a hemiplegic user) ☒

#### 2. Check size and adjustments

**Seat width:**

- Hips fit comfortably between armrests or pelvis side pads.
- Trunk fits comfortably between the wheelchair frame backrest tubes or trunk side pads.
- Thighs fit comfortably between the armrests, mud/skirt guards or pelvis side pads and are not pushed together.

**Seat depth:**

- Two fingers’ gap between the back of the knee and the seat/cushion.

**Footrests height:**

- The thighs are fully supported on the cushion with no gaps.
- The feet are fully supported on the footrests with no gaps.

**Backrest height:**

- The wheelchair user has the support they need and freedom to move their shoulders to push (if self propelling).

**Rear wheels position (for hand propelling):**

- The wheelchair user's arm should be in line with the rear axle when hanging down.
- When hands are placed on the push rims, the user's elbows should be at a right angle.

**Seat height (for foot propelling):**

- With the wheelchair user sitting upright, the back should be comfortably supported by the backrest, with feet resting flat on the floor.

---

Figure 4.35: Page 1 of the Wheelchair Fitting Checklist designed for Study 3 Intervention
### 3. Check posture

- Is the wheelchair user able to sit upright comfortably? ✓
- Check posture from the side. ✓
- Check posture from front/back. ✓

### 4. Check pressure

Check pressure under seat bones for all wheelchair users at risk of developing a pressure sore.

<table>
<thead>
<tr>
<th>A</th>
<th>Explain the test to the wheelchair user.</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Ask wheelchair user to lean forward or push up. Place fingertips under wheelchair user's seat bone.</td>
</tr>
<tr>
<td>C</td>
<td>Ask the wheelchair user to sit back down on your fingers. Make sure they sit upright with hands on thighs.</td>
</tr>
</tbody>
</table>
| D | Identify the pressure:  
  **Level 1 = safe:** Finger tips can wriggle up and down 5mm or more.  
  **Level 2 = warning:** Finger tips cannot wriggle, but can easily slide out.  
  **Level 3 = unsafe:** Finger tips are squeezed firmly. It is difficult to slide fingers out. |
| E | Repeat under the second seat bone. |

### 5. Check fit while the wheelchair is moving

- Does the backrest allow the wheelchair user freedom to move their shoulders to push? ✓
- Does the backrest give the wheelchair user enough support? ✓
- Do the wheelchair user's feet stay on the footrests? ✓
- Is the rear wheels position correct for the user? ✓

### 6. Action?

Is there any further action necessary? Write any actions in the wheelchair user's file/medical record. ✓

* Remember to handle the leaflet about pressure sore prevention and care.

Finish time:
How can pressure sores be prevented?

Use a pressure relief cushion:
A pressure relief cushion will help to reduce pressure. Anyone at risk of developing a pressure sore should be given a pressure relief cushion.

Eat well and drink lots of water:
A well-balanced diet with fresh vegetables, fruits and meat can help to prevent pressure sores. Drinking lots of water will help to keep the skin healthy and prevent pressure sores. If you are concerned about your diet, look for a service that can help.

Sit upright:
Sitting upright helps to distribute weight evenly. This reduces pressure under bony parts and helps to reduce sores caused by pressure.

Avoid friction:
Make sure the wheelchair fits correctly and has no rough edges. Be careful when getting in and out of the wheelchair.

Use pressure relief techniques:
Regular pressure relief can be effective in preventing pressure sores. Check the Table on next page for more information about how to relieve pressure.

Avoid moisture:
Change wet or soiled clothing straight away, and do not use a wet cushion. A bowel and bladder management programme can reduce problems with moisture.
Check skin every day:
Pressure sores can develop quickly. It is important to identify a pressure sore quickly and take action. Check your skin every day using a mirror, or ask a family member to check. If you see a red or dark area of the skin take all necessary measures to relieve pressure on that spot immediately.

-----------------------------

While lying or sitting, change positions regularly:
Changing position regularly helps to relieve pressure. For example, change position from sitting to lying. This is particularly important for someone who has a recently healed pressure sore. People who cannot change position by themselves are at risk.

-----------------------------

Pressure relief techniques
You can relieve pressure from the seat bones while in their wheelchair. How you do this will vary, depending on how much strength and balance you have. Check with your therapist which of the following exercises are adequate for you.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A method suitable for most wheelchair users.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Side to side leaning:</th>
<th>Some wheelchair users may hook their arm over the push handle for support.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A method suitable for wheelchair users with limited strength and balance.</td>
<td></td>
</tr>
</tbody>
</table>

Source: ©World Health Organization /Wheelchair service training package, Basic Level. Reference manual for participants

Figure 4.38: Page 2 of the leaflet about pressure sore prevention and care designed for Study 3 Intervention
4.6 Conclusion

This chapter described the functioning of the wheelchair service in Belo Horizonte SUS and how providers gather and use information in order to specify each user's wheelchair. The wheelchair service was analysed in the light of existing good practice guidelines, specifically those from WHO WSTP and HEART study quality indicators.

The study reveals various gaps regarding the application of existing good practices. Key findings were:

- There was no consensus between CReabs staff regarding how to conduct the activities involved in the various service stages.
- Apart from one CReab, there was no use of protocols to assess user requirements. There was no protocol to ensure the necessary areas were covered when fitting the wheelchair to the user.
- Recurrence of similar information passed to user or carer was considerably low. There was no agreement about what kind of information should be passed or who should pass them. Many users ended up not being informed with regards to various topics.
- WHO recommends that the same practitioner should accompany the user through the service delivery stages. At CReabs, this was not guaranteed or encouraged.
- There was no culture to evaluate risk or history of pressure sores as recommended. Also, there was no culture to assess whether the pressure was safe under the seat bones.
- The user positioning in the wheelchair was not thoroughly checked through the service stages as recommended.

In Study 2, interviews collected providers' opinions about implementing the WHO forms and checklist. Two forms and one checklist were selected to be used as a base to design the interventions. These were modified according to the service context, by using information gathered up to that point in the research. The designed interventions consisted of:

- A prescription form
- An entry form collecting information about the user environment
- A measurement tape, to be given to the user
- An assessment form
- A wheelchair fitting checklist
- A leaflet for the user about pressure sore prevention and care
Preparatory stage

Chapter 4  The Wheelchair Services at CReabs

Understand how users are assessed
Investigate the applicability of good practices
Define the interventions

Evaluative stage

Chapter 5  Evaluating & Refining the interventions

Evaluate the interventions
Understand the barriers to the interventions
Refine the interventions
While Study 2 had defined a set of interventions for Belo Horizonte SUS wheelchair service, a subsequent study was necessary to test these interventions. A third study, aiming to evaluate and refine these interventions, was conducted between early July and early September 2015 in Belo Horizonte city, Brazil. This chapter is divided into three sections. Section 5.1 provides details about the research design. Section 5.2 presents the main findings of the study. Section 5.3 gives details on how the results were employed to modify the tested interventions.

A new set of specific research questions were developed grounded on the findings of Study 2. The research inquiries and the methods selected to investigate them are listed in Table 5.1.

### Table 5.1: Rationale for Study 3

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Research Stage</th>
<th>Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>What are the major barriers encountered when testing the proposed interventions?</td>
<td>Study 3, Testing the Interventions in the Wheelchair Service</td>
<td>Participant Observation of the staff using the proposed forms and checklist</td>
</tr>
<tr>
<td>What are the necessary modifications and possible solutions for the implementation of the interventions in CReab Services?</td>
<td></td>
<td>Structured Interview with the staff involved in the WC service.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Focus Group with WC stakeholders voting decisions</td>
</tr>
</tbody>
</table>
5.1 Research Design

Study 3 research plan is further detailed following the structure used in the previous chapters.

5.1.1 Conceptual Framework

Study 3 conceptual framework was described in the Section 4.4.1 to contextualise the design of Study 3 interventions. Refer to the section for more details.

5.1.2 Purpose and Objectives

The purpose of this study was to test the suggested interventions at CReab services and collect the providers’ feedback to refine the interventions and create a set of recommendations for the service. Hence, the study had a formative evaluation purpose (See section 2.4.1.1) as it intended to improve the evaluated service.

The following objectives were set to investigate the study research questions:

- present to CReab participants a summary of previous study results and introduce the study rationale, giving them opportunities to clarify any concerns;
- identify how CReab practitioners make use of the proposed intervention’ tools and the difficulties faced during the initial application;
- collect providers feedback on the proposed intervention’ tools;
- collect providers feedback with regards to the necessary service modifications to implement the intervention and other key good practices guidelines;
- refine the interventions and create a package of recommendations for the service based on the study results.
5.1.3 Methods

Methods similar to Study 2 were considered at this stage of the research to achieve the study objectives (see Section 4.1.4 for details). The selected methods and the rationale behind the selection are described in this section.

- **Participant observation – observer as a participant**, was considered as a suitable method to the following study objectives:
  - Identifying how CReab participants make use of the proposed forms and checklist.
  - Identifying the difficulties encountered during the initial use of the proposed forms and checklist at the different wheelchair service stages.

  As mentioned in previous chapters, in this approach the researcher has its identity revealed and fully engages in the life and activities of the participant without taking part on them (Gill and Johnson, 2002 in Saunders, 2007). This method allows accompanying participants closely during initial implementation, observe how they make use of the form, clarifying any question they might have about using the form and taking notes about their difficulties and other spontaneous feedback. Also, it would allow testing the practicalities of the implementation, such as finding an efficient way to guarantee the forms and checklist utilisation. This was one of the methods selected for Study 3.

- **Semi-structured and fully structured** interviews with providers were both considered as potential methods to study 3 to collect providers feedback with regards to the necessary modifications of the proposed forms and checklist. The fully structured interview was found more appropriate for similar reasons to Study 2. This approach provides participants with equal opportunities to contribute with their feedback to delineate the type of necessary interventions. Selecting this method would also add consistency to the study, as participants would be familiar with it. The fully structured interview was one of the methods selected for Study 3.
• **Delphi technique** was considered as a method to facilitate participants to find consensus to the necessary modifications of the proposed interventions. As previously defined, Delphi technique is a series of sequential questionnaires or ‘rounds’, combined with controlled feedback, which seek to gain the most reliable consensus of opinion of a group of experts (Linstone and Turoff, 1975 in Powell, 2003). The technique was excluded after realising that participants were not necessarily expert in the proposed interventions, which regards to wheelchair service best practices. Study 1 and 2 demonstrated that participants’ knowledge in wheelchair service was limited to their experience and a restricted amount of training undertaken. They do not hold expertise in various wheelchair stages and practices suggested in the good practices. Hence they were not indicated to compose a Delphi technique expert panel. The literature reviewed exposed that wheelchair services are an incipient area in Brazil, in a way that finding a panel that has both wheelchair service good practice experience and SUS experience was unlikely. Considering that was possible to compose such a panel, the time necessary to do it would become unrealistic at such late stage of the research.

• **Focus group** interview using virtual response solutions were considered as a combined method to help participants to vote specific points of intervention where agreement between parts would be ideal. The virtual response solutions allow participants to respond to a poll through digital response cards, as well as applications available for smartphones and tablets (Turning Technologies, 2016). If selected, this method could be used in the following manner. The agenda to be voted would be shown on a screen with possible options to answer. Participants would be given each a remote control to input their votes. Results are instantaneous and could be shared on the screen. Also, if the votes did not achieve an agreement, it could be possible to discuss through the focus group and set additional rounds for non-agreed subjects until participants consensus. If there was no consensus, certainly quality data was to be obtained from the discussion. In order to work, previous analyses of the observations and interviews data would be necessary to identify the agenda for both voting and focus group. This combined method approach was selected to Study 3, but because of unpredicted circumstances, it was not possible to accomplish it (See Section 5.1.3.1.2 Limitations).
5.1.3.1 Design of the Observations

The participant observation in this stage had a different purpose than previous studies. While before the researcher made an effort not to influence the activity, at this stage the activity was directly influenced by the proposed intervention. Despite this, it was kept the observer as participant approach, where the researcher fully engages in the life and activities of the participant without taking part on them. The observations aimed to identify how CReab staff made use of the proposed forms and checklist. Also, it aimed to recognise the difficulties encountered in the initial use of the suggested forms and checklists. The same observation schedule used during the Study 2 was piloted and used in Study 3 with the aim to record:

- How CReab participants make use of the proposed intervention tools.
- The difficulties participants might have while testing the suggested intervention tools.
- Any spontaneous feedback from the participants while testing the suggested intervention tools.
- The measured time participants engage with the user at each observed stage.
- Potential insights to solve recognised issues regarding the service functioning and the proposed intervention implementation.

Verbal protocol analysis was used in conjunction with the observations as participants were encouraged to think out loud and share any difficulties and insights while testing the interventions. Note taking strategies created in previous studies were used to record the observed phenomena effectively.
5.1.3.2 Design of the Interviews

Study 3 interviews aimed to collect providers' feedback with regards to:

- The difficulties encountered during the test of the proposed interventions.
- The necessary modifications of the proposed interventions.
- The benefits of implementing the suggested interventions.
- Likely barriers to an official implementation of the suggested interventions at CReab service.
- Possible actions to overcome likely barriers to an official implementations of the suggested intervention at CReab service.

An interview schedule was designed to cover these subjects and also to take notes from central points discussed during the interviews. The purpose of taking notes at interviews was to facilitate a preliminary data analysis to identify a voting agenda for the focus group.

The interview schedule was divided into two parts. The first part investigated each section of the tested forms and checklist, investigating the participants’ difficulties and collecting their insights to improve each section. The second part of the interview covered the aspects related to the functioning of the service affecting the proposed interventions. Questions were related to the overall difficulties encountered and the necessary modifications to the service functioning if interventions were to be formally implemented. Additionally, questions were made with regards to the benefits of implementing the forms and checklist and if participants would continue to use the pilot version until modifications were made. The original and the translated version of Study 3 interview schedule can be found in Appendix 30 and 31 respectively.
5.1.3.3 Sources of Material

Data collection methods included data obtained specifically for research purposes, including:

- note taking from the users’ care observed procedures;
- digital copy of all proposed forms and checklist used by CReab participants during observations;
- audio recorded from interviews;
- diary from fieldwork activities;
- photographs;
- collection of samples from medical reports, measurement forms filled, AT request form filled and supplier assessment forms filled.

5.1.3.4 Sample and Sampling Strategy

Similar to the previous study, this research stage followed the non-probability purposive sampling strategy, also called theoretical sampling (Robson, 2011, p.275). Purposive sampling uses the selection principle characterised by the researcher’s judgment as according to the research interests or emerging theory (Robson, 2011, p.275). The sample was selected following the lead from Study 1 and 2 analyses, which defined the key staff involved in wheelchair service at CReabs that needed to be included in Study 3 interviews. A total of seventeen (n=17) interviews were conducted with thirteen different participants (n=13). Table 5.2 provides information about which form and checklist interviews had regard to.

Table 5.2: Study 3 sample of interviews conducted at each institution

<table>
<thead>
<tr>
<th>Checklist</th>
<th>CReab1</th>
<th>CReab2</th>
<th>CReab3</th>
<th>AMR</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Referral</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Assessment</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Fitting checklist</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>TOTAL</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>17</td>
</tr>
</tbody>
</table>
For the observations, a total of ninety-three (n=93) users had their care observed and the proposed forms and checklist tested. Extra five observations (n=5) were conducted with the administrative staff without the presence of a wheelchair service user. Cases were excluded from analyses when the proposed forms and checklist were not used. Exceptions was made for the screening stage, on which users observed were not necessarily related to wheelchair services. The opportunity was used to test the practicalities of implementing the interventions by informal conversations with providers. Additional forms used by providers without the presence of the researcher were also collected for analyses. A total of ninety-eight (n=98) observations were conducted and ninety-five forms (n=95) were analysed. Table 5.3 provides further information about the observations conducted and forms collected.

Table 5.3: Study 3 sample of users observed at each stage

<table>
<thead>
<tr>
<th>Stage</th>
<th>CREAB 1</th>
<th>CREAB 2</th>
<th>CREAB 3</th>
<th>AMR</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screening</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>NA</td>
<td>12</td>
</tr>
<tr>
<td>Assessment</td>
<td>17</td>
<td>16</td>
<td>18</td>
<td>NA</td>
<td>51</td>
</tr>
<tr>
<td>Excluded</td>
<td>-1</td>
<td>0</td>
<td>-1</td>
<td>NA</td>
<td>-2</td>
</tr>
<tr>
<td>Adit. forms</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>NA</td>
<td>7</td>
</tr>
<tr>
<td>Delivery</td>
<td>7</td>
<td>4</td>
<td>8</td>
<td>10</td>
<td>29</td>
</tr>
<tr>
<td>Excluded</td>
<td>0</td>
<td>0</td>
<td>-1</td>
<td>-10</td>
<td>-11</td>
</tr>
<tr>
<td>Adit. forms</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Refurbish</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Excluded</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td>Admin</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>NA</td>
<td>5</td>
</tr>
<tr>
<td>TOTAL</td>
<td>34</td>
<td>28</td>
<td>33</td>
<td>0</td>
<td>95</td>
</tr>
</tbody>
</table>
5.1.3.5 Piloting

The observation schedule was tested during the initial cases when the whole process of analyses was simulated. No modification was found necessary. The modifications made to Study 2 also fitted Study 3 observation conditions. A similar procedure followed the interviews. After the first two interviews, minor modifications were necessary to the interview schedule, increasing and structuring the space for taking notes.

5.1.3.6 Ethical Considerations

Participants in this study were healthy individuals, aged 18-65 years, working as occupational therapists and physiotherapists, service administrators, service coordinators and wheelchair suppliers’ staff. The population studied was from Belo Horizonte city in Minas Gerais estate, Brazil. Participants were required to meet the criteria described in Sampling strategy and Piloting section.

Overall, due to the non-invasive character of this second study, potential risks associated with participation were unlikely and of low risk. The risks to the human participants were assessed and ethics approval was conceded from Loughborough University Ethics Committee, Belo Horizonte Municipal Department of Health and at Plataforma Brasil, which regulates research in Brazilian public health institutions as mentioned before. All necessary approvals can be found in Appendix 6.
5.1.3.7 Risk to the Participants

The risks associated with this study were similar to the previous study as methods and participants were mostly the same. Table 5.4 describes these risks and the precautions taken to reduce them.

Table 5.4: Risks to the Participants for Study 3

<table>
<thead>
<tr>
<th>Type of Risk</th>
<th>Likelihood and Precautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Risk</td>
<td>There was little likelihood of any physical risk as a result of participation in this research stage. The participants were not asked to perform any tasks different from their routine that could result in physical harm.</td>
</tr>
<tr>
<td>Psychological risks</td>
<td>The evaluative character of this research stage had a small likelihood of psychological risk as participants could feel the quality of their work was being assessed and that implementation proposed by research could affect their work negatively. To reduce this risk, the interventions’ impact on participants work were calculated, informed to CReab coordinators and approved in advance. All participants were invited to a presentation preceding their participation where the research purpose and methods were clarified. Also, an opportunity was given for enquires about the research process and participation. The presentation was given at all CREABs’s and had the support of their coordination staff. Adding to that, a research summary along with the potential risks, research methods and research questions were all presented in the informed consent form, delivered and agreed in advance to their participation.</td>
</tr>
<tr>
<td>Social risks</td>
<td>There was a small likelihood of vulnerability of the wheelchair users that participated indirectly at the observation stage. Obtaining anticipated formal consent was impractical considering the research design. Exemption of the informed consent form was required and approved by all ethical committees. Nonetheless, at every user’s care observation procedure, CReab participants introduced the researcher to the user, resumed the research intentions and required the user’s free consent. The presentation made at CReabs has revealed once more to be an effective strategy to gain staff support regarding this point.</td>
</tr>
</tbody>
</table>
5.1.3.8 Presentation of Data

The participant’ names were replaced by a corresponding alphanumeric abbreviation as presented in previous chapters (See Table 3.4, p.113). A random number was given to each participant added to the time slot from which the citation was transcribed. For those participants that took part in the previous studies, a new random number was allocated.

Tables containing data source presented in this chapter use the term ‘sources’ in different manners. For the tables referring to the observations, the number of sources exhibited no longer represents the number of cases, i.e. the number of users observed. The reason was that each user observation contained two sources of documents analysed: a digital copy of the filled form or checklist and the filled observation schedule. For Tables related to the interviews, the term ‘sources’ represent the number of participant answering to a specific category. The term references, or just ref., represent a number of times that a category was repeated during observations and/or interviews, similar to previous studies.

Modifications made to the forms and checklists shown in the figures are presented in blue colour to facilitate differentiation.

5.1.3.9 Analysis of Data

Similarly to Study 1 and 2, data collected were analysed using the thematic analysis approach and making use of a variety of grounded theory techniques. Nonetheless, analyses tended to be more deductive at study 3 than previous studies. The main reason was that previous studies had raised hypothetical barriers to the interventions to be proposed. These were used as a parameter to the analyses of Study 3 to confirm or falsify those barriers. Added to that, there was a set of previously defined indicators to be considered when testing the interventions, described both in the observation schedule and interview schedule aims. These were also used as parameters during analyses.

The fact that more deducted approach was used did not mean that it was solely deductive. The inductive approach was still used during data analyses to
identify the themes emerging from these defined parameters. For example, the probability that some fields of the proposed forms and checklist would be left in blank was acknowledged previous to the study. The study design considered this hypothesis and a digital copy of the filled forms was taken for further analyses. However, the areas that were filled, left blank and the categories related to them had to be grounded on the collected forms (See further sections for details). Similar to that occurred in other areas, such as the investigation of the barriers encountered to implement the interventions and the examination of the intervention benefits.

For the same reasons mentioned in previous studies, despite interviews were conducted in the Portuguese language, the categories, memos and names of folders in NVivo were created using the English language.

5.1.3.10 Analyses of Participant Observations Cases

Data collected were analysed using mostly the deductive approach, based on a set of previously defined themes explained earlier. These were refined after the analyses of the first set of collected data. Themes were firstly divided as according to the wheelchair stage investigated and the administrative duties related to each of these stages. Table 5.5 shows the categories representing each of these stages.

### Table 5.5: Categories composing Study 3 observation analyses

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEEDBACK from OBSERVATIONS</td>
<td>149</td>
<td>456</td>
</tr>
<tr>
<td>01 Screening _Referral</td>
<td>23</td>
<td>55</td>
</tr>
<tr>
<td>01_02 ADMIN</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>02 Assessment</td>
<td>93</td>
<td>270</td>
</tr>
<tr>
<td>02_02 ADMIN</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>03 Delivery</td>
<td>45</td>
<td>132</td>
</tr>
<tr>
<td>03_02 ADMIN</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>04 Service Management</td>
<td>12</td>
<td>22</td>
</tr>
</tbody>
</table>
Each wheelchair service stage was assigned a specific subcategory related to the tested forms and checklist and other subcategory related to the service functioning. The aim was to distinguish what had regard to the intervention and what had regard to the service functioning. The category related to administrative duties contained a subcategory related to current problems and other related to good practices and possible solutions (See Table 5.6). The aim was to identify current barriers and solutions specific to the interventions proposed at each stage.

Table 5.6: Sub categories composing Study 3 observation analyses

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEEDBACK from OBSERVATIONS</td>
<td>149</td>
<td>45</td>
</tr>
<tr>
<td>01 Screening_Referral</td>
<td>23</td>
<td>55</td>
</tr>
<tr>
<td>01 Forms &amp; Checklist</td>
<td>14</td>
<td>31</td>
</tr>
<tr>
<td>01 Service Functioning</td>
<td>15</td>
<td>31</td>
</tr>
<tr>
<td>01_02 ADMIN</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>01_02 Current Problems</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>01_02 Good practice &amp; Possible Solutions</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>02 Assessment</td>
<td>93</td>
<td>270</td>
</tr>
<tr>
<td>02 Forms &amp; Checklist</td>
<td>83</td>
<td>214</td>
</tr>
<tr>
<td>02 Service Functioning</td>
<td>32</td>
<td>61</td>
</tr>
<tr>
<td>02_02 ADMIN</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>02_03 Current Problems</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>02_03 Good practice &amp; Possible Solutions</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

The 'Forms and checklist' categories contained subcategories named considerations, with regards to how the forms and checklisted were used. It also contained subcategories named TO MODIFY, with suggestions of modifications identified during the observation period (See Table 5.7). Suggestions were mostly made by CReab participants but also identified by the researcher himself during the observations.
Table 5. 7: Pre-defined subcategories used to evaluate the interventions

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>02 Assessment</td>
<td>93</td>
<td>270</td>
</tr>
<tr>
<td>02 Forms &amp; Checklist</td>
<td>83</td>
<td>214</td>
</tr>
<tr>
<td>02 Considerations</td>
<td>78</td>
<td>196</td>
</tr>
<tr>
<td>02 Field too short</td>
<td>30</td>
<td>43</td>
</tr>
<tr>
<td>02 Filled WRONG</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>02 How form is filled</td>
<td>31</td>
<td>37</td>
</tr>
<tr>
<td>02 NOT Filled</td>
<td>24</td>
<td>96</td>
</tr>
<tr>
<td>02 Staff FEEDBACK</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>02 TO MODIFY</td>
<td>48</td>
<td>66</td>
</tr>
<tr>
<td>02 Possible Solutions</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>02 TO ADD</td>
<td>38</td>
<td>51</td>
</tr>
<tr>
<td>02 TO CORRECT TEXT</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>02 TO EXCLUDE</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

The content of these subcategories was then examined in the second stage of analyses, after all the observation schedules, filled forms and checklists were analysed and coded into the predefined categories. This second stage of analyses used an inductive approach and the subcategories created were grounded on the collected data (See Table 5.8 example).

Table 5. 8: Example of subcategories using the inductive approach to Study 3 observation analyses

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>02 TO MODIFY</td>
<td>48</td>
<td>66</td>
</tr>
<tr>
<td>02 TO ADD</td>
<td>38</td>
<td>51</td>
</tr>
<tr>
<td>Conditions of environment WC will be used FIELD</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>Time since diagnostic FIELD</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>HOW BLADDER &amp; BOWEL is managed FIELD</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Observation FIELD at end of each subject</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Hypotetical WC &amp; BC FIELD</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Levels of dependence OPTION</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Adapted car OPTION</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Partial trunk control FIELD</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Transferring with board OPTION</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
5.1.3.11 Analyses of Interview Cases

Similar to the analyses of the observation cases, the interviews were analysed using the deductive approach to organise the participant’s feedback as according to each form and checklist section, and the inductive approach to identify the themes based on participants’ feedback (See Table 5.9 example).

Table 5.9: Example of subcategories using the inductive approach to Study 3 Interview analyses

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>02 ASSESSMENT FORM</td>
<td>11</td>
<td>161</td>
</tr>
<tr>
<td>01 Information about the user</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>02 Physical condition</td>
<td>10</td>
<td>28</td>
</tr>
<tr>
<td>02 Diagnostic</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>02 Levels of amputation</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>02 Physical issues</td>
<td>8</td>
<td>17</td>
</tr>
<tr>
<td>ADD Respirator</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>ADD tube feeding</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Doubt about IS THIS MANAGED</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Doubt about term FRAIL</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Unsure about term HIP DISLOCATION</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
5.1.3.12 Limitations

The data collected in Study 3 was affected by circumstances that could not be predicted or avoided. In 2015, during the time of the study 3 planning, various sectors in Brazil started suffering from the effects of a social-political and economic crisis (BBC, 2015). It was believed that one of the measures taken by the government to mask the crises was to delay payments to various services and sectors (Beck, 2014; Cucolo, 2015; Costas, 2015). According to the service coordinators, it is very likely that the wheelchair service in Belo Horizonte SUS was affected directly by these measures as some contracts with wheelchair suppliers were delayed by seven months and others not even renewed until the end of the study. Adding to that, the contract with one of the main wheelchair suppliers couldn’t be renewed due to problems with documentation, resulting in further delays to the service provision. These delays happened during the study planning and data collection period. This was acknowledged late when the institutions were being contacted to the final study arrangements. It was then raised the possibility to postpone the data collection until the service was normalised. However, there was no indication or guarantee when this was to occur. This study was planned during the third year of the research, and, postpone it without a determined date would pose serious concerns to the research funding period, which was limited to four years.

There were both positive and negative aspects of the described circumstance affecting the Study 3, which are listed in Table 5.10, as according to each stage.
A collection of additional data was still considered and planned so that all proposed interventions could be tested in similar circumstances and quantity. However, the service did not normalise within the research’ planned period. The researcher then encouraged the providers to send a digital copy of filled the intervention tools after the data collection period to include in the analyses. However, only three (n=3) proposed fitting checklist and six (n=6) assessment forms were sent. Only the fitting checklists were added to the analyses.
5.2 Findings of Evaluative Stage

This section presents the findings of the evaluative stage, which tested the proposed interventions. It is divided into five parts. The first three parts relate to the evaluation of the proposed interventions for the screening, assessment and delivery stage. The last two parts regard to the participant’s perceived benefits after interventions and the necessary adjustments to service to formally implement the proposed interventions.

5.2.1 Evaluation of the Interventions for the Screening Stage

Interventions proposed to the screening stage could not be tested consistently. Only five Referral Forms and one User Environment Information Entry Form were filled. Apart from the reasons explained in limitations section (See 5.1.3.12), there were two other barriers for such few tests. The first was that, to test the referral form, a user needs to show spontaneously to the service with a wheelchair demand, what cannot be predicted. Few wheelchair users appeared to the service with a demand for a wheelchair during Study 3.

Another reason was the resistance from some CReab participants working at screening stage to apply the forms. Participants declared they lack of time and training to do it. CReab coordinators acknowledged that resistance came mostly from those who did not joy in the study presentations. The screening staff was still observed, and the opportunity used to test the practicalities of implementing the interventions and get insights to overcome such resistance.
5.2.1.1 Considerations on How the Forms Were Tested

As previously mentioned, the referral form intended first the primary care referring the users to the CReabs. In case the user arrives at CReab without the standard Referral Form and the User Environment Information Entry Form, CReab participants should apply these forms at the screening stage. Because it was impractical to include primary care to test the form in the study, the CReab screening staff was requested to do it.

In CReab 2, the AT service administrator (ASP:4) suggested filling the referral form herself when staff shows resistance. She agreed to do this to test the form and think a solution for the resistance. She mentioned during observations that the lack of time can indeed be an issue for screening staff but mainly during peak times, which are mostly predictable. During the interview she also mentioned (ASP:4, Author translation):

"Because this was a pilot I did not want to upset the staff as I have just arrived in the administration (staff). Until recently, I was on their side, so I just followed orders. Arrive IMPOSING? (I didn’t want). What I did? I made myself available—for example, yesterday MSP:37 was doing screening and asked me: ‘Should I use the form?’ I said yes. Then she asked me: ‘Should I give the (User Environment Information) entry form?’ ‘Yes’ (I said). She returned later to me and said: ‘This part I did not fill, but I gave (the user) the entry form.’ ‘Ok’ (I said). But when the person is unwilling, I do it myself. So for some staff, I gave the forms, but to others, I didn’t."

P: But do you think that is it possible to implement it to the screening stage in the future?

ASP:4: Yes, totally."

During the observations MSP:37 commented that applying the form in the screening stage should not be a problem and that, currently, screening stage lacks direction. She mentioned that most staff concludes the screening in less than fifteen minutes, but some often take one hour.

ASP:8 mentioned during observations that users or carers should be explained how to take the door measurements as this could be an issue. He suggested that possible mistakes to occur are measuring the door instead of measuring the clear width between the face of the door and the door stop, or measuring
the door with the measuring tape in angle. The error could be enough for prescribing a wheelchair that does not fit the clear width. Because this was spotted early in the observations, it was possible to discuss between ASP:4 and ASP:8 how the user should be trained to measure the door at home and find a solution. This was discussed between the researcher and ASP:4 and ASP:8 until a solution was agreed. It was decided that the measurements should be taken with the tape on the floor to avoid measuring at an angle. It was also decided that the clear width between the face of the door and the door stop should be the space measured as this is the smallest door clearance. Consequently, all the staff observed during the screening stage was trained to explain to the user how to take the measurements. After the explanation, each of them was requested to perform a door measure to make sure they understood the procedure.

It was found that, at CReab 3, the wheelchairs users do not go through a screening stage. When users arrive at reception with a wheelchair demand, they are referred to the administrative staff to schedule an assessment. However, the ASP:7, the admin person in charge of scheduling the users at CReab3, was subcontracted and was not qualified to apply the referral form. It was decided that ASP:7 would only give users the User Environment Information Entry Form and explain to them how to take the measurements. During the final stages of the research, ASP:7 mentioned she handle out various User Environment Information Entry Forms and explained to the user how to take the measures without difficulties.

5.2.2 Evaluation of the Interventions for the Assessment Stage

There was no resistance from any CReab participant to test the wheelchair assessment forms suggested in the intervention. A total of fifty-one (n=51) user assessments were observed, from which forty-nine (n=49) had the form filled and a copy retrieved for analyses. Two cases (n=2) were excluded from analyses. One had the care interrupted and was re-scheduled for assessment with an adapted wheelchair supplier. The other case was excluded because the form copy was lost. Additional seven forms (n=7)-filled outside the period of observation-were collected to add to the analyses. A total of fifty-six (n=56) forms were analysed. Eleven participants (n=11) that were observed using the forms were interviewed after the period of observation regarding the forms functioning.5.2.2.1 Average Care Time Using The Interventions.
One of the providers’ initial concerns about implementing protocols such as
forms and checklist was the hypothesis that these require additional time what
could affect the already long waiting list. Figure 5.1 shows a comparison be-
tween the average care time spent with the user at the assessment stage without
using an assessment form – calculated during Study 2 – and using the assessment
form – calculated during Study 3.

Despite there was a minor increase in the average time spent when using the
assessment form in all CReabs, this increase did not reach statistical significance
(as P>0.5). The chi-square calculation can be found in Appendix 32.

5.2.2.2 Considerations on How the Forms Were Used

The filled forms and observation schedules were collected and analysed
with regards to the way participants used them. Filled forms were analysed
with regards to areas not filled, entry field that was too short, parts that were
filled wrongly and how the form was filled (See Table 5.11). The last was used
to provide insights on how providers can incorporate the form into their
assessment routine.
Table 5.11: Categories regarding the considerations how the form was filled

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>02 Assessment</td>
<td></td>
<td>270</td>
</tr>
<tr>
<td>02 Forms &amp; Checklist</td>
<td>83</td>
<td>214</td>
</tr>
<tr>
<td>02 Considerations</td>
<td>78</td>
<td>196</td>
</tr>
<tr>
<td>02 NOT Filled</td>
<td>56</td>
<td>197</td>
</tr>
<tr>
<td>02 How form is filled</td>
<td>31</td>
<td>37</td>
</tr>
<tr>
<td>02 Field too short</td>
<td>30</td>
<td>43</td>
</tr>
<tr>
<td>02 Filled WRONG</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>02 Staff FEEDBACK</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

With regards to how the form was filled, it was observed that on some occasions participants followed the order of the form, using it uninterruptedly, and in other occasions intermediating within their own assessment routine. This seemed not affect how the form was filled.

It was also observed that on some occasions participants read the checkbox options out loud to the user, and on other occasions, they asked a generic question to provide insights to check the box. When staff read the checkbox options from the form, it was observed that often they only read those checkboxes options they thought likely to represent the user condition. Although both practices appeared to work well in most areas investigated, it presumably affects the quality of the assessment in some specific areas. This seemed to be the case for the following form fields:

- Physical issues
- Transferring method

Another remark had regards to the way participants had modified the questions from the form. In most of the cases, this had a positive effect, leading to an easier understanding of the questions by the user. The poor examples of question approach (See Table 5.12) and the filling behaviour were acknowledged for training purpose (See Table 5.13).
The areas of the form left in blank were acknowledged and grouped by category. Areas that were purposely left in blank were not coded in this category. For example, if the staff had checked that a user can feel normally and had no current or previous pressure sore, then it was expected that the other fields related to the presence, risk or history of pressure sore were to be left in blank, hence they were not coded into the category NOT filled. Thirty-nine (n=39) different subcategories were created based on the non-filled fields of the collected forms. Table 5.13 shows the main fields left blank (complete list in Appendix 33).

The options related to the presence, risk or history of pressure sore stood out from the areas not filled. Also called the attention the entry field related to the sensory information and the option if bladder or bowel problem is managed.
Also noted from the filled forms where the text entry fields that were *too short*. Table 5.14 lists the areas of the form where this was identified.

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>02 Field too short</td>
<td>30</td>
</tr>
<tr>
<td>Diagnostic</td>
<td>12</td>
</tr>
<tr>
<td>User Name</td>
<td>9</td>
</tr>
<tr>
<td>Physical Issues</td>
<td>4</td>
</tr>
<tr>
<td>When out of the wheelchair where it sit or lie</td>
<td>4</td>
</tr>
<tr>
<td>Method of pushing</td>
<td>3</td>
</tr>
</tbody>
</table>

It was observed that in some occasions staff inserted information that was not related to the entry field or was *filled at the wrong entry field* (See Table 5.15). There was a clear confusion between entry fields regarding the characteristics of the users’ *current wheelchair* and the wheelchairs that belong to *school/care home/ other*. Also, information regarding how user managed problems related to bowel or bladder was on some occasion collected but not filled in the form.

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>02 Filled WRONG</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Information collected but not registered</td>
<td>17</td>
<td>19</td>
</tr>
<tr>
<td>if BOWEL or BLADDER problem is managed</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Independence</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Current wheelchair information</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>pressure sore information</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Pain or Pain location</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Seated or Posture control</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>WC Goal</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Current WC FIELD</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>filled at the WRONG place</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Info about current wheelchair</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Use empty field to write observations</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Type of transport used</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>
5.2.2.3 Issues Regarding the Assessment Stage

Although it was not under the scope or focus of this study to raise the overall service problems, these have a direct effect on the quality of the service provided. This section highlights some critical issues related to the assessment stage identified during this research.

A serious issue observed is that users had to return for a second or third assessment on many occasions. The reasons varied. The most current seemed to be the user from adapted wheelchair coming back for an assessment with a specific supplier. Another reason was to have the measurements retaken. This often happened to young users who were still growing and had to wait too long to receive the wheelchair.

Another current problem observed was related to the SISREDE system. Staff frequently complained the system falls frequently. In those occasions staff usually opened a word file so that written notes could be easily copied and pasted into the system later. Alternatively, they used a paper form to take notes of the assessment (See Figure 5.2 example). Various CReab participants complained about one practitioner that writes detailed assessment notes on the paper form. The complaint was that she only updates a simplified resume of the assessment in the SISREDE system, making it difficult for other practitioners to access the user information. Because of this, service coordinators only recommends the use of paper form when SISREDE is not working or when conducting assessments out of CReabs.
Also noted in previous studies was the lack of criteria to provide the power wheelchair, which provision just started during Study 2 data collection. It was evident that the criteria were still not solid and that decisions had a great influence from the practitioner and supplier present at the assessment.

Similar happened to the cushion to relieve the pressure, one of the newest item included in the list. There were still no criteria defined to which users the cushion should be prescribed. Consequently, there are no criteria to differentiate the user profile to receive the simple cushion - paid R$17,38 at OPM list- or the cushion with air cells – paid R$995,00 at OPM list. Adding to this problem is the fact that, as currently observed and reported in this research, CReabs staff did not assess user for pressure sore to prescribe the cushions.
5.2.3 Evaluation of the Interventions for the Delivery Stage

Due to the reasons mentioned in the limitation section, there were a limited amount of wheelchairs delivered during Study 3 data collection period. A total of twenty-nine (n=29) wheelchair deliveries were observed. From these, eleven (n=11) were excluded from the analyses, as the proposed fitting checklist was not used. From these eleven, ten were related to an unusual power wheelchair group delivery made at AMR supplier. Because one of the power wheelchair manufacturer’s staff was passing by Belo Horizonte, the users receiving their power wheelchair were gathered at AMR to obtain information on the usage and maintenance by the manufacturer staff. Nonetheless, due to the rushing aspect of this delivery, AMR and manufacturer staff opted not to use the checklist. Also, there was no CReab participant present in this delivery. Usually, wheelchair delivery occurs at CReab under CReab staff supervision. Nonetheless, power wheelchairs provided by AMR supplier are sometimes delivered in their centre without CReab supervision. Another case observed was excluded from analyses as CReab participants forgot to fill the checklist. Three additional checklists were sent by e-mail after data collection. A total of twenty-two (n=22) forms were analysed.

5.2.3.1 Considerations On How the Fitting Checklist Was Used

Overall, there was no resistance to use the proposed checklist. However, in all observed wheelchair deliveries that the fitting checklist was used (n=18), the CReab participants did not perform the suggested task to check the pressure under the user seat bones (See Table 5.16). When participants were asked, both informally during observations and formally during the interviews, about the reasons for not performing the task, the main reasons given were due uncertain hygiene conditions of the users and the fact they do not know what to do with this information. It worth mention that most CReab participants were either not assessing users for the need of pressure relieve the cushion, one of the solutions for the identification of pressure risk (WHO 2012, 2013).
With regards to the areas not filled in the form, the only major concern had regards to the field Patient Record Number, not filled in twelve forms (n=12), representing around fifty-five percent (55%) of the total forms collected. Most likely reasons are that practitioners already collected patient record number in previous stages. Contributing to this is the fact that patients can be tracked in the system both by their name and patient record number. Table 5.16 also provides details of all the fields not filled in the collected checklists.

Table 5.16: Areas left blank in the collected wheelchair fitting checklist.

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>03 NOT Performed (Check Pressure task)</td>
<td>18</td>
</tr>
<tr>
<td>03 NOT filled</td>
<td>15</td>
</tr>
<tr>
<td>Patient RECORD N</td>
<td>12</td>
</tr>
<tr>
<td>User NAME</td>
<td>3</td>
</tr>
<tr>
<td>Date of fitting</td>
<td>3</td>
</tr>
<tr>
<td>Assessor NAME</td>
<td>2</td>
</tr>
<tr>
<td>Check posture from the side</td>
<td>2</td>
</tr>
<tr>
<td>Check posture from front or back</td>
<td>2</td>
</tr>
<tr>
<td>Check fit while the wheelchair is moving OPTIONS</td>
<td>2</td>
</tr>
<tr>
<td>Rear wheels position (for hand propelling)</td>
<td>1</td>
</tr>
<tr>
<td>Does the backrest allow the wheelchair user freedom to move their shoulders to push</td>
<td>1</td>
</tr>
<tr>
<td>Was the wheelchair produced as specified</td>
<td>1</td>
</tr>
<tr>
<td>Is the wheelchair user able to sit upright comfortably</td>
<td>1</td>
</tr>
</tbody>
</table>
The checklist was used in different manners than expected. Similar to the assessment form, it was observed that CReab participants used the blank spaces to make additional notes in half of the checklists collected (n=11). Figure 5.3 shows notes examples from three different CReab participants.

Figure 5.3: Examples of additional notes made in the checklist
It was also observed in half of the forms collected (n=11) that participants wrote *not applicable* – *não aplicável* or N/A in Portuguese- instead of checking option boxes in various sections of the checklist. Figure 5.4 shows some examples.

![Checklist sections example](image)

**Figure 5.4**: Examples of checklist sections where participants wrote not applicable
Similarly, CReab participants wrote SIM(S) and NO(N) - which means YES and NO in Portuguese - instead of checking the option boxes. This was observed in eight collected forms (n=8) and thirty-nine times (n=39). Figure 5.5 show some examples.

![Checklist examples](image)

Figure 5.5: Examples of checklist sections where participants wrote yes or no

With regards to the *check posture* section of the checklist, some staff apparently had checked the boxes without checking the posture. Others performed only a quick and vague examination.

Only in two of the collected checklists (n=2), participants inserted information in the wrong place. In both cases, they mistake the fields *name of the user* and the *practitioner name*. 
5.2.3.2 Issues Regarding the Delivery Stage

This section highlights some critical issues related to the delivery stage identified during this research.

The lack of criteria for prescribing a pressure relief cushion and the fact that few practitioners currently prescribe them is certainly a critical issue. The delivery stage is the last opportunity in the service cycle for assessing the pressure under seat bones and take the necessary action, such as prescribing a pressure relief cushion, in case something wrong is recognised.

Another difficulty mentioned by ASP:4 during the observations was the fact that the power wheelchairs delivered by AMR supplier happen at their centre without the supervision of the CReab staff. The reason stated was that CReabs doesn’t have an appropriate space to train the users and simulate a diverse environment. Another advantage was that any necessary adaptation could be arranged on the spot with AMR, speeding the process. Nonetheless, ASP:4 commented that the procedure is wrong because is in “good faith”.

During observations, ASP:5 raised an issue with regards to the bath chair provision. She mentioned that bath chairs models are provided in a variety of sizes and models. To know if a bath chair will fit in users’ bathroom, a home visit by a NASF social assistant or CReab staff is necessary. Nonetheless, ASP:5 commented they face resistance from NASF social assistants to commit to anything related to ATs due to their lack of training, consequently their lack of confidence. Adding to this ASP: 5 mentioned that a similar bath chair size could vary its overall width as suppliers often buy different models with different settings. She mentioned it is difficult to rely on the width measures for some bath chair models, increasing the chance of the device be inappropriate to the user environment.

Either ASP:4 and ASP:5 commented that it is still unclear how the adaptation warranty works. Both said suppliers usually made repairs but that this should be clarified in the contract to protect the different parts involved in the service delivery.
5.2.4 Perceived Benefits

CReab participants were asked during interviews about the perceived benefits after applying the interventions. First, they were asked the following question:

- Does the form/checklist have helped to improve the quality of the service offered? How?

Twelve participants answered this question (n=12). Help to specify an adequate wheelchair was the most perceived benefit, mentioned by around sixty-seven percent of the participants responding to this question (n=8). To standardise the service and having more information collected were mentioned by around fifty-eight percent of the participants responding to this question (n=7). Improving the overall communication in the service and helping not to forget to ask or checking information was mentioned by fifty percent of the participants (n=6). Table 17 provides information about these and other perceived benefits mentioned by at least twenty-five percent of the participants (n=3).

Table 5.17: Perceived benefits of applying the interventions

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits for SERVICE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Help specifying an ADEQUATE wheelchair</td>
<td>8</td>
<td>17</td>
</tr>
<tr>
<td>STANDARDIZE the service</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>MORE INFORMATION collected</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Improves communication</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>Help NOT TO FORGET asking or checking information</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Staff SPEAKING the SAME LANGUAGE</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Help IDENTIFYING the need of OTHER ATs &amp; Services</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>REDUCE wheelchair ABANDONMENT</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>GUIDE the ASSESSMENT</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Guide the WC PRESCRIPTION</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Help to ORGANIZE the service</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Help SPECIFYING USER REQUIREMENTS</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Guide the WC DELIVERY</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Improve SERVICE EFFECTIVENESS</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
Another question asked had regard to the perceived benefits for the service user. The following question was asked:

- If any, what benefits do you believe the user will have by implementing this form/checklist in the service?

Twelve participants answered this question (n=12). To provide more adequately wheelchairs to the users’ requirements were mentioned by around fifty-eight of participants (n=7). To help to identify the need for other ATs and services provided were the second most cited topic, mentioned by around forty-two percent of the participants (n=5). A third of the participants (n=4) mentioned the topics: avoid developing or worsening deformities, improves communication with the user and help to specify user requirements. Table 5.18 list all the topics mentioned by participants.

Table 5.18: Perceived benefits for the service users from applying the interventions

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits for the USER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provide MORE ADEQUATED WC to users requirements</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Help identifying the need of OTHER ATs &amp; Services</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Avoid developing or worsening DEFORMITIES</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Improves COMMUNICATION with user</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Help specifying USER REQUIREMENTS</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Saff will be more aware of users requirements</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Improve service trust</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>User will be served by more qualified staff</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>User will make a better usage of the WC</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>facilitate independence at DLA</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Treat better the user</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
5.2.5 Necessary Adjustments in the Service

During the interviews, participants were enquired about the necessary adjustments to the service in order to implement the proposed interventions into the service routine. The most commented topic was making available the digital copy of the forms and checklist, mentioned by around fifty-eight percent of participants (n=7) (See Table 5.19). The digital copy was made available to all CReabs. However, few participants had used it or knew where to find them. It seems that in most cases the CReabs' administrative staff in possession of the files only printed copies and inserted it into the wheelchair service folder. Whether implementing the service in the GESTAO system was an initial concern, few participants suggested it after the test (n=2). A common reason stated was that the system is not reliable enough. Participants mentioned that filling it on the computer and printing a copy to attach to the end user folder is the safest and quickest way to use it.

Table 5.19: Necessary adjustments to implement the proposed intervention in the service routine

<table>
<thead>
<tr>
<th>Name</th>
<th>Sources</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Modifications</td>
<td>13</td>
<td>16</td>
</tr>
<tr>
<td>Regarding the Forms &amp; Checklist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital form</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Scheduling less users</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Organize the service</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Dedicated staff for WC</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Provide Training</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Implementing on digital system</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>MAKE it STANDARD procedure</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Half of the participants (n=6) suggested scheduling fewer users (See Table 5.19). Because this was acknowledged previous to the study, all participants were asked the following question during the interviews:

- Considering a four hours shift, how many users can you provide care without sacrificing the quality of your service?
Twelve participants answered this question (n=12). Participants’ answers varied from four (4) to six (6) users care per four-hour shift. The average response was 4.9 users care per four-hour shift.

Three participants (n=3) mentioned the need for a more organised service. This suggestion was directly related to the fact that often suppliers deliver many wheelchairs at once and the pressure increases for the practitioners to rush their service due the lack of space to store the wheelchairs. Service organisation was also related to the suggestion of having dedicated staff for the wheelchair service, mentioned by three participants (n=3).

### 5.2.6 Using the Interventions After the Research

CReab participants using the interventions proposed were asked the following questions during the interviews:

- At the end of this research stage, until the suggested modifications are made to the form/checklist, do you intend to keep using this form/checklist?
- In what circumstances would you used or not used it? Why?

From the nine participants (n=9) using the Wheelchair Assessment Form and interviewed, eight (n=8) had answered they would keep using the form, and one (n=1) said it would use it only when they have around forty-five minutes available to perform the assessment. Informal conversations with CReab service administrators and coordinators one year after the Study 3 indicates that practitioners in all tree CReabs kept using the Wheelchair Assessment Form.

From the four participants (n=4) using the Wheelchair Fitting Checklist and interviewed, three (n=3) said they would keep using the checklist after the study and one said it would only use for standard wheelchair users. Informal conversations with service administrator and coordinators one year after the Study 3 indicates that only a few practitioners from two CReabs kept using the fitting checklist. Similar happened to the Referral Form and User Environment Information Entry Form, for which the use a year after the study is sporadic among few practitioners.
5.3 Modifying the Interventions

Concluding the analyses of the collected data, the suggested interventions were modified. Similar to the procedure used to design the interventions, its modification was a result of a triangulation process that involved:

- Evaluating the providers’ feedback on the tested interventions.
- Evaluating the providers’ feedback on the current barriers and opportunities.
- Considering the providers’ difficulties to use the interventions.

The modifications were a result of the combination these process. Not all participants suggestions were accepted, neither were the amount of specific feedback always essential to decide whether to modify or not. This was because participants suggestions sometimes contradicted existing evidence-based good practices guidelines. In other circumstances, suggestions made by few participants were either in tune with good practices guidelines or provided a solution for problems identified during analyses. All information collected was valuable to decide whether to modify the form or to recommend providers training.

This section provides details about the modifications made to the forms and checklist followed by suggestions for specific training. The parts modified are exhibited in blue colour to facilitate its identification (See Figure 5.6 example). The final versions of the modified forms translated into English are presented in the Chapter 6 Discussion. The original version in Portuguese is presented in full size in Appendices 34-38.
5.3.1 Modifications to the Referral and Screening Stage Interventions

There were few opportunities to test the content and how CReab staff makes use of both Wheelchair Referral Form and User Environment Information Entry Form. However, the few filled samples collected and both informal and formal interviews provided enough feedback for some improvements.

Modifications were mostly made to the User Environment Information Entry Form. The main modification was providing a more detailed explanation on how to take the door measure. Both text and door figure were modified to illustrate the process agreed with the CReab participants (See Figure 5.6).

The form name was inserted to facilitate internal communication at CReabs (See Figure 5.7). A username entry field was also added as CReab participants were observed inserting the name of the user in blank spaces. This was also thought to support internal service organisation (See Figure 5.7).
The observation field was enlarged as in some of the forms collected the written information did not fit in the entry field space (See Figure 5.8).

Capital letters and bold style were used to call user attention that is not necessary to perform a new examination in case the user does not have the requested information. ASP: 5 advised this during the interviews as she mentioned that CReab users often struggle to understand the written information provided (See Figure 5.9).

With regards to the *Wheelchair Referral Form*, modifications were subtle. Overall, there was a slight enlargement of all the fields by reducing the margin and excluding the information about the pilot form on the left margin.
CReab Centro Sul contact number was updated as recommended by the administrative staff interviewed. The username entry field was enlarged as it was observed to be too short in some collected forms. Similar happened to the user telephone number, which was enlarged so more numbers could be inserted.

Observation fields were added to accommodate notes from additional topics not covered in the referral form, as it was observed. An observation field was inserted at the end of the section *Information about the wheelchair user* (See Figure 5.10). The observation entry field was also enlarged in *Information about the referral* and *Information about the user environment* section (See Figure 5.10). Vocabulary regarding the door measure was changed from *Residence door sizes* to *Clear width measures* (See Figure 5.10). This followed the discussion among participants that door size does not always represent the smallest clear width.

Table 5.20 compiles all the changes made to WHO WSTP Basic Referral Form, the justification for the change and whether the change was supported by the data analyses from the observations, the interviews or review of the literature.
### Table 5.20: Changes made to WHO WSTP Basic Referral form

<table>
<thead>
<tr>
<th>Information added (+), deleted (-) or modified from WHO WSTP basic form</th>
<th>Justification</th>
<th>Supported by</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Field to insert the name of the primary care basic health unit.</td>
<td>Facilitate information exchange between CReabs, NASF and ESF.</td>
<td>Int. Obs. Lit.</td>
</tr>
<tr>
<td>+ Field to insert the name of the NASF supporting basic health unit.</td>
<td>Facilitate information exchange between CReabs, NASF and ESF.</td>
<td>Int. Obs. Lit.</td>
</tr>
<tr>
<td>+ Field to insert the health system’s ID number.</td>
<td>To locate user information in CReab systems.</td>
<td>Int. Obs. Lit.</td>
</tr>
<tr>
<td>+ Field to insert the user’s medical record number.</td>
<td>To locate user information in CReab systems.</td>
<td>Int. Obs. Lit.</td>
</tr>
<tr>
<td>+ Question regarding the user’s ability to sit upright.</td>
<td>Schedule assessment with the adapted wheelchair supplier.</td>
<td>Int. Obs. Lit.</td>
</tr>
<tr>
<td>+ Question if the user’s current wheelchair was provided by SUS.</td>
<td>Check the user eligibility for a new wheelchair.</td>
<td>Int. Obs. Lit.</td>
</tr>
<tr>
<td>+ Field to request information about the user environment</td>
<td>Inform decisions. Avoid AT discontinuance.</td>
<td>Int. Obs. Lit.</td>
</tr>
<tr>
<td>- Option to contact users by post.</td>
<td>Service does not contact users by post.</td>
<td>Int. Obs. Lit.</td>
</tr>
</tbody>
</table>
5.3.2 Modifications to the Assessment Stage Intervention

Initial modifications to the assessment form tested were made at the user’s name entry field. This was enlarged as there was not enough space to insert the username in around sixteen percent (16%) of the collected forms. The medical record number entry field was reduced as it was observed that the space was too large (See Figure 5.11).

![Figure 5.11: Initial modifications to the assessment form](image)

Following modifications related to the Diagnostics field, under the Physical Condition section. An entry field to insert the time since diagnosed – Diag. Time – was added. Four CReab participants (n=4) were observed asking these questions, two of them (n=2) also suggested the entry field inclusion during the interviews. The information appears to be relevant to predict the user level of experience in the wheelchair when analysed in conjunction with the current wheelchair information collected. An observation entry field was added at the end of the Diagnostic section. This was found necessary to accommodate additional notes staff was observed making about the diagnostic in the form. Also, this could be used to complement the entry field other when space is not enough, as it was observed in twenty-one percent (21%) of the filled forms (See Table 5.14).

The options of the field Levels of amputation were reordered as according to the height of the amputation, starting from the hips downwards, as suggested by one of the CReab service coordinators. An observation entry field was added at the end of Level of amputation section to accommodate additional notes staff was observed making.

In the section Physical issues, two options were added to the sub-section Make use of. The options added were Feeding tube and Respirator. Two CReab participants suggested including these options during the interview.
suggestion made sense as it was observed in the previous study that supplier participants often get to know about adapting the wheelchair to accommodate such devices at the delivery stage. Despite one supplier had a structure to make these adaptations on the spot during the delivery this was not the reality for all other suppliers. Collecting this information in advance can reduce the chance of additional adapting stages after the wheelchair delivery. Figure 5.12 shows the modifications made to the **Physical condition** section.

**Figure 5. 12: Modifications made at Physical condition section of the assessment form**

Modifications to the section **Lifestyle and environment** started at the **Activities/Goals** subsection. After the field **Describe why you demand a wheelchair and what activities you seek to achieve with it**, a parenthesis was added suggesting the practitioner to investigate the goal in relation to user’s work, study and leisure context (See Figure 5.13). In the majority of the cases observed the users provided oversimplified information and CReab participants did not probe further details. AAATE suggests investigating the users’ work, study and leisure context as the basis of the AT’ theoretical context of use (Andrich, et al., 2013).

**Figure 5. 13: Modifications made to the subsection Activities/Goals of the assessment form**
The next modification was moving the question *When out of the wheelchair, where does the user sit or lie down and how (posture and the surface)*? from the subsection *Locomotion* to *Independence*. Three CReab participants (n=3) made this suggestion during the interview. One of the participant’s comments was decisive to make the change. MSP:31 (5’-11’) commented:

“I would put (the question) how the user sits at home at the beginning of the investigation regarding its independence. (Because) if he can sit and how he stays sit (at home) tells me a lot about his level of independence.”

The following question was added to the section regarding the transfer method: *Would user benefit with the use of a transfer board?* followed by the checkbox options Yes, No and *Already has*. This question was added as transferring board is another item recently included in the OPM list. Nonetheless, CReab participants did not investigate the need for a transferring board in any of the user assessments observed. Following, the investigation of other dependent and independent activities was changed to the investigation of dependent and independent activities of daily living –ADL and instrumental activities of daily living –IADL. Two CReab participants (n=2) suggested this modification. The ADL includes tasks that are required to get going in the morning, get from place to place using one’s body, and then close out the day in the evening (Weston, 2009). Examples are walking, bathing and dressing. The IADL are the activities that people do once they are up, dressed, put together, such as cooking, driving, shopping (Weston, 2009). The suggestion was accepted to encourage further probing, as these fields were underused.

The following question was added after IDLA/DLA investigation: *Would user benefit with the use of an activity table?*. This is another item recently added to the OPM list. This was previously assessed only for wheelchairs provided by a specific supplier that provided the activity table without additional costs to the service. Even though, there were some observed cases during Study 2 where CReab participants only identified the need for an activity table when the supplier was delivering the wheelchair. Figure 5.14 shows the modifications made to *Independence* subsection.

![Independence](image)

**Figure 5.14: Modifications made to the subsection Independence of the assessment form**
In the *Locomotion* subsection, first modification had regard to the question *Where will the user use the wheelchair?*. A parenthesis was added to the observation entry field suggesting staff to investigate if users intend to use the wheelchair at *work, study or leisure* environment. This was thought to reinforce the previous investigation about the *activities and goals*. The question *Does the wheelchair user often use public/private transport?* was deleted from the form. It was observed that in around 14% of the cases (n=8) this question’ checkbox was left blank (See Table 5.13). Also, around 14% of the cases (n=8) CReab participants filled the subsequent question *If yes, then what kind* although user said it does not use public/private transport often. Hence, these questions were reduced to *Types of transport used* with the same checkbox options from the previous form. An *observation* entry field was added at the end of Locomotion subsection to accommodate additional notes that participants were observed making.

![Figure 5.15: Modifications made to the subsection Locomotion of the assessment form](image-url)

The section *Existing wheelchair* - *WC* and *existing bath chair* – *BC* suffered various modifications. First modification had regard to the bath chair inquire. Instead of asking if user *Has a bath chair at home?* The question was changed to *How do you bath?* Followed by the probing question *Need a bath chair?* This was suggested by two of CReab most experienced practitioners during observations and also at the interviews. MSP:31 (11’-15’) noticed:

“So, (to ask) has a bath chair at home? the HAS A BATH CHAIR worries me a lot. Worries me in a sense of=maybe the question could be: How do you bath? ‘I bath with a stool and it works well’, understand? If I ask: ‘Has a bath chair at home?’ the user will say: ‘No I don’t, can you give me one?’ If the bath method is working this is no longer a problem, I don’t need to throw him a bath chair that can be very bulky in his bathroom.”
The following modification had regard to the current wheelchair-probing question *Use it for how long?* CReab participants noted during observations that this question might cause ambiguity as it could be understood either how long does user use their current wheelchair as how long user uses a wheelchair. The original intention was to predict the age of the current wheelchair, as there is a minimum period of two years to change the wheelchair provided by the service. The question was changed to *Age of the current wheelchair*.

The following questions and checkboxes were excluded:

- *Has a wheelchair at school/care home/other?*
- *WC belongs to the user*
- *WC belongs to school/care home/other*
- *Can you transport the WC to the school/care home/other?*

The reason for excluding these options was that around 41% of these fields were filled wrongly or at the wrong place. Five CReab participants (n=5) said during the interviews that these questions were confusing. Despite improving the questions was still a possibility, the information was not considered essential. A checkbox option *Loan/Donation* was added to the question *Has a wheelchair?* as various users were observed saying their current wheelchair was donated or loaned (See section 4.2.4 Conditions of the Users’ Wheelchair). The observation field *Characteristics of the WC at school/care home/other* was changed to *Characteristics of the current WC/BC*.

The only modification made at the section *Existing wheelchair condition* had regard to the checkbox for the question *Does the cushion provide proper pressure relief (if user has pressure sore risk)?*. The checkbox was aligned with the previous question checkboxes. The reasons for this was that this question was left blank in around 20% of the cases (n=11) under the hypothesis that CReab...
participants confounded as a question related to the bath chair (due to the Gestalt principle of proximity). It is also believed that it was left blank because staff had no training to assess if the user has a pressure sore risk. Figure 5.17 shows the modification to the Existing wheelchair condition section after the modification.

Figure 5. 17: Modification made at section Existing wheelchair condition

Modifications to the second part of the form, the physical assessment, started at the section Presence, risk of or history of pressure sores. Two parts were added to this section. First, the question excluded from WHO form Is this person at risk* of a pressure sore? was inserted back into the form. The reason was that this information helps to define criteria to provide a pressure relief cushion, recently added to the OPM list. Second, the following question was added: Would user benefit with the use of cushion to relieve the pressure? If yes, describe the model (See Figure 5.18).

Figure 5. 18: Modifications made to the section Presence, risk of or history of pressure sores.
There were no modifications to the section *Seating/Posture Control* section. With regards to the *Sensory Information* section, the observation entry fields related to each of the senses were excluded and one general observation entry field was added instead. The reason was that around 41% of the filled forms (n=23) CReab participants had checked these boxes but did not insert any observation in the entry field.

Lastly, modifications to the *Method of pushing* section were two. First, the option *Pushed by a helper* was moved to the beginning of the section. Two CReab participants (n=2) suggested this to avoid confounding that *pushed by a helper* is part of the *Power Wheelchair* options (Gestalt principle of common region). The text *Power Wheelchair* was made bold to emphasise that final options are all related to it.

Table 5.21 compiles all the changes made to WHO WSTP Basic Wheelchair Assessment Form, the justification for the change and whether the change was supported by the data analyses from the observations, the interviews or review of the literature.
Table 5.21: Changes made to WHO WSTP Basic Wheelchair Assessment Form

<table>
<thead>
<tr>
<th>Information added (+), deleted (-) or modified from WHO WSTP basic checklist</th>
<th>Justification</th>
<th>Supported by</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Field to insert the user’ medical record number</strong></td>
<td>To locate user information in CReab systems</td>
<td>Int. Lit. Obs.</td>
</tr>
<tr>
<td><strong>Field about accompanying person</strong></td>
<td>Improve interaction with accompanying person</td>
<td></td>
</tr>
<tr>
<td><strong>Question asking if the accompanying person is the user carer</strong></td>
<td>Investigate reliability of information provided by the accompanying person</td>
<td></td>
</tr>
<tr>
<td><strong>Information about age, gender, phone number and address</strong></td>
<td>Avoid rework. Info is collected in previous stage</td>
<td></td>
</tr>
<tr>
<td><strong>Question about the goal moved to lifestyle and environment field</strong></td>
<td>Made more sense to most participants</td>
<td></td>
</tr>
<tr>
<td><strong>Probes work, study and leisure context were added to goal question</strong></td>
<td>Collect detailed information as users often simplify their answers</td>
<td></td>
</tr>
<tr>
<td><strong>Diagnostics contained in WSTP Intermediate level were added</strong></td>
<td>There is no distinction between users during the assessment stage</td>
<td></td>
</tr>
<tr>
<td><strong>Additional diagnostics added were arthritis and fracture/post-surgical</strong></td>
<td>Support user referral to additional services</td>
<td></td>
</tr>
<tr>
<td><strong>Field to insert time since diagnosed</strong></td>
<td>Predict the user level of experience in the wheelchair</td>
<td></td>
</tr>
<tr>
<td><strong>Detailed clinical names of the amputations</strong></td>
<td>Information is useful for other services provided</td>
<td></td>
</tr>
<tr>
<td><strong>Q: If the user makes use of devices such as tracheostomy, gastrostomy, oxygen, feeding, respirator</strong></td>
<td>Identify necessary adaptations to accommodate devices used</td>
<td></td>
</tr>
<tr>
<td><strong>Q: why user demands a wheelchair and what activities they seek to achieve with it</strong></td>
<td>Investigate further the user goals with the wheelchair</td>
<td></td>
</tr>
<tr>
<td><strong>Field dependent and independent activities of daily living and instrumental activities of daily living</strong></td>
<td>Investigate further the user level of independence. Support user referral to additional services and devices.</td>
<td></td>
</tr>
<tr>
<td><strong>Q: Would user benefit with the use of a transfer board?</strong></td>
<td>Investigate user need for AT devices provided by SUS</td>
<td></td>
</tr>
<tr>
<td><strong>Q: Would user benefit with the use of an activity table?</strong></td>
<td>Investigate user need for AT devices provided by SUS</td>
<td></td>
</tr>
<tr>
<td><strong>Changing Q: where the user will use their wheelchair? to a close question.</strong></td>
<td>Speed up assessment interview. Help users with probes</td>
<td></td>
</tr>
<tr>
<td>Information added (+), deleted (-) or modified from WHO WSTP basic checklist</td>
<td>Justification</td>
<td>Supported by</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>- Type of toilet</td>
<td>Culturally in Belo Horizonte toilets at people homes are western style</td>
<td>Int.</td>
</tr>
<tr>
<td>+ Q: How do you bath? Need a bath chair?</td>
<td>Investigate user need for AT devices provided by SUS</td>
<td></td>
</tr>
<tr>
<td>+ Q: Has a wheelchair?</td>
<td>Investigate further the need for a new wheelchair</td>
<td></td>
</tr>
<tr>
<td>+ Characteristics of the current WC/BC</td>
<td>Understand what works and what don’t in current wc/bc</td>
<td></td>
</tr>
<tr>
<td>+ Q: Would user benefit with the use of cushion to relieve pressure?</td>
<td>Investigate user need for AT devices provided by SUS</td>
<td></td>
</tr>
<tr>
<td>+ Section seating posture control</td>
<td>Predict the need for an adapted wheelchair or the need for a PSD</td>
<td></td>
</tr>
<tr>
<td>+ Section sensory information</td>
<td>Evaluate user condition to operate a powered wheelchair</td>
<td></td>
</tr>
<tr>
<td>+ Powered wheelchair methods of pushing</td>
<td>Investigate user need for AT devices provided by SUS</td>
<td></td>
</tr>
<tr>
<td>+ Observation field on various sections</td>
<td>Accommodate participant notes often made in the form</td>
<td></td>
</tr>
</tbody>
</table>
5.3.2 Modifications to the Delivery Stage Intervention

Modifications to the delivery stages intervention were mostly related to the wheelchair-fitting checklist. First change had regard to how to fill in the form, as different behaviours were observed on this matter. A variety of checklist filling behaviours’ were observed that can create confusion among CReab staff, especially considering that same user is cared for by different practitioners through wheelchair service. Hence any document related to a user is shared among all staff.

Suggestions on how to fill in the checklist were made to sections one and two of the form. For the section 1. Is the wheelchair ready?, it was suggested that boxes were checked and options in brackets were circulated (See Figure 5.20). A specific suggestion was made on how to fill the options to the question Was the wheelchair produced as specified?. The suggestion was to verify and check all the items to be delivered. This was made to avoid confusion between what was specified, what has been checked and what has been delivered. Additionally, all the possible specification options from OPM list were added. The options wheelchair Model and wheelchair Size were also added. Two of the most experience CReab staff mentioned during the interviews they had issues with wheelchair model and size delivery in the past, and there was no record to indicate who was wrong.

Figure 5.20: Modifications to the wheelchair fitting checklist section Is the wheelchair ready?

For the sections 2. Check size and adjustments and 5. Check fit while the wheelchair is moving it was suggested that boxes should be filled with the options Yes (Y), No (N) or Not Applicable (n/a)(See Figure 5.21 and 5.22). The first reason is that several of the examination options are not applicable if the user
does not push the wheelchair. Because of that, various participants wrote not applicable in half of the forms collected \( (n=11) \). Also, it was observed that CReab participants wrote Yes or No instead of checking the option boxes in several of the collected forms \( (n=8) \). This provides further insights into the necessary actions.

An observation entry field was added at the end of each section (See Figures 5.20, 5.21). The reason for this was that participants were observed using the blank spaces to make additional notes in half of the collected forms \( (n=11) \). All the participants interviewed with regards to the fitting checklist also suggested adding an observation entry field so they could make notes about fitting issues identified in each section.

The same question added to the assessment form with regards the need of cushion to relieve the pressure was added to the fitting checklist at the end of Section 4. Check pressure section (See Figure 5.23). The reason was that this is the last opportunity to prescribe pressure relief cushion considering the current wheelchair service cycle. Also, associating the question to the check pressure section would make it clear the need to assess users pressure sore to prescribe a pressure sore cushion.
As noted in previous findings, most CReab participants didn’t see the purpose of checking pressure sore and didn’t prescribe pressure cushion although they were available.

**Figure 5.23: Question added to section 4. Check pressure**

It was suggested that the checkbox related to the section 6. Action? should be filled with the options Yes (Y) or No (N) (See Figure 5.24). It was also suggested that necessary actions should be written in the observation entry field and the wheelchair users’ file. This is because the checklist should be used to support the CReab staff to resume the user care in the SISREDE system. Several participants were observed writing actions or observations about the care at this part of the checklist.

**Figure 5.24: Modifications to the sections 6 and 7 of the fitting checklist**
Lastly, the note *Remember to handle the leaflet about pressure sore prevention and care,* was turned into section 7, with a checkbox included (See Figure 5.24). The reason was to avoid CReab staff forgetting to deliver the leaflet as it was observed.

When modifying the interventions, it was raised the possibility to design two checklists, one for standard wheelchairs and other for adapted wheelchairs, as it is the case of WHO forms and checklist. However, WHO checklist for adapted wheelchairs contains several PSD terms explained in WSTP Intermediary level. Using PSD terms without introducing them was thought to confuse CReab staff. Also, by the time of the modifications WSTP intermediary level was not translated in the Portuguese language. A future upgrade of the checklist should consider this issue.

Table 5.22 compiles all the changes made to WHO WSTP Basic Wheelchair Fitting Checklist, the justification for the change and whether the change was supported by the data analyses from the observations, the interviews or review of the literature.

<table>
<thead>
<tr>
<th>Information added (+), deleted (-) or modified from WHO WSTP basic checklist</th>
<th>Wheelchair Fitting Checklist</th>
<th>Justification</th>
<th>Supported by</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>Suggestions on how to fill in the checklist</td>
<td></td>
<td>Standardise how to fill in due to great differences observed</td>
</tr>
<tr>
<td>+</td>
<td>Field verifying if the brakes are working moved to section is the wheelchair ready?</td>
<td></td>
<td>Made more sense to participants to evaluate all safety items first</td>
</tr>
<tr>
<td>+</td>
<td>Field to verify if the wheelchair was build conforming to the specification (wheelchair model, size and parts listed)</td>
<td></td>
<td>There is no previous stage for specification check before the delivery</td>
</tr>
<tr>
<td>+</td>
<td>Q: Would user benefit with the use of cushion to relieve pressure?</td>
<td></td>
<td>Investigate user need for AT devices provided by SUS</td>
</tr>
<tr>
<td>+</td>
<td>Reminder to handle the leaflet for the user about pressure sore prevention and care</td>
<td></td>
<td>Provide user with information about pressure sore prevention and care</td>
</tr>
<tr>
<td>+</td>
<td>Observation field added to end of each section</td>
<td></td>
<td>Accommodate participant notes often made in the form. Make notes about fitting issues identified</td>
</tr>
</tbody>
</table>
5.3.3 Suggestions for Future Training

During analyses of Study 3 data and modifications of the suggested interventions, it was recognised that training was necessary to effectively implement the modified interventions in the service and overcome existing barriers. This section provides details from the suggested training. It should be clear that implementing this training was not under the scope of this research.

Overall, the training was based on various factors such as specific parts of the intervention CReab participants had difficulty, or lack of knowledge to perform the suggested tasks or areas that were often left blank in the collected forms and checklist. Most of the training suggested can be achieved using the resources from WSTP basic level, available in the Portuguese language.

5.3.3.1 Training Regarding the Referral Form

Training regarding the Referral form should focus mostly on raising the awareness for the importance of the information collected at this stage and how to obtain information about the user environment. Training should aim practitioners working at screening stage at CReabs and practitioners from the primary care, such as ESF and NASF team that are indirectly involved in the wheelchair service. Nonetheless, it is ideal that training is provided to all SUS staff involved in the wheelchair service, including the suppliers.

CReab staff should be trained first so that crucial practitioners can train NASF and ESF teams. MSP:31, who was one of the most experience CReab staff practitioner, suggested that each CReab should train the NASF staff covering the area related to their CReab. This would facilitate organising the training at CReab level.
Training should teach how to measure the clear width between the face of the door and the door stop. Also, it should highlight the importance of collecting the user environment information and the negative impact of not doing it. The research recognised at least three negative implications for not taking the user environment information, they were:

- The risk of the wheelchair and bath chair not fitting the user home environment.
- Discontinuance of the provided wheelchair and bath chair.
- Waste of public resources when the device is discontinued.

5.3.3.2 Training Regarding the Assessment Form

The first section of the assessment form requiring training is the Physical Condition. It was observed that participants did not circulate the options if Bowell and Bladder problems were managed or not in around twenty percent (20%) of the collected forms where these options were marked (See Table 5.15, p.285). It was also observed that participants often investigated if these problems are managed but did not circulate the option in the form. Four participants (n=4) had commented difficulty to understand what ‘Is this managed’ means. Training should provide information on Bowell and Bladder issues and how to manage it.

Also, in the Physical Condition section, seven participants (n=7) questioned what should be considered as Frail. Training should provide further details on what should be considered as frail when checking this option. Overall, practitioners should be encouraged to read all the options of the sub-section Physical Issues to the user.

Moving to the Lifestyle and Environment section, four participants (n=4) reported having difficulty in differentiating the transfer’ options Standing and Lifted. Eight (n=8) out of the eleven participants interviewed had reported difficulty to help users to guess the distance travelled per day in their current wheelchair. This field was left blank in twenty-five percent (25%) of the filled forms (n=14). Training should consider these facts.
Overall, the assessments of the *existing wheelchair condition* observed in Study 2 and 3 were superficial. It was observed that most staff only read the questions to the users’ without having a look at their wheelchairs. Also, there were few probing questions to get to investigate why user said no to any of the questions, as it is suggested by WSTP (2012). Training should encourage the staff to assess the wheelchair in conjunction with the user, probing the reasons when the user says it does not attend a specific aspect, instead of just reading the questions.

Assessing the *presence, risk of or history of pressure sores* was the part of form participants expressed more resistance. The entire section was not filled in around twenty-one percent (21%) of the collected forms. Additionally, the *figure to illustrate where the user does not feel or have current or previous pressure sore* was left blank in eighteen forms (n=18) where staff had checked these boxes. In other seven forms (n=7) the checkbox option *Can feel normally* was left empty. Also, only two forms had the *pressure sore stage* described. When interviewed, seven participants (n=7) said they lack the training to assess pressure sore. Six staff participants (n=6) said they had doubt how to use the illustration figure or did not realise they were part of the assessment. Pressure sore assessment training was suggested and training material sent to CReab service coordinators two months before the data collection period. Nonetheless, none of the CReab had conducted the training. Pressure sore assessment training is now essential to prescribe the recently included cushions to relieve the pressure.

Five participants had reported difficulty in measuring or making notes regarding *tactile* related disability. Training should define what should be considered as a *tactile* disability.

Lastly, during observations, some participants commented they never thought about the possibility to *push the wheelchair with the legs*. It was also observed they often ask: - which arm do you use to push the wheelchair? Asking in such way discourages the user to mention the legs. Training should encourage the staff to read all the *pushing methods* options for the user.
5.3.3.3 Training Regarding the Wheelchair Fitting Checklist

Training regarding the use of the wheelchair fitting checklist should focus on raising the awareness of its use and the importance to check the pressure under the user seat bones. The last was identified as the main participants' difficulty and it was not performed in any of the observed deliveries. The main reasons reported were due to the uncertain hygiene conditions of the users and the fact they do not know what to do with this information. With regards to the hygiene conditions of the user, it was observed that all the rooms where wheelchair service is conducted are equipped with rubber gloves and gel alcohol, which seems to be enough to avoid contamination due to bad hygiene condition of the user. The test does not require the users to take its close out but to lean forward so the practitioner can place its fingertips under wheelchair user’s seat bone to verify the pressure exerted on the seat. This test eliminates the existing problem of having no criteria defined to which users the pressure relief cushion should be prescribed. It also eliminates the issue of CReab staff not knowing what to do with the information collected from the test.

The training should also encourage staff to check the posture and ask users if they are able to sit upright comfortably. It was observed that some staff checked the boxes without clearly checking the posture as requested, and others performed only a quick and vague examination. Overall, staff should be encouraged to check the wheelchair size, fit and adjustments more carefully, considering the good practices provided in the checklist.

Lastly, the training should also highlight the suggestions on how to fill in the form in order to establish a common language and effective communication in the service.

The updated version of the WSTP –available in Portuguese- brings detailed explanation with regards to each of the checklist section, potential problems that may arise during the wheelchair fitting and likely solution for these problems. The material should be used in training or as reference material at CReabs.
5.4 Conclusion

Study 3 was conducted to evaluate and refine the interventions adapted from the WHO forms and checklists in Study 2. A total of ninety-eight (n=98) observations were conducted and ninety-five forms and checklists (n=95) were analysed. Participants using the interventions and CReab administrative staff involved in the wheelchair service were interviewed after the period of observations to provide their feedback. A total of seventeen (n=17) interviews were conducted with thirteen different staff practitioners (n=13).

Some participants resist testing the interventions for the screening stages saying they lacked time and training to use them. Most resistance came most from participants who were not involved in the previous studies or had not participated in the study presentations. The main modification to the interventions for the screening stages was to clarify how to collect user environment information. The need for training was acknowledged to implement the modified interventions at CReabs formally. Such training should focus on how best to obtain the user environment information.

All participants received the intervention designed for the assessment stage well. Although there was a minor increase in the average time spent using the assessment form in all CReabs, this did not reach statistical significance (as P>0.5). The sections related to the presence, risk or history of pressure sores stood out from the areas not filled in the collected forms, showing the urgency for training, especially considering that the service can now provide cushions to relieve pressure. Various modifications were made to the assessment form. One of the most important was investigating the need for ATs recently added to the OPM list that are directly involved with wheelchair use. Training was also needed to consistently implement the modified interventions at CReabs. This training should focus on how to assess pressure sores, and on specific parts of the forms participants had difficulty with.

Overall, there was no resistance to using the wheelchair fitting checklist. However, participants did not perform the suggested task to check the pressure under the user seat bones. A significant modification was to insert an observation entry field at the end of each section to accommodate participants’ notes. Training regarding the use of the checklist should focus on raising the awareness of its purpose and the importance of checking the pressure under the user's seat bones. Overall, staff should be encouraged to check the wheelchair size, fit and adjustments more carefully, considering the good practices provided in the checklist.
Defining the research

Chapter 1 Introduction
Chapter 2 Literature Review

Exploratory stage

Chapter 3 Finding a Research Focus
Chapter 4 The Wheelchair Service at CReabs
Understand the Wheelchair Service

Preparatory stage

Chapter 4 The Wheelchair Service at CReabs
Define the Interventions

Evaluative stage

Chapter 5 Evaluating & Refining the interventions

Research outcomes

Chapter 6 Discussion
Reflections
Research Outcomes
CHAPTER 6

DISCUSSION

This chapter is divided into two main sections. Section 6.1 Reflections, which reflects on the research findings from the three studies, discusses the outcomes, reviews key topics that emerged during the analysis of data as according to existing knowledge and calls attention for future research fields. This section also discusses relevant events influencing the wheelchair and other assistive technologies services provided in Brazil. Section 6.2 Research Outcomes, presents the outcomes of the research, summarised into recommendations for the service and the modified version of the tested forms and checklist.

6.1 Reflections

6.1.1 Reflections on the Brazilian Healthcare Context

Brazilian healthcare SUS is a complex system, which is influenced by a series of factors necessitating consideration when proposing improvements. First and most recognized is the financial restrictions of the service that has a snowball effect on the other factors, discussed later. It is natural for researchers and consultants to identify serious failures in SUS service and propose structural modifications. Successful examples of structural modifications were the decentralization of the service and the increase of attention to the primary care services. However, these improvements did not happen overnight and often were initiated on a smaller scale. Historical examples include the health centres, an initiative with Professor Paulo Souza from Universidade de São Paulo in the twenties, and the Programa Mãe Curitibana-PMC, considered the most successful experience with regards to integrated services in SUS (Mendes, 2011). PMC is a prenatal thematic integrated health care programme from Curitiba Municipality that has been studied and adopted in different parts of the country. The objective of the programme is to introduce organizational changes to enhance accessibility, increase the number and distribution of prenatal visits, and ensure minimum necessary procedures (Carvalho and Novaes, 2004).
Other recognized barrier is the reduced number of staff to care for a great number of service users, this, in turn, results in the creation of long waiting lists, pressure on staff, and reduced service quality. During this study, it was common to see CReab staff worried about users waiting for a long time at the centre or waiting for long time to receive an AT device. Often, the staff was seen rushing care and delivering an inappropriate wheelchair influenced by these factors. In the case of CReabs, the pressure came more from the contextual situation as compared to the coordinators. These were open to reflect on current practices and welcome change. Lack of time seems to be the greatest barrier for the CReabs to study, reflect on their practice and propose changes themselves. This brings to light the essential role of action and evaluative research to the service.

Lastly, there is the issue of inappropriate physical space. The CReabs buildings were not designed or redesigned for the purpose of AT services. A clear example is that none of the CReabs have appropriate space to stock the AT devices and to allow users to be trained. The lack of appropriate physical space has a snowball impact in the service quality, as mentioned by participants. This is corroborated by Mendes (2001) observations on SUS service in Section 2.2.1.

Restructuring a service with more than 100 million users is very costly, given that these changes often would lead to saving huge costs to the governments in the long term. The interventions designed in this study had to consider the limitations above, proposing modifications that would interfere minimally with the service routine and make optimal use of existing resources and staff. Still, structural long-term modifications listed in Section 6.2 were presented to all CReabs by the end of the study in the form of an executive summary. Review of the literature unveiled the importance to communicate the results for the participants, stakeholders, and decision-makers when conducting evaluative research (Robson, 2011; Tilley, 2006). The executive summary was handled during a final presentation scheduled - to each CReab. The document contained a summary of the research findings, the updated protocols, and suggestions on feasible implementation guidelines. The executive summary was designed with time and resources not included in this research.
6.1.2 Thinking Beyond the List

Having a list-based AT service provision has its advantages and drawbacks. As an advantage, it facilitates service management and controls its expenditure, what can be decisive in a country with a population as big as Brazil. However, as a drawback, users’ requirements for the assistive solution might not be listed and not necessarily it will always cost more than the solution provided (as the sandal example given in section 3.2.6.1).

There are alternatives for the provision of a broader range of devices without necessarily increasing the cost of the service. One is providing the user with a voucher at the same price paid by SUS to the suppliers.

Another issue specific to the OPM list is that it contains very detailed specifications (See wheelchair example in Appendix 18). Despite this is aimed to guarantee a minimum quality of the provided AT this is not the reality. The report (Inmetro, 2013) shows that all wheelchairs offered at SUS had failed to attend the requirements tested. Detailing too much the AT to be provided can also prevent innovation and reduce the number of suppliers willing to participate in the public tenders. Instead, other alternatives should be used to ensure AT quality. Examples are requiring that AT device provided comply with existing standards, or ensuring that a group of independent experts evaluates random samples of the provided ATs, especially in those cases where there are no existing standards.

Future research and public policies regarding assistive technology provision in Brazil should consider alternatives to provide a wider range of devices and services without making it financially unfeasible.
6.1.3 Assistive Solution: the Need For a Service Integration

This research had shown that CReab users were assessed for a specific AT device. The need for other devices available in the OPM list can be identified and prescribed during these assessments. Nonetheless, no mechanism was found to ensure that these assessments cover the items available in OPM list and often users in need of AT provided did not receive them. Also, items added to the list lacked criteria for assessment and eligibility.

The assistive solution provided at CReabs should consider the entirety of devices offered in the OPM list and be more integrated with other devices and AT services available through other VSL policies, such as accessibility and access to education. Future research should investigate effective mechanisms to exchange and integrate staff knowledge and available services for disabled population aiming the definition of the assistive solution.

6.1.4 Lack of Supplier and the Service Stagnation

Finding AT suppliers that are willing to participate in the SUS public tender it was a critical issue. During the studies, suppliers’ staff often complained how difficult it was to sustain their business with SUS for reasons such as low value paid for some AT items and delays on payments. As a result, the Belo Horizonte SUS public tender for wheelchair provision in 2016 was cancelled due to lack of supplier participating. This certainly affected the already long waiting list. One of the suppliers’ complaints was that the price paid on OPM list items was only updated once in seven years while Brazil inflation had grown drastically in recent years. The consumer price index used to measure the country inflation increased 6,4% in 2014 and 10,6% in 2015 (Global Rates, 2015).

The production and commercialisation of AT is a complex process as described in Section 2.1.4. On the government side, providing the service for a population as large as Brazil is a real financial challenge. Finding a balance to meet the demands of suppliers, government and users will be a constant challenge in Brazil AT service provision.
### 6.1.5 Staff Training and Research Conducted at SUS

Certainly among the most important aspects highlighted in this research was the lack of formal staff training at Belo Horizonte CReabs. The Decree 1060 (Brasil, 2002) pledge about the public provision of AT services in Brazil:

> "These services will be structured as according to the disability nature and will count accordingly with multi-professional and interdisciplinary staff, one that considers the entirety of the users' requirements. Thereby, beyond offering the assistive technologies at secondary care, they should develop activities in the field of research and human resource training..." (Brasil, 2002, Author translation).

This research revealed that the training offered to CReab staff involved in the wheelchair service was limited to those given by internal staff, Coordenação da Rehabilitação staff or the suppliers. None of the staff commented enrolling in a WSTP or other formal wheelchair fitting qualification. Very few staff knew about the existence of the WSTP training occurred in Brazil or other formal qualification. Their first contact with WSTP resources was through this research despite its free availability online. The fact that they were not translated to Portuguese until 2014 also contributed to this scenario. CReab participants also complained they lack time to study and discuss cases mostly due to the constant pressure to reduce the waiting queue.

With regards to research conducted by academic institutions, both CReab and Coordenação da Rehabilitação participants complained that these organisations hardly ever return to the service to share the results, provide recommendations or engage in the service improvement.

There was another fact that substantiates the existence of such gap. The Universidade Federal de Minas Gerais, located in Belo Horizonte, is part of the Rede da Universidade Aberta do SUS (UNA-SUS, 2016), an open university network developed as part of the VSL strategies. They had created the distance course Therapeutic use of Assistive Technologies (UNA-SUS, 2016). The program offers fours online modules with 30 hours course load each. In total, 120 hours course load is available, which is more hours of AT-related training than any CReabs staff had reported enrolling. Nine participants (n=9) from CReab wheelchair service staff were asked if they had enrolled or concluded any of the modules offered. Only two participants (n=2) had reported being enrolled or concluded any of the course’ modules.
Future research and public policies should address this gap and encourage academic institutions to be more engaged locally, helping to identify issues and provide care solutions to its community.

6.1.6 Issues With the Wheelchair User Training

Wheelchair users at Belo Horizonte’ CReabs were not given the opportunity to train the necessary wheelchair skills, such as basic wheelchair mobility, transferring in and out of the wheelchair and handling the wheelchair. Users were only oriented with regards to the situation of problems with the wheelchair and explained basic maintenance tips provided at the delivery stage. Users were left alone to learn these skills, putting at risk their ability to safely and effectively use a wheelchair (WHO, 2012). Despite NASF staff provides support to SUS users after an AT device provision, no information was found regarding wheelchair skills training support. Some studies correlate training these wheelchair skills to increased participation (Hosseini, et al., 2012; Sakakibara, et al., 2013). Studies report that users receiving wheelchair skills training benefit from fewer acute and overuse injuries; an improved sense of wellbeing through self-esteem; self-efficacy; confidence and personal control; and, in the case of children, improved development (Dalhousie University, 2010).

Future research and public policies related to CReab services should focus on implementing wheelchair skills training for the end users and consider SUS limitations. The WHO Wheelchair Guidelines provides guidance on how to implement overall wheelchair service training for existing health and rehabilitation programmes, such as Belo Horizonte’ CReabs. It also provides guidance on how to implement training in alternatives service scenarios, such as mobile “camp”-style services and outreach services (See WHO, 2008).
6.1.7 The Zika Virus and the Healthcare Burden

In the year of 2015, Brazil had suffered the outcomes of a Zika virus outbreak that became a global health emergency (WHO, 2016a). The Zika virus outbreak and its association with an increase in microcephaly, other congenital malformations and Guillain-Barré syndrome-GBS, have caused increasing concern in countries across the world, particularly in the Americas (WHO, 2016a). Brazil announced a national public health emergency in November 2015 (ECDC, 2015; Olivera Melo, et al., 2016) and WHO declared Zika a public health emergency of international concern on 1st February 2016 (WHO, 2016b).

On average, between 150 and 200 children per year were born with microcephaly in Brazil between 2010 and 2014 (ECDC, 2015). In 2016, as of 25th of June, 8,165 suspected cases of microcephaly have been identified (COES, 2016). From these, 5,104 cases were investigated and 1,638 confirmed for microcephaly, resulting in a tenfold increase compared to the average cases between 2010 and 2014 (COES, 2016).

Both microcephalia and GBS can affect the motors skills to the point that a wheelchair is recommended (Khan, 2004; Orsini, et al., 2010). Despite not every person diagnosed may require a wheelchair, the economic burden associated with their care is inevitable (ECDC, 2015). Babies born with microcephaly will need regular check-ups and medical assistance to monitor and support their growth and development (ECDC, 2015). Healthcare of GBS cases often requires care with mechanical ventilation in intensive care units (ECDC, 2015). This poses an additional burden on the already financially limited SUS services.
6.1.8 The Problems Regarding Urban Accessibility

The literature reviewed in section 2.3.8 presented many problems wheelchair users face regarding urban accessibility in Brazil. It is indisputable that urban accessibility in Brazil has improved in the past decade, especially in the host cities for World Cup, Olympic and Paralympic events, such as Belo Horizonte. Nonetheless, it is also indisputable there is still much to be done to provide minimal standards of urban accessibility in the majority of Brazil urban areas, including the cities that hosted these mega-events. According to the 2010 Census (IBGE, 2010), only 4.7% of Brazilian urban sidewalks have ramps for the wheelchair users, and in the Belo Horizonte Municipality, only 9.6% of urban walkways have ramps (IBGE, 2010). Studies also revealed incipient level of accessibility in the interior of public buildings in various regions of Brazil (Corrêa and Manzini, 2012; Calado, 2006; Vasconcelos and Pagliuca, 2006; Mazzoni, et al., 2001).

During the data collection period on site, the researcher encountered several hurdles on the sidewalks surrounding the CReabs. Figures 6.1 shows two pictures taken near CReab East. The picture on the left side of the reader shows the poor condition of the sidewalk, with two signing posts obstructing the way. The picture on the right shows a public telephone cabin hanging on a wall, in a position that is hard to be identified either by a white cane or someone walking while navigating on a mobile phone.

![Figure 6.1: Hurdles found in the pathway surrounding CReab East](image)
The picture from Figure 6.2 was taken near the CReab CGR shows an obstacle made of concrete in front of a bus stop. The same picture shows various glass cullets on the sidewalk, which are a potential danger not only to wheelchair users but any passers-by. The picture from Figure 6.3, also taken near CGR, shows a zebra crossing leading to a sidewalk without dropped kerbs in an intersection between two of the largest city avenues. Oddly, there was a dropped kerb on the opposite side of the avenue. CGR is located in a hospital area in the heart of the city, where the urban accessibility is even more important and expected. These are few of the countless examples found during the research period.

![Figure 6.2: Hurdles found in the pathway surrounding CGR](image-url)
Adding to this, various users complained or commented to CReab participants having problems with transportation during the period of observations. Many complained that drivers did not stop for them. Despite the majority of buses have wheelchair lifts in Belo Horizonte city, users said that drivers do not like to stop for them as it takes longer to use the wheelchair lift, delaying their schedule. User complaints with regards to public transport and the condition of urban accessibility in the surrounding of the CReabs were very similar to those reported in the review of the literature section 2.3.8.

The overall impression was that urban accessibility and the inclusion of the disabled people in Brazil is viewed mostly as law enforcement and not as citizen role. The following two examples corroborated to this impression. Prefectures in the countryside of Parana state built wheelchair ramps in remote areas leading to nowhere. Ramps were built leading to the wall, open manhole and abandoned areas (Bernardi, 2015). Luis Cardoso, Alto Piquiri mayor, claimed that he needed to build ramps, no matter where, to receive funding to pave roads. He said: “If I send the project to them without the ramps it is not approved. It needs ramps, no matter if there is pavement on the street or not” (Bernardi, 2015; Author translation).
Another extreme example occurred in Belo Horizonte city regarding a luxurious block of flats recently built in the central neighbourhood of Lourdes. Despite the spacious sidewalk in front of the building, the tectile floor was placed in a manner that surrounds ten trees across the sidewalk (See Figure 6.4).

![Figure 6.4: Tactile floor in R. Felipe dos Santos (Source: Google maps, 2015)](image)

Despite paralympic games had contributed to raising awareness of disabled people requirements in the country, there is still a considerable gap between the current awareness and the practice necessary for the effective inclusion of the disabled people in the Brazilian society. Future research should look into alternatives to reduce this gap.
6.1.9 Service Improvement in Brazil: A Funding Issue

Funding has proven to be a critical issue stopping SUS progress. Records showed that the government have been less than private healthcare sector, despite SUS care for nearly three-quarters of the Brazilian population (WHO, 2011). The government spending with each citizen healthcare per year has been way below the world’ average rate (BBC Brasil, 2013). Also, there is a limited resource in the value of R$ 24,555,240,52 - around $8 million at quotation in 21/09/2016 – for the annual costs regarding the AT procedures at SUS (Conitec, 2013). With healthcare investments frozen from 2017 to 2037, there is no indication that the situation will improve (Lima and Murakawa, 2016; Ciscati, 2016). Incorporating new technologies to the list without increasing the budget may lead to fewer users attended with a greater variety of devices. As a consequence, the waiting list would inevitably increase.

In the top of that, there is still the danger for current social advancements and programmes to be discontinued or started from scratch when new political party assumes the power (D’ávila Viana and Dal Poz, 2005; Pinheiro, 2007). Despite discussing political and financial alternatives was not under the scope of this research, it was hard to believe that the quality of the service can significantly improve without increasing the budget not only for the AT procedures but the SUS service overall. Future work should address the funding system and possible alternatives to the current situation.
6.2 Research Outcomes

This section presents the outcomes of the research, summarised into recommendations for the service and the modified version of the tested forms and checklist. The recommendations for the service were divided in short-term recommendations, in which the use of the adapted forms and checklist were suggested, and long-term recommendations, in which important stages and other protocols suggested in the good practice literature were recommended.

6.2.1 Short-Term Recommendations

The short-term recommendations aimed at the wheelchair service as well as the assistive technology service provided in Belo Horizonte’ SUS. These are modifications possible to be implemented without major changes in the service organisation and structure. They were divided as according to current service stages. Recommendations for the service as a whole are provided at the end of this section.

6.2.1.1 Recommendations for the User Referral

Every user in need of an assistive technology service should be referred to CReabs using a standardised referral protocol. Despite a referral protocol exists between SUS primary and secondary levels of care, this is incomplete and does not reach users coming outside SUS network. This research suggests that every potential user in need of wheelchair must be referred using the Wheelchair Referral Form shown in Figure 6.5. The original version of the form in the Portuguese language is provided in its full size in Appendix 34.
## Wheelchair Referral Form

Please complete referral form and post to:

- CREab Centro Sul (CGR) - Rua Domingos Vieira 463, Santa Efigênia, Tel: 3277-9840
- CREab Leste (Sagrada Familia) - Rua Bicas 58, Sagrada Familia, Tel: 3277-7620
- CREab Noroeste (URS Padre Eustáquio) - Rua Pe. Eustáquio 1951/3º, Padre Eustáquio. Tel: 3277-7113

<table>
<thead>
<tr>
<th>Information about the referral person</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name:</td>
<td>Sig.</td>
</tr>
<tr>
<td>Clinic / Healthcare unit:</td>
<td>NASF:</td>
</tr>
<tr>
<td>(if applicable)</td>
<td></td>
</tr>
<tr>
<td>Referral person contact details (the best way to contact you):</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Information about the wheelchair user</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>User name:</td>
<td>Date of birth:</td>
</tr>
<tr>
<td>SUS identification card:</td>
<td>ID:</td>
</tr>
<tr>
<td>Gender</td>
<td>Age (years)</td>
</tr>
<tr>
<td>male: □</td>
<td>female □</td>
</tr>
<tr>
<td>Parent / carer’s name:</td>
<td></td>
</tr>
<tr>
<td>Address:</td>
<td></td>
</tr>
<tr>
<td>Telephone n:</td>
<td>Friend/neighbour n:</td>
</tr>
</tbody>
</table>

**Wheelchair user’s disability if known:**
- Can the user easily sit upright? Yes □ No □
- Obs.: ............................................

**Information about the referral**
- Reason for referral:
  - □ Has no wheelchair
  - □ Has a broken wheelchair
  - □ Has a wheelchair that does not meet their needs

**If the user has a wheelchair, was the wheelchair:**
- □ provided by SUS? Yes □ No □
- □ How long was the wheelchair provided? Obs.: ............................................

**Information about the user environment (hand over the User Environment Information Entry Form if information is unknown)**
- Clear width measures from:
  - Main entrance door  cm
  - Main bathroom door  cm
  - User bedroom door  cm

**Check if your residence has any of the following:**
- □ Stairs
- □ Adapted toilet
- □ Loose carpet
- □ Access ramp

Obs. ............................................

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Figure 6.5: Suggested Wheelchair Referral Form
In case the user does not arrive at CReab service with the *Wheelchair Referral Form*, then staff at screening stage must hand over the *User Environment Information Entry Form* shown in Figure 6.6. The original version of the form in the Portuguese language is provided in its full size in Appendix 35. Staff must also teach users how to take the required measures at home. For this, the CReab participants trained during this research should train others involved in the provision of the AT services how to perform the measurement. Ideally, CReab should provide users with a measurement tape similar to those provided for this research (See Figure 4.32, p.247). In case funding for this is restricted an alternative is to provide users with a piece of twine so they can cut in the size of the doors clear width and bring to the assessment stage.

**Figure 6.6: Suggested User Environment Information Entry Form**
Table 6.1 summarises areas that must be focused when training staff for an official implementation of the suggested recommendations. Ideally, CReab service’ coordinators or other key practitioners enrolled in all stages of the research should provide this training.

<table>
<thead>
<tr>
<th>Section</th>
<th>Training focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information about the user environment</td>
<td>Teach how to measure the clear width between the face of the door and the door stop.</td>
</tr>
<tr>
<td>Overall</td>
<td>Highlight the importance of taking the user environment measures and the negative impact of not taking them.</td>
</tr>
<tr>
<td>Overall</td>
<td>Training NASF teams how to fill the forms and how to measure the clear width between the face of the door and the door stop.</td>
</tr>
</tbody>
</table>
6.2.1.2 Recommendations for the Assessment Stage

Although users were assessed mostly for a specific device referred, it is important that staff considers the need for other devices and services available to the users. It is also recommended that every user must be assessed using standard protocols. For the users in need of a wheelchair, this research suggests the use of the *Wheelchair Service Assessment Form* shown in Figures 8.3 and 8.4. The original version of the form in the Portuguese language is provided in its full size in Appendix 36.

Ideally, every CReab services should have a sample of the AT devices offered so users could test it before defining the assistive solution. For the wheelchair service, users should be given the opportunity to see and, whenever possible, try samples of wheelchairs, cushions and postural support components. This could be included in the supplier contract. At the CReabs where the lack of space prevents this to occur, it is recommended that a picture of potential devices be shown to the user until the problem with space is resolved.

CReab staff must be given enough time to assess at least all the information contained in the assessment form, perform the users’ measurements, discuss with the users the assistive solution and write up assessment and prescription notes immediately after each appointment.

CReab staff should give users an estimate when their wheelchair and other AT devices prescribed will be ready.

If a supplier needs to assess the user without the presence of a CReab staff, it must follow the same protocols recommended to CReabs, for example, the use of the *Wheelchair Service Assessment Form*. 
## Wheelchair Service Assessment Form

**Assessor's name:**  
**Date of assessment:**

### Part 1: Interview Assessment

#### Information about the user

<table>
<thead>
<tr>
<th>Name</th>
<th>Medical record no:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parent / carer's name:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Is the person accompanying the user carer?</th>
<th>Yes ☐</th>
<th>No ☐</th>
</tr>
</thead>
</table>

#### Physical condition

**Diagnostic**

- Cerebral palsy ☐  
- Spinal cord injury ☐  
- CVA/cerebral thrombosis ☐  
- Brain injury ☐  
- Spina bifida ☐  
- Polio ☐  
- Muscular Dystrophy ☐  
- Fracture/post-surgical ☐  
- Arthritis ☐  
- Other ☐

<table>
<thead>
<tr>
<th>Diag. Time:</th>
<th>Obs.:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Levels of amputation**

<table>
<thead>
<tr>
<th>Disjoint of the hip (removal of the all hip joint and below): L/R ☐</th>
<th>Transfemoral (above knee): L/R ☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disjoint of the knee (removal of the all joint and below): L/R ☐</td>
<td>Transfibial (below knee): L/R ☐</td>
</tr>
<tr>
<td>Obs.:</td>
<td></td>
</tr>
</tbody>
</table>

#### Physical issues

- Spasms or uncontrolled movements ☐  
- Muscle tone (high/low) ☐  
- Frail ☐  
- Hip dislocation ☐  
- Fatigue ☐  
- Epilepsy ☐  
- Pain ☐, describe location: 

| Bladder problems (is this managed?): Y/N ☐  
|---------------------------------------------|

| Bowel problems (is this managed?): Y/N ☐  
|---------------------------------------------|

| Make up of: | Tracheostomy ☐  
|-------------|----------------|

| Feeding tube ☐  
|----------------|

| Gastrostomy ☐  
|----------------|

| Oxygen ☐  
|----------------|

<table>
<thead>
<tr>
<th>Respirator ☐</th>
<th>Other ☐</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Obs.:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Lifestyle and environment

#### Activities/goals

Describe why you demand a wheelchair and what activities you seek to achieve with it. (Investigate: work, study, leisure)  

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Independence

When out of the wheelchair, where does the user sit or lie down and how (posture and the surface)?

| Transfer: | Independent ☐  
|-----------|----------------|

| Assisted ☐  
|-------------|

<table>
<thead>
<tr>
<th>Standing ☐</th>
<th>Non Standing ☐</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Lifted ☐</th>
<th>Other ☐</th>
</tr>
</thead>
</table>

| Would user benefit with the use of a transfer board?: Yes ☐  
|-------------------------------------------------------------|

<table>
<thead>
<tr>
<th>No ☐</th>
<th>Already has ☐</th>
</tr>
</thead>
</table>

#### ADLs/IADLs

- Dependent ADLs/IADLs: 

<table>
<thead>
<tr>
<th>Independent ADLs/IADLs:</th>
</tr>
</thead>
</table>

| Would user benefit with the use of an activity table?: Yes ☐  
|------------------------------------------------------------|

<table>
<thead>
<tr>
<th>No ☐</th>
<th>Already has ☐</th>
</tr>
</thead>
</table>

### Locomotion

Where will the user use the wheelchair:  

<table>
<thead>
<tr>
<th>Internal environment ☐</th>
<th>External environment: Rural area ☐</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Urban area ☐</th>
<th>Obs.: (work, study, leisure)</th>
</tr>
</thead>
</table>

| Distance travelled per day: Up to 1 km ☐  
|-------------------------------------------|

<table>
<thead>
<tr>
<th>1 - 5 km ☐</th>
<th>More than 5 km ☐</th>
</tr>
</thead>
</table>

| Hours per day using wheelchair: Less than 1 ☐  
|-----------------------------------------------|

<table>
<thead>
<tr>
<th>1 - 3 ☐</th>
<th>3 - 5 ☐</th>
<th>5 - 8 ☐</th>
<th>More than 8 hours ☐</th>
</tr>
</thead>
</table>

| Types of transport used: Car ☐  
|-------------------------------|

| Taxi ☐  
|--------|

| Bus ☐  
|-------|

<table>
<thead>
<tr>
<th>Subway ☐</th>
<th>Other ☐</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Obs.:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Existing wheelchair - WC and existing bath chair - BC (if a person already has one of these)

How do you bath?  

| Need a bath chair?: Yes ☐  
|-------------------------|

<table>
<thead>
<tr>
<th>No ☐</th>
<th></th>
</tr>
</thead>
</table>

| Has a wheelchair?: Yes ☐  
|--------------------------|

<table>
<thead>
<tr>
<th>No ☐</th>
<th>Loan/Donation ☐</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Age of the current wheelchair?:</th>
</tr>
</thead>
</table>

| Characteristics of the current WC/BC: |

**Figure 6.7: Wheelchair Service Assessment Form page 1**
### Existing wheelchair condition

<table>
<thead>
<tr>
<th>Question</th>
<th>Wheelchair</th>
<th>Bath Chair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the wheelchair meet the user's needs?</td>
<td>Yes [ ]</td>
<td>No [ ]</td>
</tr>
<tr>
<td>Does the WC meet the user's environmental conditions?</td>
<td>Yes [ ]</td>
<td>No [ ]</td>
</tr>
<tr>
<td>Is the wheelchair safe and durable? (Check if there is a cushion)</td>
<td>Yes [ ]</td>
<td>No [ ]</td>
</tr>
<tr>
<td>Does the wheelchair provide proper fit and postural support?</td>
<td>Yes [ ]</td>
<td>No [ ]</td>
</tr>
<tr>
<td>Does the cushion provide proper pressure relief (if user has pressure sore risk)?</td>
<td>Yes [ ]</td>
<td>No [ ]</td>
</tr>
</tbody>
</table>

Comments: Characteristic of the existing WC: 

---

If yes to all questions, the user may not need a new wheelchair. If no to any of these questions, the user needs a different wheelchair or cushion; or the existing wheelchair or cushion needs repair or modifications.

### Part 2: Physical Assessment

#### Presence, risk of or history of pressure sores

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Yes [ ]</th>
<th>No [ ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>/ = does not feel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o = previous pressure sore</td>
<td></td>
<td></td>
</tr>
<tr>
<td>= existing pressure sore</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Can feel normally? Yes [ ] No [ ]

Previous pressure sore? Yes [ ] No [ ]

Current pressure sore? Yes [ ] No [ ]

If yes, is it an open sore (stage 1 - 4)? Yes [ ] No [ ]

Duration and cause: 

---

Is this person at risk* of a pressure sore? Yes [ ] No [ ]

* A person who cannot feel or has 3 or more risk factors is at risk. Risk factors: cannot move, moisture, poor posture, previous / current pressure sore, poor diet, ageing, under or over weight.

Would user benefit with the use of cushion to relieve pressure? Yes [ ] No [ ]

If yes, describe the model: 

---

### Seating/Posture Control

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Yes [ ]</th>
<th>No [ ]</th>
<th>In acquisition [ ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has head control?</td>
<td>Yes [ ]</td>
<td>No [ ]</td>
<td>In acquisition [ ]</td>
</tr>
<tr>
<td>Has trunk control?</td>
<td>Yes [ ]</td>
<td>No [ ]</td>
<td>In acquisition [ ]</td>
</tr>
<tr>
<td>Situation of femur in relation to the pelvis:</td>
<td>Neutral [ ]</td>
<td>Anteversion [ ]</td>
<td>Retroversion [ ]</td>
</tr>
<tr>
<td>Rotation with adduction of the lower limbs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Side inclination to the:</td>
<td>Right [ ]</td>
<td>Left [ ]</td>
<td></td>
</tr>
<tr>
<td>Situation of the back:</td>
<td>Normal [ ]</td>
<td>Scoliosis [ ]</td>
<td>Is the scoliosis structured? Yes [ ] No [ ]</td>
</tr>
<tr>
<td>Gibbosity [ ]</td>
<td>Kyphosis [ ]</td>
<td>Is the kyphosis structured? Yes [ ] No [ ]</td>
<td></td>
</tr>
</tbody>
</table>

Obs: 

### Sensory information

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Vision [ ]</th>
<th>Hearing [ ]</th>
<th>Tactile [ ]</th>
<th>Mental [ ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has any of the following disabilities:</td>
<td>Vision [ ]</td>
<td>Hearing [ ]</td>
<td>Tactile [ ]</td>
<td>Mental [ ]</td>
</tr>
</tbody>
</table>

Obs: 

Is lucid/conscious [ ] Communicate verbally [ ] Communicate with gestures/face expressions [ ]

Understand what is said to him or her/sense what is happening in the surroundings [ ] Does not interact [ ]

### Method of pushing (How will the wheelchair user push their wheelchair?)

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Pushed by a helper [ ]</th>
<th>Both arms [ ]</th>
<th>Left arm [ ]</th>
<th>Right arm [ ]</th>
<th>Both leg [ ]</th>
<th>Left leg [ ]</th>
<th>Right leg [ ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Wheelchair:</td>
<td>Joystick on the left side [ ]</td>
<td>Joystick on the right side [ ]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chin control [ ]</td>
<td>Head control [ ]</td>
<td>Suck and Blow Switch [ ]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments: 

---

Figure 6.8: Wheelchair Service Assessment Form page 2
Table 6.2 summarises the areas that must be focused when training staff for an official implementation of the suggested recommendations for the assessment stage. The WSTP Basic resources available in Portuguese must be used as reference material.

<table>
<thead>
<tr>
<th>Assessment form training suggestions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Section</strong></td>
</tr>
<tr>
<td><strong>Physical Condition</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Lifestyle and environment</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Existing wheelchair</strong></td>
</tr>
<tr>
<td><strong>Presence, risk of or history of pressure sores</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Sensory Information</strong></td>
</tr>
<tr>
<td><strong>Method of Pushing</strong></td>
</tr>
</tbody>
</table>
6.2.1.3 Recommendations for the Delivery Stage

CReab services must establish protocols for the delivery and fitting of the AT devices. For the users receiving a wheelchair, this research suggests the use of the *Wheelchair Fitting Checklist* shown in Figures 8.5 and 8.6. The original version of the checklist in the Portuguese language is provided in its full size in Appendix 37.

Whenever possible, the delivery of the AT devices should be carried out by the same practitioner that assessed the user. CReab service coordinators and administrators should take reasonable measures to encourage this.

Apart from assessing the fit of the wheelchair with the user sitting in the stationary wheelchair, the fit must also be assessed while the user self-propels the wheelchair or is pushed by a carer. Due to the lack of space in most CReab rooms where assessment occurs, this could be accomplished using the corridors.

CReab staff must be more cautious when checking the wheelchair size, adjustments and the user’s posture. These should be done using the hands and the guidance from the checklist instead of just checking visually.

Every user at risk of developing a pressure sore must have the pressure under seat bones checked. This was not performed in any of the cases observed during the research. This will help to decide if further adaptions are necessary and if the user might benefit from cushion to relieve the pressure, recently added to the OPM list. Additionally, users should be provided with the leaflet about pressure sore prevention and care shown in Figure 8.7 and 8.8. The original version of the leaflet in the Portuguese language is provided in its full size in Appendix 29.
# Wheelchair fitting checklist

**Practitioner name:** [Name]

**Date of fitting:** [Date]

**Information about the user**

<table>
<thead>
<tr>
<th>Name</th>
<th>Medical record n</th>
</tr>
</thead>
</table>

**1. Is the wheelchair ready?**

- Has the wheelchair been checked to make sure it is safe to use and all parts are working? [ ]
- Are the brakes working? [ ]
- Was the wheelchair produced as specified? [ ]

**Suggestions for filling in the checklist:** [ ] and (standard/adaptation)

<table>
<thead>
<tr>
<th>Model</th>
<th>Size</th>
<th>Colour</th>
<th>Straps</th>
<th>Hearest</th>
<th>Armrest</th>
<th>Trunk side pads</th>
<th>Wheel</th>
<th>Push ring type</th>
<th>Functioning side (hemiplegia)</th>
<th>Footrest</th>
<th>Pressure relief cushion</th>
<th>Activity Table</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<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>
</tr>
</tbody>
</table>

**Verify and check all the items to be delivered.**

**2. Check size and adjustments**

**Seat width:**

- Hips fit comfortably between armrests or pelvis side pads.
- Trunk fits comfortably between the wheelchair frame backrest tubes or trunk side pads.
- Thighs fit comfortably between the armrests, mud/skirt guards or pelvis side pads and are not pushed together.

**Suggestions for filling in:** [ ] No [ ] Not Applicable [ ]

<table>
<thead>
<tr>
<th>Seat width</th>
<th>Obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Seat depth:**

- Two fingers’ gap between the back of the knee and the seat/cushion.

**Footrests height:**

- The thighs are fully supported on the cushion with no gaps.
- The feet are fully supported on the footrests with no gaps.

<table>
<thead>
<tr>
<th>Footrests height</th>
<th>Obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Backrest height:**

- The wheelchair user has the support they need and freedom to move their shoulders to push (if self-propelling).

<table>
<thead>
<tr>
<th>Backrest height</th>
<th>Obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Rear wheels position (for hand propelling):**

- The wheelchair user's arm should be in line with the rear axle when hanging down.
- When hands are placed on the push rims, the user's elbows should be at a right angle.

<table>
<thead>
<tr>
<th>Rear wheels position</th>
<th>Obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Seat height (for foot propelling):**

- With the wheelchair user sitting upright, the back should be comfortably supported by the backrest, with feet resting flat on the floor.

<table>
<thead>
<tr>
<th>Seat height (for foot propelling)</th>
<th>Obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 6.9: Wheelchair Fitting Checklist page 1
### 3. Check posture
- Is the wheelchair user able to sit upright comfortably?  
- Check posture from the side.  
- Check posture from front/back.

### 4. Check pressure
Check pressure under seat bones for all wheelchair users at risk of developing a pressure sore.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Explain the test to the wheelchair user.</td>
</tr>
<tr>
<td>B</td>
<td>Ask wheelchair user to lean forward or push up. Place fingertips under wheelchair user’s seat bone.</td>
</tr>
<tr>
<td>C</td>
<td>Ask the wheelchair user to sit back down on your fingers. Make sure they sit upright with hands on thighs.</td>
</tr>
</tbody>
</table>
| D | Identify the pressure:  
   Level 1 = safe: Finger tips can wriggle up and down 5mm or more.  
   Level 2 = warning: Finger tips cannot wriggle, but can easily slide out.  
   Level 3 = unsafe: Finger tips are squeezed firmly. It is difficult to slide fingers out.  
| E | Repeat under the second seat bone. |

Would user benefit with the use of cushion to relief pressure?  
Yes [ ] No [ ]  
If yes, describe the model: ........................................

### 5. Check fit while the wheelchair is moving
(Yes [Y] No [N] Not Applicable [N/A])
- Does the backrest allow the wheelchair user freedom to move their shoulders to push?  
- Does the backrest give the wheelchair user enough support?  
- Do the wheelchair user’s feet stay on the footrests?  
- Is the rear wheels position correct for the user?  

### 6. Action?
Suggestions for filling in: Yes [Y] No [N]
Is there any further action necessary? Write any actions here and in the wheelchair user’s file/medical record.  
.................................................................

### 7. Handle the leaflet about pressure sore prevention and care.
[ ]

---

Figure 6.10: Wheelchair Fitting Checklist Page 2
How can pressure sores be prevented?

Use a pressure relief cushion:
A pressure relief cushion will help to reduce pressure. Anyone at risk of developing a pressure sore should be given a pressure relief cushion.

Eat well and drink lots of water:
A well-balanced diet with fresh vegetables, fruits and meat can help to prevent pressure sores. Drinking lots of water will help to keep the skin healthy and prevent pressure sores. If you are concerned about your diet look for a service that can help.

Sit upright:
Sitting upright helps to distribute weight evenly. This reduces pressure under bony parts and helps to reduce sores caused by pressure.

Avoid friction:
Make sure the wheelchair fits correctly and has no rough edges. Be careful when getting in and out of the wheelchair.

Use pressure relief techniques:
Regular pressure relief can be effective in preventing pressure sores. Check the Table on next page for more information about how to relieve pressure.

Avoid moisture:
Change wet or soiled clothing straight away, and do not use a wet cushion. A bowel and bladder management programme can reduce problems with moisture.

Figure 6.11: Pressure sore prevention leaflet page 1
Chapter 6  | Discussion

Check skin every day:
Pressure sores can develop quickly. It is important to identify a pressure sore quickly and take action. Check your skin every day using a mirror; or ask a family member to check. If you see a red or dark area of the skin take all necessary measures to relieve pressure on that spot immediately.

While lying or sitting, change positions regularly:
Changing position regularly helps to relieve pressure. For example, change position from sitting to lying. This is particularly important for someone who has a recently healed pressure sore. People who cannot change position by themselves are at risk.

Presssure relief techniques
You can relieve pressure from the seat bones while in their wheelchair. How you do this will vary, depending on how much strength and balance you have. Check with your therapist which of the following exercises are adequate for you.

| Side to side leaning: A method suitable for wheelchair users with limited strength and balance. | | Some wheelchair users may hook their arm over the push handle for support. |

Figure 6.12: Pressure sore prevention leaflet page 2
Table 6.3 summarises the areas that must be focused when training staff for an official implementation of the suggested recommendations for the delivery stage. Ideally, training should be provided by CReab AT service’ coordinators or other key practitioners enrolled in all stages of this research. The WSTP Basic Level resources available in the Portuguese language must be used as reference material.

<table>
<thead>
<tr>
<th>Table 6. 3: Training area to focus when implementing the fitting checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wheelchair fitting checklist training suggestions</strong></td>
</tr>
<tr>
<td><strong>Section</strong></td>
</tr>
<tr>
<td>2. Check size and adjustments</td>
</tr>
<tr>
<td>3. Check posture</td>
</tr>
<tr>
<td>4. Check Pressure</td>
</tr>
<tr>
<td>Overall</td>
</tr>
</tbody>
</table>
6.2.2 Overall Recommendations for the Service

Implementation of the forms and checklists suggested by this research must be compulsory to all CReabs. All the suggested forms and checklist must be implemented. Failing to implement any of these will increase the chance of the wheelchair not attending users needs and might lead to discontinuance of the device use and waste of resources.

CReab services must carry out quality control to ensure that every wheelchair is assessed for safety before the user tries it. The wheelchair must not be opened and assembled in front of the users during the delivery stage. This must be done before delivery is scheduled to avoid user going to the service unnecessarily in case there is a problem.

Overall, CReab services must adopt a more "user-centred approach". For this to become a reality, the users must receive more information throughout the entire process regarding the service provision and their rights and responsibilities in this process. Users must be consulted more often with regards to the decisions taken through the service provision. They should also be represented in major decisions, modifications, and improvements with regards to the service. Additionally, the service must actively collect feedback from users about the AT provided, the service, and how it may be improved.

6.2.3 How to Get Recommendations into Practice

Ideally, all CReab staff working with the wheelchair service should take part in WHO WSTP basic level training. Nonetheless, lack of time and resources had proven to be a concerning barrier for this to happen. As an alternative, it is recommended the promotion of campaigns and training to increase the use of the suggested protocols, using the existing time and resources available at CReabs. Part of the time available for department training could be used for this purpose, or intensive training could be organised by CReab service coordinators involving all staff related to the wheelchair service. It is crucial that key staff, such as the head of CReab department, assume the responsibility to coordinate and promote these training and campaigns. For this purpose, is essential that they are trained first.
6.2.1.4 Summary of The Designed Tools

Figure 8.9 illustrates the dynamic between the user, the health centres and staff from the primary and secondary level of care with regards to the wheelchair service provided at Belo Horizonte SUS, locating where the proposed tools should be used in the current service structure, and summarising the type of they collect.
It is important that the recommended forms and checklist are made readily accessible to overcome likely resistance and barriers to implement them at the SUS service. Suggested strategies are:

- Making the forms available in the SUS intranet;
- Making the form available for download on the Internet;
- Making the forms available in the wheelchair service physical folder;
- Sending a digital copy to institutions that often refer to SUS, such as Sarah Kubitschek Hospital;
- Promoting campaigns and training to encourage the use of protocols.

It is expected that CReab staff might want to modify the suggested protocols for convenience or any other reason. It is pivotal that the recommended protocols are not changed without evidence-based reasons and the approval of an independent and specialized consultant. Modifications to the protocols without attending both criteria may increase the chance of the wheelchair not meeting users’ requirements and may lead to discontinuance of the device use and waste of resources.
6.2.4 Long-Term Recommendations

Long-term recommendations suggested here involve modifications that require changes in the current service structure to function as recommended in the good practice literature. Additionally, any of the recommendations proposed in the previous section that is not planned in a short-term must be considered in the long term.

Key service good practices suggested in the literature and not performed in AT services at Belo Horizonte SUS are:

1. Identifying an assistive solution: defining the user’ individual AT programme.
2. Preparing the AT: checking the AT to be delivered for safety and if it was built according to specification before the delivery.
3. Training users the necessary skills to use the AT.
4. Conducting user follow-up.

Currently, AT devices and services available for public provision in Brazil are provided by a mix of services and programmes. As a consequence, there is no definition of a user’ individual AT programme. These are segregated between services with barely any communication between them. The assistive solution or individual AT programme should be more integrated between the AT services and programmes available in Brazil.

AT devices provided at CReabs are often not checked before the delivery stage. Hence, if there is a problem with the device or if it is not made according to specifications users have to be rescheduled or might even receive a device that it does not fit its requirements. Every AT device must be checked for safety and if it is built according to specification before the delivery. For the wheelchair service, resources from the WSTP Basic can be used as reference material for implementing this preparatory stage. The WSTP Checklist: Is the Wheelchair Safe and Ready to Use? can be used as reference protocol.

Wheelchair users at Belo Horizonte’ CReabs are not trained for the necessary wheelchair skills, such as basic wheelchair mobility, transferring in and out of the wheelchair and handling the wheelchair. Users are left alone to learn these skills, putting at risk their ability to safely and efficiently use a wheelchair. The situation seems to be similar to other AT devices delivered at CReabs.
SUS services should consider training users for the necessary skills to use the provided AT devices. Training could be promoted by NASF, CReabs or by using staff and resources from both levels of care. For the wheelchair service, the WSTP Basic resources can be used as the material for reference, and the *Wheelchair User Training Checklist* used as reference protocol.

Currently, there is no follow-up after AT devices are delivered. Users are invited to contact the supplier or the service in case of a problem, but there is no formal follow-up stage so practitioners can evaluate the device fit after use. Also, users’ are not given the opportunity to self-evaluate the AT impact in their lives and to evaluate the AT service and devices provided. Introducing a formal follow-up stage must be a priority to the service modifications. For the wheelchair service, the WSTP Basic resources can be used as a reference for implementing a follow-up stage and the *Wheelchair Follow Up Form* used as reference protocol.

Overall, the issue of lack of space at CReab should be treated as a priority in future service modifications. Results of this research had shown that the lack of space affects the implementation of various stages suggested in the good practice literature. The issue of the space makes it difficult to implement the user training, to store and check the AT devices before delivery, and to store a sample of the AT devices provided to help practitioners and users to decide for the assistive solution.

The lack of space also affects various stages of the current service. It affects users comfort and safe mobility through the CReabs as AT devices are placed at corridors and ramps. It affects the quality of the service provided as the CReab staff has to rush delivering the AT devices to free space. It also affects the service coordination, as many practitioners’ agenda are often canceled to give priority to deliver inappropriate stored AT items.

Future modifications to the AT service should consider alternatives for the provision of a broader range of devices without necessarily increasing the cost of the service, making use of solutions such as the provision of vouchers, diminishing the technical specification in the OPM list, or expanding the range of devices models offered.

Last but not least, more investments are necessary to diminish the service queue and increase the service quality. New investments should be used carefully and consider the recommendations suggested in this thesis and other evidence-based sources to define the priorities for the service change.
6.2.5 Expanding the Recommendations to Other Contexts

The recommendation provided here were developed to a specific context, considering the existing barriers met at Belo Horizonte SUS’ rehabilitation centres, existing structure and way of functioning. Nonetheless, the knowledge generated in this study will help to comprehend and improve various other services provided in a similar context as well as enhancing the effectiveness of wheelchair service provision. Hence, there are various lessons to be learned that can be applied to other settings.

The first lesson regards to the barriers encountered to introduce new protocols. It was observed that resistance varied according to the level of the participant’s engagement in the study. For an efficient implementation of new protocols, it is important that service providers are listened and involved in the entire process.

Other lesson learned regards to falsifying the general belief that improving the SUS service is extremely difficult due to the lack of resources and political interest. This research has proven that is possible to introduce existing good practices guidelines and improve service quality and effectiveness with the time and resources available. Public services in Brazil can improve significantly if universities and other types of research-based institution conduct more action research, evaluative research or any research approach aiming to promote change in this setting. This is particularly important considering the critical moment lived in Brazil. A constitutional amendment was approved in Brazil so that public investments with health care and education are frozen from 2017 to 2037, meaning there will be no extra investments apart from inflation (Lima and Murakawa, 2016; Ciscati, 2016). Despite improving public service is possible using existing time and resources, a profound and structural change, such as most of the long-term recommendations suggested, is more complicated and will require political effort.

A third lesson to be learned is that existing protocols had to be adapted to consider current SUS structure in Belo Horizonte. This is likely to be the case for other SUS rehabilitation centres in Brazil and other less resourced countries where there is a lack of political effort to promote significant changes in healthcare systems. The research brings various lessons to be learned in that sense. The research methods, limitations, and results can serve as reference material when adapting protocols and implementing good practices guidelines in different contexts.
Defining the research

Chapter 1 Introduction
Chapter 2 Literature Review

Exploratory stage

Chapter 3 Finding a Research Focus
Chapter 4 The Wheelchair Service at CReabs
Understand the Wheelchair Service

Preparatory stage

Chapter 4 The Wheelchair Service at CReabs
Define the Interventions

Evaluative stage

Chapter 5 Evaluating & Refining the interventions

Research outcomes

Chapter 6 Discussion

Chapter 7 Conclusions

Answer the research questions
CHAPTER 7

CONCLUSIONS

This research aimed to provide answers to the following research question:

How to improve the current assistive technology services in Belo Horizonte city, Brazil from a user-centred perspective?

Additional research questions were added throughout the research period. The answers to these questions built the necessary knowledge to provide answers to the major question. This concluding chapter will summarise the main findings of these research questions.

7.1 The Review of Literature

To provide answers to the primary research question, it was first necessary to understand the factors influencing assistive technology services in Europe and Brazil, and the quality indicators used to assess user-centred aspects of assistive technology services in Europe. These were the concerns guiding the review of the literature (See Chapter 2). Various factors have been shown to influence assistive technology services. Prior studies show that there are: ethical issues related to the principle of equal opportunities; financial issues related to the need to remove cost barriers; expertise issues related to the need for qualified professional support; consistency issues related to the need to ensure that an assistive technology intervention fits the overall individual intervention program. For these reasons, it is considered good practice for the provisions of assistive technologies to include a service delivery system routine. However, AT services for the public provision vary according to the service organisational model that is influenced by the country’s disability policy, socio-economic context, and history. AT service organisational models are generally differentiated between medical, social and consumer models (See
Section 2.1.3.1). Andrich, et al. (2013) sustain that, despite AT systems differing significantly from each other, no system recognises itself as “perfect”. Thus, each country needs to design systems that are best tailored to its context, based on state-of-the-art recommendations.

Having provided this context for the research enquiry, the focus of the review of the literature shifted to the following question:

**What are the quality indicators used to assess user-centred aspects of assistive technology services in Europe?**

Recent literature had revealed the existence of various conceptual models to help practitioners and researchers “understand key variables, relationships, and systems that stimulate advancements in the theory, research development, policy and practice” (See Section 2.1.5.1). To facilitate good practice in AT services, the HEART Study developed a set of recommendations, published in 1995 by the European Commission, and by a consensus process within the Board of the AAATE. These included seven steps that should be common to any service delivery process and a set of quality indicators for assessing each of these steps or stages (See Section 2.1.5.2). The quality indicators are grouped into six categories: Accessibility, Competence, Coordination, Efficiency, Flexibility and User Influence. User Influence assesses whether the system is designed from a user-centred perspective.

### 7.2 Answering the Research Questions Set for Study 1

A first exploratory study, or Study 1 (See Chapter 3), was designed to address the research questions that emerged from the review of the literature:

**What are the characteristics of the current assistive technology services provided by SUS in Belo Horizonte city?**

**To what extent the current assistive technology services provided by SUS in Belo Horizonte city apply user-centred service provision best practices?**
The study collected qualitative evidence by visiting key institutions providing AT services in Belo Horizonte city (n=5) and conducting semi-structured interviews with stakeholders directly involved in these services (n=28).

AT services provided in Belo Horizonte SUS, through rehabilitation centres at the secondary level of care (CReabs) were found to uphold the ‘medical model’ of service delivery, as defined by AAATE. It is likely that this is also true across Brazil as the public health service functions similarly throughout the country. However, this does not mean that Brazil as a country adopts the so-called ‘medical’ model of disability (See Section 2.1.3.1). On the contrary, the ratification of UN CRPD, and the Viver Sem Limites programme policies give us reason to believe that Brazil is moving towards a ‘social’ model of disability (See Section 2.1.3.1).

The qualitative evidence indicated that these services still lack the essential stages suggested in best practice literature, such as testing the device before making a decision, providing users with AT training, and systematic feedback mechanisms. From the perspective of service providers, more knowledge support is necessary, a follow-up stage should be introduced, and rehabilitation centres’ physical space should be improved. The OPM list is considered rigid, and the process of requesting ATs that are not offered on the list is overly bureaucratic and time-consuming.

Study 1 also identified a research focus based on providers’ expectations and difficulties in applying existing good practices. The investigation revealed that providers’ major expectation towards improving the service was concerned with knowledge support. Most participants were eager to have more access to training, evidence-based tools and more time available to reflect on daily practice and study. The wheelchair was the most commented topic in participants’ responses (see Section 3.2.9). It was clear from the Study 1 analysis that services lack an adequate mechanism to assess users’ characteristics and requirements, beyond the clinical perspective, or to involve users in decisions. It was also apparent that, in current service conditions, there is a high risk of mismatching a user with a selected wheelchair, considering a large number of options and lack of an evidence-base to support choice. Hence, the research focus was shifted to the wheelchair service and the design of interventions that supports informed decisions through the service stages.
7.3 Answering the Research Questions Set for Study 2

After providing answers to the questions set for Study 1, and having defined the research focus to the wheelchair service, another literature review was conducted with regards to existing wheelchair service good practices (See Section 2.3). A follow-up study, Study 2, was designed to deepen understanding of the focused area, and define a set of interventions for the service. Chapter 4 provides detailed information on the methods used in Study 2, its findings, and discussion. Study 2 was divided into two parts, each having a different purpose and research questions.

Study 2.1 still had an exploratory purpose and aimed to provide answers to the following research question:

**What are the characteristics of the current assistive technology services provided by SUS in Belo Horizonte city?**

For Study 2.1, data were collected using participant observation of a hundred fifty-three users (n=153) at the various service stages. Several informal interviews were conducted with practitioners and suppliers during the observations and nine (n=9) formal interviews were later conducted with practitioners, service coordinators, and service administrators.

It was noticed that the service at Belo Horizonte CReabs varies according to two mains types of wheelchair offered: the standard wheelchair and the adapted wheelchair. Standard wheelchairs are assessed, ordered and delivered by CReab staff. There are two mains types of standard wheelchair available in the OPM list. All have their structure available in different sizes and also various features that can be selected according to user needs. Adapted wheelchairs are assessed, fitted and delivered by the CReabs staff in conjunction with the supplier staff. There are three different types of adapted wheelchairs and eight different types of adaptations available in the OPM list. Belo Horizonte SUS service offers all the different types of wheelchairs and wheelchair adaptations listed in the OPM list.

Users can change their wheelchair every two years, in the case that the offered wheelchair no longer fits their requirements. Whether the wheelchairs used at the observed stages of assessment were offered or not by CReabs, it was noticed that the condition of these wheelchairs was often worn out or otherwise inappropriate.
Study 2.2 initiated the preparatory stage of the research. At this point, the research focus was clarified and additional information was collected to expand the understanding of the focused area. The research focus shifted to preparation of a service intervention based on the identified service gap, to apply existing wheelchair good practices. Study 2.2 aimed to provide answers to the following research questions:

**How CReab practitioners from SUS assess and record wheelchair user information?**

**How to implement a user-centred Standard Operational Procedure for Belo Horizonte SUS’ current wheelchair service provision?**

A total of a hundred and forty-two users (n=142) had their care observed using participant observation at CReabs wheelchair service stages. From this, 37 were excluded and a final sample of 105 users was analysed. From these, 36 were from the assessment stage, 32 from the adapted wheelchair fitting stage and 37 were from the delivery stage. The study revealed various gaps regarding the application of existing good practices. Key findings were:

- There was no consensus between CReabs staff, regarding how to conduct the activities involved in the various service stages.
- Apart from one CReab, there was no use of protocols to assess the user requirements. There was no use of a checklist or other tools to ensure the necessary areas were covered when fitting the wheelchair to the user.
- Recurrence of similar information passed to user or carer was considerably low. There was no agreement about what kind of information should be passed and who should pass them. Many users ended up not being informed about various topics.
- WHO recommends that same practitioner should accompany the user through the service delivery stages. At CReabs, this was not guaranteed or encouraged.
- There was no culture to evaluate user presence, risk or history of pressure sores as recommended by WHO (WHO, 2012; WHO, 2013b). Physical evaluation of pressure sores by CReab participants was observed only in one case, and verbal enquiry in only four cases during the assessment.
- User positioning in the wheelchair was not thoroughly checked through the service stages as recommended by WHO (WHO, 2012; WHO, 2013b).
By the end of the period of observations, twelve CReab participants were interviewed (n=12), representing 100% of the staff working directly with wheelchair service at the moment of the study. Interviews targeted collecting providers opinions about implementing the WHO forms and checklist in the service to delineate the type of necessary interventions. Two forms and one checklist were selected to ground the design of interventions. These were adapted to the service context, using information gathered up to that point of the research. The interventions consisted of:

- A prescription form
- An entry form collecting information about the user environment
- A measurement tape to be given to the user
- An assessment form
- A wheelchair fitting checklist
- A leaflet for the user about pressure sore prevention and care

### 7.4 Answering the Research Questions Set for Study 3

Study 3 (See Chapter 5) was conducted to evaluate and refine the interventions adapted from the WHO forms and checklist at Study 2. Study 3 aimed to provide answers to the following research questions:

**What are the major barriers encountered when testing the proposed interventions?**

**What are the necessary modifications and possible solutions for the implementation of the interventions in CReab Services?**

To apply the interventions participants were invited to an initial presentation preceding their participation, in which the research purpose, methods and interventions were clarified. Participant observations accompanied the testing of the proposed interventions’ tools. A total of ninety-eight (n=98) observations were conducted from which ninety-five forms and checklists (n=95) were used and analysed. Participants using the interventions and CReab administrative staff involved in the wheelchair service were interviewed after the period of obser-
vations to provide their feedback. A total of seventeen (n=17) interviews were conducted with thirteen different participants (n=13).

Some participants resisted testing the interventions for the screening stage, stating that they lacked time and training to use them. CReab coordinators mentioned that this resistance came mostly from participants that had not been involved in the previous studies or did not participate the study presentation. The main modification to the interventions for the screening stages was to clarify how to gather information about the user environment.

Interventions designed for the assessment stage (the assessment form) was well received by all participants. Despite the fact that there was a minor increase in the average time spent when using the assessment form in all CReabs, it did not reach statistical significance (as P>0.5). The sections related to the presence, risk or history of pressure sores stood out from the areas not filled in the collected forms. This was an alarming issue raised. This is because the cushion to relieve the pressure is one of the newest items included in the list of devices offered. The research also revealed that there are still no criteria defined to prescribe the pressure relief cushions. Also, CReab staff lack the training to assess user pressure sores. As a consequence, no prescription of cushions to relieve pressure was observed. Various modifications were made to the assessment form. One of the most important was assessing users to other AT devices added to OPM list that are directly involved with the wheelchair use. These are the transfer board, the activity table and cushion to relieve the pressure.

Overall, there was no resistance using the proposed wheelchair fitting checklist. However, CReab participants did not check the pressure under the user seat bones, suggested in the form. The major modification made to the fitting checklist had regard to inserting an observation entry field at the end of each section, accommodating practitioners notes and supporting informed decisions.

It was recognised that training is necessary to formally implement the protocols in the service and overcome existing barriers. Section 5.3.4 and Chapter 6 provides details on required training and how to conduct them using current service structure and resources. Most of the suggested training can be achieved using the resources from WSTP basic level, available in the Portuguese language.


7.5 Answering the Main Research Questions

The research studies and review of the literature aimed to provide answers to the main research question:

**How to improve the current assistive technology services in Belo Horizonte city, Brazil from a user-centred perspective?**

To build knowledge to provide the answer to this question, a review of the literature was conducted and three studies were developed to collect field data. A total of sixty-six interviews were conducted (n=66) and two hundred and fifty user care observed (n=250) from which ninety-five (n=95) had the proposed interventions tested.

The research concluded that one effective way to improve the current assistive technology services from a user-centred perspective is by helping the services’ stakeholders to collect from and provide to users the right set of information to support informed decisions during their care provision. This information needs to extend beyond the clinical perspective to also consider contextual factors: the users intended activities; assessing the fit; and user satisfaction with the technology provided, among others. By providing the right set of information to users means informing them of; rights and responsibilities; how to self-care; and how to use and maintain the AT device provided, among others. These informed decisions will then improve the chances that the AT devices and services provided will fit user requirements, promoting the user’s activity and participation as a consequence. It will also avoid discontinuance of the provided device, which leads to waste of effort and resources.
7.6 Contribution to Knowledge

Overall, this research offers a holistic understanding of the complexity involved in the provision of the assistive technology services. More specifically, it brings original knowledge about the functioning of the assistive technology services provided by SUS in Belo Horizonte, one of the largest and most populated cities in Brazil. These have not been explicitly recognised previously in the literature. The knowledge brought will help to comprehend various other services provided in a similar context.

The research reveals that wheelchair services in Belo Horizonte SUS have been far from applying recommended good practices. Structural modifications are required if good practices recommended by WHO are to be incorporated in these wheelchair services.

The research also presents detailed information about the process of adapting the existing wheelchair services’ resources produced by WHO, to the reality of healthcare provision at SUS in Brazil. Beyond the adaptation of resources, the research produced an evaluation of the service situation as according to existing good practices and quality indicators, providing detailed recommendations for the current state of the service and future structural modifications of the service. Although the evaluation carried out does not represent the totality of services in Brazil, or other less resourced countries, it can be considered a pilot for larger scale evaluations.

Finally, the research gives suggestions for future work, mapping various other issues affecting the quality of the service evaluated and illuminating the path for future research and researchers.
7.7 Overall Limitations of the Research

This research focused on the assistive technology services provided at Belo Horizonte CReabs. Hence it did not include other institutions directly or indirectly involved in service provision, such as the institutions referring users to the services. Also, it did not include other public policies and services providing assistive technologies in Belo Horizonte. As a consequence, the results had revealed only a fraction of the assistive technology services available at Belo Horizonte.

As for the CReabs’ wheelchair services evaluated in this research, the interventions designed and tested focused on the service provided by CReab staff, hence only users in need of a standard wheelchair. The considerations made in the interventions with regards to the adapted wheelchair and power wheelchair, which service is under suppliers’ responsibility, were limited to the level of CReab role to these services. Although interventions were based on validated resources developed by WHO, they could not be tested, modified and tested again consistently at CReab services. Informal conversations with CReab service administrators and coordinators one year after the Study 3 indicate that staff in all three CReabs kept using the Wheelchair Assessment Form, but only a few staff practitioners continued using the other tools developed, suggesting that further work is necessary for effective implementation of the interventions and recommendations proposed. Still, the evaluation carried out can be considered as a pilot for the more extensive scale evaluation.
7.8 Recommendations for Future Work

Future work regarding the public provision of assistive technology services in Brazil should evaluate the service provided by SUS suppliers in the light of the existing good practices. In the case of wheelchair services, this includes evaluating the services involved in the provision of the power wheelchair and the adapted wheelchairs. Future work could also look into effective mechanisms for integrating existing knowledge, structures and available services for the disabled population, in order to define assistive solutions.

Another important issue raised by this research, that should be considered in future work, is searching for alternative devices and services in order to provide a broader range without making it financially unfeasible.

Although the Paralympic Games contributed to raising awareness for the disabled population's requirements in Brazil, there is still a considerable gap between current awareness and the practice necessary for effective inclusion of the disabled people in Brazilian society. Future research should look into alternatives to reduce this gap.

Overall, future research and public policies should address the gap between universities and SUS practice, encouraging academic institutions to be more engaged locally, helping to identify issues and provide care solutions to its community.


Google maps, 2015. 738 R. Felipe dos Santos, Belo Horizonte, Minas Gerais. Street View, Setember, 2015. Available through: https://www.google.co.uk/maps/place/R.+Felipe+dos+Santos,+Belo+Horizonte+-+MG,+Brasil/@-19.934145,-43.948746,3a,75y,290.56h,93.78t/data=!3m7!1e1!3m5!1s0mjyULQeqihFZb6c-dim24Q!2e0!6s%2F%2Fgeo2.ggpht.


### User Influence

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<thead>
<tr>
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<tbody>
<tr>
<td>1</td>
<td>The user is the best judge of whether a specific technical solution to a functional limitation is good.</td>
<td>The user is the best judge of whether a specific technical solution to a functional limitation is good. The individual AT programme should be built in relation to what life goals the user wants to achieve.</td>
</tr>
<tr>
<td>2</td>
<td>A good service delivery process is designed in a way that empowers users to make their own choices. This can be done by: a) educating professionals to have an attitude of equity towards users; b) providing information and consultation to enable users to make responsible choices; c) allowing users to try out products for a reasonable time before making the final choice; d) providing the possibility, to both users and professionals, to change decisions that have been made.</td>
<td>Still valid</td>
</tr>
<tr>
<td>3</td>
<td>The rights of disabled persons to appropriate assistive technology should be ensured by: a) adequate legislation; b) accompanying financial means; c) platforms (e.g. advisory committees) at local, national and/or European level promoting and monitoring regulations and practices; d) statutory bodies to ensure and protect the rights of individuals (right to appeal).</td>
<td>Still valid</td>
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<td></td>
<td>User influence could be facilitated by providing financial resources at two levels: a) providing individual users with their own budget to use towards services and devices; b) providing user organisations with financial support which may be earmarked for specific uses or open for whatever the organisation sees as most important.</td>
<td>Still valid</td>
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<td>5</td>
<td>The search for good technical solutions to the limitations of disabled persons can be facilitated by the involvement of disabled persons.</td>
<td>Still valid</td>
</tr>
<tr>
<td>6</td>
<td>In a good service delivery system, user influence in research and development is organised on three levels: a) mechanisms to systematically collect individual user feedback, e.g. through panels of expert users; b) user involvement in specific projects; c) user involvement in defining priorities in Research and Development programs.</td>
<td>Still valid</td>
</tr>
<tr>
<td>7</td>
<td>In designing a service delivery system the general level of education of the population, as well as the educational opportunities available to people with disabilities, have to be taken into account.</td>
<td>Still valid</td>
</tr>
<tr>
<td>8</td>
<td>Effective systems – based on state-of-the-art ICT but also including structured ways to meet face-to-face – should be designed to connect developers and users, in such a way to facilitate innovation based on real user needs captured in the field. Innovators should find out where the need is.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Access to AT information by user is extremely important to empower users to make informed choices. Sophisticated systems (semantic search, natural language processing etc.) should be implemented to improve user-friendliness of the search interfaces of the AT information system14.</td>
<td></td>
</tr>
</tbody>
</table>

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14. For more information, refer to user interface design principles and best practices in AT information systems.
| 10 | A service delivery system should be able to provide appropriate services tailored to different needs; according to the level of complexity of the problem of the user; to the level of knowledge, awareness and decision making ability of the user; to the expected level of complexity of the solution; |
| 11 | Professionals in AT service delivery should adopt flexible approaches to best cope with the competence of each individual end users: for instance, costly evaluations should be avoided for simple needs expressed by users who have already clear ideas of possible solutions. |
| 12 | In the various steps of the service delivery process, users should be empowered and receive all information needed to make informed choices. In particular, within the rehabilitation process, professionals should work at empowering the user to become a specialist him/herself of his/her needs; professionals should have the attitude to make themselves as much as possible “unnecessary”, although ready to offer again high level expertise at any time it is needed. |
| 13 | Peer counselling (by persons who have longer experience of living with a disability) could be a powerful resource in the “selection” step, to improve effectiveness of the service delivery process. |
| 14 | Individual AT programmes should be part of a wider life plan (rehabilitation, care, education, employment etc.). They shouldn’t be a goal in itself. For this reason, the user should be given an active role in the whole process. For instance, professional assessment reports might be integrated by self assessment reports, in order to better take into account environmental factors and personal goals. |
| 15 | People with disabilities and their representing organisations should participate or be invited to participate in any decisional process or governing bodies in Assistive Technology. |
Appendix 2> Study 1 Interview schedule Coordination staff

Introduction
My name is Tulio Maximo and I am PhD student at Loughborough University, UK, through the programme Science Without Border. My research aims to understand how low-income families have access to assistive technology services in Brazil, more specifically in Belo Horizonte. As part of my research I developed a study to better understand the functioning of these services in Belo Horizonte city, interviewing staff from different areas working in the care of this public. Your participation will consist of a semi-structured which will be recorded for analysis purpose. All the information will be confidential and will be deleted from the tape recorder after analysis. All references and quotes used in the project will be anonymous.

The aim is not to judge or evaluate the way you work but to better understand the functioning of the services provided by the institution where you work.

The questions will be made in two different stages: the first regarding the functioning of the assistive technology service offered by the institution where you work; the second regarding the centre capacity and other demographic characteristics.

1st Stage
Warm up

1. Can I first ask you about your function and daily activities at CGR/CRE AB/URS/AMR?

Considering that the AT services has different stages that could be provided by different institutions

2. Which of the classifications below best fits the administrative control of the institution?
   a. Municipality
   b. Estate
   c. Federal
   d. Profit Making
   e. OSCIP - Civil Society Organization for Public Interest
   f. Public Utility entity
   g. Philanthropic entity

3. Which of the stages below includes the assistive technologies services offered by the institution where you work?
   a. Initiative: The first contact with the service delivery system.
   b. Assessment: Evaluation of user needs whiting or without the user environment.
   c. Selection of the assistive solution: Defining the individual AT programme, if AT is necessary.
   d. Selection of the equipment: Choosing the specific equipment within the AT programme, if AT is necessary
Appendices

4. Which of the AT categories described below the centre offer/concede/have partners that made available free of charge?

Assistive Technology type (according to federal decree Nº 3.298/1999)

a. Hearing, visual, physics prosthetics.
b. Orthotics that favours the function.
c. Equipment to the person with disability rehabilitation and therapy.
d. Equipment, machinery and work instruments specially designed or adapted to the person with disability use.
e. Devices for mobility and personal care necessary to facilitate the safety and autonomy of the person with disability.
f. Special devices to facilitate the communication, information and guidance to the person with disability.
g. Equipment and special pedagogic material for the person with disability’s education, training, recreation.
h. Environmental adaptations and other more that ensures the access, the functional improvement and the person autonomy.
i. Ostomy bag.

Considering the AT items offered by the SIA/SUS list:

5. Cite three or more AT not yet offered by the SIA/SUS list that you consider most urgent their incorporation to the list.

a. When an item not included in the list is seen necessary, what is done?
b. Are there any AT limits to be prescribed at SUS?

Regarding the public assisted ate the centre.

6. Is there any age restriction (minimum or maximum) for the service provision?

a. If yes, what is the age restriction?
b. If age restriction includes children: where they are referred to when neglected care?

7. Does the centre provide service for other regions or cities different from where it is located? (complete using the answer matrix/prompt card)*
8. Is there any selection criterion in the allocation order?
   a. If yes. What are the priorities?
   b. Does it made use of a standard procedure/protocol?

Regarding the AT prescription

9. What occupations are allowed to prescribe the AT covered by SUS?

Regarding the AT acquisition

10. When an AT is seen necessary, what is the process undertaken by the user in order to receive the AT? (please suggest modifications to the delivered flow chart as according to the procedure in your centre)

11. Is there an opportunity to educate and to train the user/patient regarding its condition, in a sense to make it more aware and independent?
   a. How this training is made?
   b. Is there any formal procedure or protocol regarding it?

Regarding the system actual perspective:

12. What are the main difficulties faced to provide a quality AT service that respects the user characteristics?

Regarding the system future perspective:

13. What changes would you make in order to enhance the quality of the AT service provided?

2nd Stage

The interview is getting to its end. I will like to ask you access to the following data regarding the AT service capacity at the centre.

14. Number by professionals working at the centre by occupation.
15. The centre capacity.
16. Number of users that received an AT in the previous four years.
17. Number of Orthotics / Prosthetics / Walking aids and wheelchairs delivered in the previous four years.
18. The contracted service/AT suppliers attending the centre.
O centro presta serviço para regiões e cidades diferentes daquela onde se encontra? Quais?

Fonte: Saberes necessários à ação: caminhos e rotas. Alcimir Soares dos Reis, Alberth Sant’Ana da Silva & Rogério Luís Massesaini

- Venda Nova
- Norte
- Nordeste
- Pampulha
- Noroeste
- Leste
- Centro-sul
- Oeste
- Barreiro
- Ribeirão das Neves
- Vespasiano
- Santa Luzia
- Sabará
- Nova Lima
- Brumadinho
- Ibirité
- Contagem
Appendix 3> Study 1 Interview schedule MEDICAL staff

Introduction

My name is Tulio Maximo and I am PhD student at Loughborough University, UK, through the programme Science Without Border. My research aims to understand how low-income families have access to assistive technology services in Brazil, more specifically in Belo Horizonte. As part of my research I developed a study to better understand the functioning of these services in Belo Horizonte city, interviewing staff from different areas working in the care of the public. Your participation will consist of a semi-structured which will be recorded for analysis purpose. All the information will be confidential and will be deleted from the tape recorder after analysis. All references and quotes used in the project will be anonymous.

The aim is not to judge or evaluate the way you work but to better understand the functioning of the services provided by the institution where you work.

The questions will be made in two different stages: the first regarding assistive technology service offered by the institution where you work; the second regarding the process of selection, acquisition and use of the assistive technologies offered.

1st Stage

Warm up

1. Can I first ask you about your function and daily activities at CGR/CREAB/URS/AMR?

Considering that the AT services has different stages that could be provided by different institutions

2. Which of the stages below includes the assistive technologies services offered by the institution where you work?

   a. Initiative: The first contact with the service delivery system.
   b. Assessment: Evaluation of user needs whiting or without the user environment.
   c. Selection of the assistive solution: Defining the individual AT programme, if AT is necessary.
   d. Selection of the equipment: Choosing the specific equipment within the AT programme, if AT is necessary
   e. Authorisation: AT acquisition by own user, or concession through funds entity and/or government programmes or both.
   f. Implementation: Delivering the equipment to the user, fitting and training whiting or without the user environment.
   g. Management and Follow up: Maintenance, substitution and periodic verification
2nd Stage

This part of the interview focuses on the process of selection, acquisition and use of the AT when an AT is seen necessary.

Regarding the selection of the AT to be adopted:

3. How is the process undertaken to select the AT?
1. Which occupations take part of the selection of the assistive solution?
2. Which occupations take part in the selection of the equipment?
4. Is there an opportunity for the user to choose between different models in the AT selection process?

5. Is there an opportunity to test the AT before deciding for the final solution or equipment?

Considering the AT items offered by the SIA/SUS list:

6. Cite three or more AT not yet offered by the SIA/SUS list that you consider most urgent their incorporation to the list.
   a. When an item not included in the list is seen necessary, what is done?
   b. Are there any AT limits to be prescribed at SUS?

Regarding the acquisition of the AT:

7. When an AT is seen necessary, what is the process undertaken by the user in order to receive the AT? (please suggest modifications to the delivered flow chart as according to the procedure in your centre)

8. Is there an opportunity to educate and to train the user/patient regarding its condition, in a sense to make it more aware and independent?
   a. How this training is made?
   b. Is there any formal procedure or protocol regarding it?

This question regards the way you assess the user needs and you may find it the most complex question so far:

9. How the user needs regarding personal characteristics and personal goals are evaluated in order to match the technology to be prescribed?
   a. Does the process make use of specific model such as CIF (ICF), COPM (MPT), HAAT, or other?

The next question is a broaden one and regards what do you look for when prescribing an AT.
10. What do you aim to achieve with the AT when it’s seen necessary?

Regarding the production and personalization of AT made by the institution:

11. Does the centre produce any AT internally?
   a. Which of them?
   b. Is there a specific/appropriate place where these AT are made?

Regarding the personalization of the AT:

12. Is there an opportunity for the user to make choice in the process of personalization of AT?
   a. What options do they have in this process?

Regarding the user follow up.

13. Is there any user feedback mechanism regarding the AT service offered?
   a. How often do they occur?

14. Is the user given the opportunity to make a self-assessment by report or other means?

The interview is getting to its end and the final questions regard the actual and future perspective.

Regarding the system actual perspective:

15. What are the main difficulties faced to provide a quality AT service that respects the user characteristics?

Regarding the system future perspective:

16. What changes would you make in order to enhance the quality of the AT service provided?
Appendix 4> Estudo 1 Formulário de Entrevista (Coordenador)

Meu nome é Tulio Maximo e sou estudante de doutorado na Universidade de Loughborough, Reino Unido, pelo programa Ciência Sem Fronteiras. Minha pesquisa busca o entendimento de como famílias de baixa renda que possuem criança com deficiência motora acessam serviços de tecnologia assistiva no Brasil. Como parte de minha pesquisa estou desenvolvendo um estudo com o propósito de melhor entender o funcionamento destes serviços em Belo Horizonte, entrevistando profissionais de diferentes áreas que trabalham no atendimento deste público. Sua participação consistirá em uma entrevista semi-estruturada, gravada para fins de análise de dados. Toda informação coletada será confidencial e será deletada após o termo do estudo. Todas as referências e citações utilizadas no projeto serão anônimas.

O objetivo desta pesquisa não é de julgar ou avaliar a forma de trabalho, mas sim de melhor compreender o funcionamento dos serviços providos pela instituição onde trabalha.

Farei as perguntas em dois estágios, sendo o primeiro sobre serviços relacionados às tecnologias assistivas oferecidos pela instituição, e o segundo estágio sobre os dados referentes à capacidade de atendimento

1ª Parte

Warm up

Antes de começar a entrevista

1. Fale-me brevemente sobre sua Função e atividades diárias na CGR/CREAB/URS/APAE/AMR.
   a. Qual departamento você trabalha?
   b. Ha quanto tempo você trabalha no departamento?

Sobre a Instituição e os Serviços Prestados

2. Qual classificação melhor descreve a Instituição em relação ao controle administrativo
   a. Publica (Municipal/ Estadual/ Federal)
   b. Com finalidades Lucrativas
   c. Oscip
   d. Entidade de Utilidade Publica
   e. Entidade de Fins Filantrópicos/ entidade beneficente de assistência social

3. Quais das etapas abaixo estão relacionados os serviços em Tecnologia assistiva oferecidos pela instituição (marque quantos forem necessários) PM
   a. Iniciativa do usuário em procurar o serviço para suprir alguma necessidade.
   b. Avaliação e identificação de necessidades, avaliação funcional e/ou avaliação funcional do indivíduo em seu ambiente habitual;
   c. Determinação do conjunto de soluções em termos de tecnologias assistivas necessárias ou programa individual de tecnologias assistivas necessárias, se realmente for necessário algum equipamento.
   d. Seleção do conjunto específico de tecnologias assistivas e serviços, com respeito
a marcas, modelos e configurações de montagem entre equipamentos, se for o caso;

e. Aquisição do equipamento pelo próprio usuário ou familiares, concessão por entidade financiadora e/ou programas do governo, ou combinação de ambos.

f. Entrega do equipamento, experimentação, personalização, treinamento do uso do equipamento no contexto de vida do usuário ou no próprio local de entrega.

g. Seguimento e avaliação, incluindo adaptação, manutenção, conserto e substituição do equipamento.

4. Quais das TAs descritas na lista o centro oferece/concede/possui parceiros que disponibilizam gratuitamente?

a. Próteses auditivas, visuais e físicas;

b. Órteses que favoreçam a adequação funcional;

c. Equipamentos e elementos necessários à terapia e reabilitação da pessoa portadora de deficiência;

d. Equipamentos, maquinários e utensílios de trabalho especialmente desenhados ou adaptados para uso por pessoa portadora de deficiência.

e. Elementos de mobilidade, cuidado e higiene pessoal necessários para facilitar a autonomia e a segurancas da pessoa portadora de deficiência.

f. Elementos especiais para facilitar a comunicação, a informação e a sinalização para pessoa portadora de deficiência.

g. Equipamentos e material pedagógico especial para educação, capacitação e recreação da pessoa portadora de deficiência

h. Adaptações ambientais e outras que garantam o acesso, a melhoria funcional e a autonomia pessoal

i. Bolsas coletoras para os portadores de ostomia

5. Cite três tecnologias assistivas ainda não oferecidas pela tabela SAI/SUS que você considera de maior urgência sua a incorporação? PM

a. Quando uma TA não coberta pelo SUS é necessária, o que é feito?

b. Existe algum limite de TA a ser encaminhado pelo SUS?

Publico Atendido

6. Em relação ao publico atendido, existe alguma restrição de idade mínima ou máxima para o atendimento?

a. Caso sim, qual é a idade limite?

b. Se restrição inclui criança, para onde elas são encaminhadas quando o atendimento é impossibilitado?

7. O centro presta serviço para regiões ou cidades diferentes daquela onde se encontra? (Cartão de resposta)

a. Quais regiões e por quê?

b. Quais cidades e por quê?
8. Existe algum critério para a ordem do atendimento gratuito:
   a. Caso sim. Quais critérios? Existe algum Procedimentos Operacionais Padrão?

Em relação à prescrição da TA:

9. Quais profissionais possuem permissão para prescrever as TAs cobertas pelo SUS?

Aquisição

10. Considerando um paciente que necessite de uma TA, qual procedimento percorrido para aquisição do equipamento (ver fluxograma?) PM

11. Existe a oportunidade de educar e treinar o usuário/paciente em relação à sua condição, no sentido de torna-lo mais consciente e mais independente? PM

Perspectivas futuras

12. Quais são as principais dificuldades enfrentadas para oferecer de uma TA de qualidade e que atenda as características do usuário? PM

13. Se você pudesse fazer uma mudança para melhorar o serviço que oferecem de TA, qual seria esta mudança? PM

2ª Parte

Dados referentes à capacidade de atendimento

Seria possível o acesso a dados referentes às tecnologias assistivas como:

14. Quantos profissionais da saúde trabalham no centro e de quais ocupações?

15. Qual a capacidade de atendimento do hospital?

16. Numero de pessoas beneficiadas com itens de TA nos últimos 4 anos?

17. Número de Órtese / Prótese /Meios Auxiliares De Locomoção E Cadeira De Rodas oferecidas nos últimos 4 anos?

18. Quais oficinas ortopédicas atendem ao centro?
Appendices

Appendix 5 > Estudo 1 Formulário de Entrevista (MEDICO)

Meu nome é Tulio Maximo e sou estudante de doutorado na Universidade de Loughborough, Reino Unido, pelo programa Ciência Sem Fronteiras. Minha pesquisa busca o entendimento de como famílias de baixa renda que possuem criança com deficiência motora acessam serviços de tecnologia assistiva no Brasil. Como parte de minha pesquisa estou desenvolvendo um estudo com o propósito de melhor entender o funcionamento destes serviços em Belo Horizonte, entrevistando profissionais de diferentes áreas que trabalham no atendimento deste público. Sua participação consistirá em uma entrevista semi-estruturada, gravada para fins de análise de dados. Toda informação coletada será confidencial e será deletada após o término do estudo. Todas as referências e citações utilizadas no projeto serão anônimas.

O objetivo desta pesquisa não é de julgar ou avaliar a forma de trabalho, mas sim de melhor compreender o funcionamento dos serviços providos pela instituição onde trabalha.

Farei as perguntas em dois estágios, sendo o primeiro sobre serviços relacionados às tecnologias assistivas oferecidos pela instituição, e o segundo estágio sobre o processo de seleção, aquisição e uso de tecnologias assistivas.

1ª Parte

Warm up

Antes de começar a entrevista

1. Fale-me brevemente sobre sua Função e atividades diárias na CGR/CREAB/URS/APAE/AMR.
   a. Qual departamento você trabalha?
   b. Ha quanto tempo você trabalha no departamento?

2. Quais das etapas abaixo estão relacionados os serviços em Tecnologia oferecidos pela instituição (marque quantos forem necessários) PC
   a. Iniciativa do usuário em procurar o serviço para suprir alguma necessidade.
   b. Avaliação e identificação de necessidades, avaliação funcional e/ou avaliação funcional do indivíduo em seu ambiente habitual;
   c. Determinação do conjunto de soluções em termos de tecnologias assistivas necessárias ou programa individual de tecnologias assistivas necessárias, se realmente for necessário algum equipamento.
   d. Seleção do conjunto específico de tecnologias assistivas e serviços, com respeito a marcas, modelos e configurações de montagem entre equipamentos, se for o caso;
   e. Aquisição do equipamento pelo próprio usuário ou familiares, concessão por entidade financiadora e/ou programas do governo, ou combinação de ambos.
f. Entrega do equipamento, experimentação, personalização, treinamento do uso do equipamento no contexto de vida do usuário ou no próprio local de entrega.

g. Acompanhamento e avaliação, incluindo adaptação, manutenção, conserto e substituição do equipamento.

2ª Parte

Diagnóstico de necessidades / seleção / aquisição / treinamento e acompanhamento

Esta parte da entrevista focará no processo de seleção, aquisição, treinamento e acompanhamento do uso das tecnologias assistivas por usuários/pacientes com deficiência motora.

Em relação à seleção da TA(s) ou solução a ser adotada:

3. Qual o procedimento percorrido para selecionar a TA específica a ser utilizada?
   a. Quais profissionais participam da escolha do equipamento? Como a decisão é feita?

4. Existe oportunidade do usuário de escolher entre diferentes modelos no processo de seleção da TA?

5. Existe possibilidade de testar a TA antes da decisão final pela TA?

Considerando os itens de tecnologias assistivas oferecidos pela tabela SIA/SUS

6. Cite três tecnologias assistivas ainda não oferecidas pela tabela SAI/SUS que você considera de maior urgência sua a incorporação? PC
   a. Quando uma TA não coberta pelo SUS é necessária, o que é feito?
   b. Existe algum limite de TA a ser encaminhado pelo SUS?

Aquisição

7. Considerando um paciente que necessite de uma TA, qual procedimento percorrido para aquisição do equipamento (ver fluxograma?) PC

8. Existe a oportunidade de educar e treinar o usuário/paciente em relação à sua condição, no sentido de torna-lo mais consciente e mais independente? PC

9. Como as necessidades referentes a características e objetivos pessoais são avaliadas a fim de adequar/selecionar a TA a ser indicada?
   a. Este processo faz uso de algum modelo específico como CIF(ICF), Medida
Canadense de Desempenho Ocupacional COPM (MPT), HAAT- human activity AT, ou outro (próprio)? QUAL?

b. Quais profissionais participam da avaliação do paciente no que se refere à definição da TA?

10. O que os profissionais do instituto buscam atingir quando uma tecnologia assistiva é vista necessária?

Em relação à produção/ personalização da TA quando feita pela instituição

11. O centro produz alguma TA internamente?

Em relação às TAs que necessitam de ajustes/personalização

12. Onde são feitos estes ajustes?
   a. Que escolha a criança possui neste processo de personalização?

13. Existe oportunidade de escolha do usuário/paciente no processo de personalização da TA?

Acompanhamento

14. Existem mecanismos de retorno/feedback dos usuários em relação aos serviços oferecidos?
   a. Com que frequência ele ocorre?

15. O usuário é dada a oportunidade fazer auto avaliação através de relatório ou outros meios?

Perspectivas futuras

16. Quais são as principais dificuldades enfrentadas para oferecer de uma TA de qualidade e que atenda as características do usuário?

17. Se você pudesse fazer uma mudança para melhorar o serviço que oferecem de TA, qual seria esta mudança.
Appendix 6> Ethics Approval

Plataforma Brasi (same for Study 1,2,3)
Loughborough University Ethics Approvals

<table>
<thead>
<tr>
<th>Project Details</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. Project Title: Designing Better Assistive Technology at Brazil: assessing the needs of physically disabled children’s families in unfavourable social conditions in Belo Horizonte</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Applicant(s) Details</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Name of Applicant 1: Tulio Pereira dos Santos Maximo</td>
<td>10. Name of Applicant 2: Laurence Clift</td>
</tr>
<tr>
<td>5. Programme (if applicable): Click here to enter text.</td>
<td>13. Programme (if applicable): Click here to enter text.</td>
</tr>
<tr>
<td>6. Email address: <a href="mailto:t.p.d.s.maximo@lboro.ac.uk">t.p.d.s.maximo@lboro.ac.uk</a></td>
<td>14. Email address: <a href="mailto:L.Clift@lboro.ac.uk">L.Clift@lboro.ac.uk</a></td>
</tr>
<tr>
<td>7a. Contact address: 54 Tyler Avenue, Loughborough, LE11 3NN</td>
<td>15a. Contact address: Click here to enter text.</td>
</tr>
<tr>
<td>7b. Telephone number: 07932681557</td>
<td>15b. Telephone number: +441509226918</td>
</tr>
<tr>
<td>9. Responsible Investigator: No</td>
<td>17. Responsible Investigator: Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Participants</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>18. Are researchers in a position of direct authority with regard to participants (e.g. academic staff using student participants, sports coaches using his/her athletes in training)?</td>
<td>No</td>
</tr>
</tbody>
</table>
### Vulnerable groups

<table>
<thead>
<tr>
<th>19. Will participants be knowingly recruited from one or more of the following vulnerable groups?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children under 18 years of age</td>
</tr>
<tr>
<td>Persons incapable of making an informed decision for themselves</td>
</tr>
<tr>
<td>Pregnant women</td>
</tr>
<tr>
<td>Prisoners/Detained persons</td>
</tr>
<tr>
<td>Other vulnerable group</td>
</tr>
</tbody>
</table>

**If you have selected No to all of Question 19, please go to Question 23.**

| 20. Will participants be chaperoned by more than one investigator at all times? | Choose an item |
| 21. Will at least one investigator of the same sex as the participant(s) be present throughout the investigation? | Choose an item |
| 22. Will participants be visited at home? | Choose an item |

### Researcher Safety

| 23. Will the researcher be alone with participants at any time? | No |

**If Yes, please answer the following questions:**

| 23a. Will the researcher inform anyone else of when they will be alone with participants? | Choose an item |
| 23b. Has the researcher read the 'guidelines for lone working' and will abide by the recommendations within? | Choose an item |

### Methodology and Procedures

<table>
<thead>
<tr>
<th>24. Please indicate whether the proposed study:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Involves taking bodily samples (please refer to published guidelines)</td>
</tr>
<tr>
<td>Involves using samples previously collected with consent for further research</td>
</tr>
<tr>
<td>Involves procedures which are likely to cause physical, psychological, social or emotional distress to participants</td>
</tr>
<tr>
<td>Is designed to be challenging physically or psychologically in any way (includes any study involving physical exercise)</td>
</tr>
<tr>
<td>Exposes participants to risks or distress greater than those encountered in their normal lifestyle</td>
</tr>
<tr>
<td>Involves collection of body secretions by invasive methods</td>
</tr>
<tr>
<td>Prescribes intake of compounds additional to daily diet or other dietary manipulation/supplementation</td>
</tr>
<tr>
<td>Involves pharmaceutical drugs</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>Involves use of radiation</td>
</tr>
<tr>
<td>Involves use of hazardous materials</td>
</tr>
<tr>
<td>Assists/alters the process of conception in any way</td>
</tr>
<tr>
<td>Involves methods of contraception</td>
</tr>
<tr>
<td>Involves genetic engineering</td>
</tr>
</tbody>
</table>

**Involves testing new equipment**

**Observation/Recording**

<table>
<thead>
<tr>
<th>25a. Does the study involve observation and/or recording of participants?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>If Yes:</strong></td>
<td></td>
</tr>
<tr>
<td>25b. Will those being observed and/or recorded be informed that the observation and/or recording will take place?</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Consent and Deception**

| 26. Will participants give informed consent freely? | Yes |

**Informed consent**

| 27. Will participants be fully informed of the objectives of the study and all details disclosed (preferably at the start of the study but, where this would interfere with the study, at the end)? | Yes |
| 28. Will participants be fully informed of the use of the data collected (including, where applicable, any intellectual property arising from the research)? | Yes |

**For children under the age of 18 or participants who are incapable of making an informed decision for themselves:**

| a. Will consent be obtained (either in writing or by some other means)? | N/A |
| b. Will consent be obtained from parents or other suitable person? | N/A |
| c. Will they be informed that they have the right to withdraw regardless of parental/guardian consent? | N/A |
| d. For studies conducted in schools, will approval be gained in advance from the Head-teacher and/or the Director of Education of the appropriate Local Education Authority? | N/A |
| e. For detained persons, members of the armed forces, employees, students and other persons judged to be under duress, will care be taken over gaining freely informed consent? | N/A |
### Appendixes

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>30. Does the study involve deception of participants (i.e. withholding of information or the misleading of participants) which could potentially harm or exploit participants?</td>
<td>No</td>
</tr>
<tr>
<td><strong>If Yes:</strong></td>
<td></td>
</tr>
<tr>
<td>31. Is deception an unavoidable part of the study?</td>
<td>Choose an item</td>
</tr>
<tr>
<td>32. Will participants be de-briefed and the true object of the research revealed at the earliest stage upon completion of the study?</td>
<td>Choose an item</td>
</tr>
<tr>
<td>33. Has consideration been given on the way that participants will react to the withholding of information or deliberate deception?</td>
<td>Choose an item</td>
</tr>
</tbody>
</table>

**Withdrawal**

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>34. Will participants be informed of their right to withdraw from the investigation at any time and to require their own data to be destroyed?</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Storage of Data and Confidentiality**

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>35. Will all information on participants be treated as confidential and not identifiable unless agreed otherwise in advance, and subject to the requirements of law?</td>
<td>Yes</td>
</tr>
<tr>
<td>36. Will storage of data comply with the Data Protection Act 1998?</td>
<td>Yes</td>
</tr>
<tr>
<td>37. Will any video/audio recording of participants be kept in a secure place and not released for any use by third parties?</td>
<td>Yes</td>
</tr>
<tr>
<td>38. Will video/audio recordings be destroyed within ten years of the completion of the investigation?</td>
<td>Yes</td>
</tr>
<tr>
<td>39. Will full details regarding the storage and disposal of any human tissue samples be communicated to the participants?</td>
<td>Yes</td>
</tr>
<tr>
<td>40. Will research involve the sharing of data or confidential information beyond the initial consent given?</td>
<td>No</td>
</tr>
<tr>
<td>41. Will the research involve administrative or secure data that requires permission from the appropriate authorities before use?</td>
<td>No</td>
</tr>
</tbody>
</table>

**Incentives**

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>42. Will incentives be offered to the investigator to conduct the study?</td>
<td>No</td>
</tr>
<tr>
<td>43. Will incentives be offered to potential participants as an inducement to participate in the study?</td>
<td>No</td>
</tr>
</tbody>
</table>
Appendices

Work Outside of the United Kingdom

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>44. Is your research being conducted outside of the United Kingdom?</td>
<td></td>
</tr>
<tr>
<td>If Yes:</td>
<td></td>
</tr>
<tr>
<td>45. Has a risk assessment been carried out to ensure the safety of the researcher whilst working outside of the United Kingdom?</td>
<td>Yes</td>
</tr>
<tr>
<td>46. Have you considered the appropriateness of your research in the country you are travelling to?</td>
<td>Yes</td>
</tr>
<tr>
<td>47. Is there an increased risk to yourself or the participants in your research study?</td>
<td>No</td>
</tr>
<tr>
<td>48. Have you obtained any necessary ethical permission needed in the country you are travelling to?</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Information and Declarations

Checklist Application Only:
If you have completed the checklist to the best of your knowledge, and not selected any answers marked with an * or †, your investigation is deemed to conform with the ethical checkpoints. Please sign the declaration and lodge the completed checklist with your Head of Department/School or his/her nominee.

Checklist with Additional Information to the Secretary:
If you have completed the checklist and have only selected answers which require additional information to be submitted with the checklist (indicated by a †), please ensure that all the information is provided in detail below and send this signed checklist to the Secretary of the Sub-Committee.

Checklist with Generic Protocols Included:
If you have completed the checklist and you have selected one or more answers in which you wish to use a Generic Protocol (indicated by #), please include the Generic Protocol reference number in the space below, along with a brief summary of how it will be used. Please ensure you are on the list of approved investigators for the Generic Protocol before including it on the checklist. The completed checklist should be lodged with your Head of Department/School or his/her nominee.

Full Application needed:
If on completion of the checklist you have selected one or more answers which require the submission of a full proposal (indicated by a *), please download the relevant form from the Sub-Committee's web page. A signed copy of this Checklist should accompany the full submission to the Sub-Committee.

Ethical Clearance Checklist January 2013
Space for information on Generic Proposals and/or Additional information as requested:

Click here to enter text.

For completion by Supervisor

Please tick the appropriate boxes. The study should not begin until all boxes are ticked.

☑️ The student has read the University's Code of Practice on investigations involving human participants
☑️ The topic merits further research
☑️ The student has the skills to carry out the research or are being trained in the requires skills by the Supervisor
☑️ The participant information sheet or leaflet is appropriate
☑️ The procedures for recruitment and obtaining informed consent are appropriate

Comments from supervisor:

Click here to enter text.

Signature of Applicant:

Signature of Supervisor (if applicable):

Signature of Head of School/Department or his/her nominee:

Date: 1st April 2014

Ethical Clearance Checklist January 2013
## Appendix 7: Transcription Convention

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(...)</td>
<td>Indicates skipped parts</td>
</tr>
<tr>
<td>“quotation mark”</td>
<td>Indicates that participant is reading</td>
</tr>
<tr>
<td>(  )</td>
<td>Indicates clarifying comments by the researcher</td>
</tr>
<tr>
<td>(xxx)</td>
<td>Indicate parts that could not be understood</td>
</tr>
<tr>
<td>=</td>
<td>Participant interrupts the phrase to starts a new one</td>
</tr>
<tr>
<td>P:</td>
<td>Indicates pesquisador (Portuguese for researcher)</td>
</tr>
<tr>
<td>SSP</td>
<td>Supplier Staff Participant</td>
</tr>
<tr>
<td>MSP</td>
<td>Medical Staff Participant</td>
</tr>
<tr>
<td>ASP</td>
<td>Administrative Staff Participant</td>
</tr>
<tr>
<td>CSP</td>
<td>Coordination Staff Participant</td>
</tr>
<tr>
<td>TSP</td>
<td>Technician Staff Participant</td>
</tr>
<tr>
<td>[   ]</td>
<td>Overlapping speech.</td>
</tr>
</tbody>
</table>

Eg. [ASP:1/P:] Eg. Indicates that ASP:1 speech overlaps P:1 speech.
Appendix 8> Tag Cloud from Study 1 interviews’ transcription
**Appendix 9> Study 2 and 3 Observation Schedule (English)**

**Observation schedule**

<table>
<thead>
<tr>
<th>CREAB</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td></td>
</tr>
</tbody>
</table>

*Ask CREab participant to think out loud whenever possible during care.*

<table>
<thead>
<tr>
<th>Stage</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>Start:</td>
</tr>
<tr>
<td></td>
<td>END:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>People involved</th>
<th>CREab:</th>
<th>Occupation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>User:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What is being done?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objects</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Space</td>
<td></td>
</tr>
</tbody>
</table>
**Observation schedule**

<table>
<thead>
<tr>
<th>Create</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td></td>
</tr>
</tbody>
</table>

**User:**

What is being done?

---

**Obs.**
## Planejamento da Observação Estudo 2 e 3

### Etapa

<table>
<thead>
<tr>
<th>Tempo</th>
<th>Data:</th>
<th>Começo:</th>
<th>FIM:</th>
</tr>
</thead>
</table>

### Pessoas envolvidas

<table>
<thead>
<tr>
<th>CREAB:</th>
<th>Ocupação:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fornecedor:</td>
<td></td>
</tr>
<tr>
<td>Usuário:</td>
<td></td>
</tr>
<tr>
<td>Outros:</td>
<td></td>
</tr>
</tbody>
</table>

### O que está sendo feito?

| Objetos | |
|---------| |
| Espaço | |

Solicitar ao participante da equipe CREAB para pensar alto durante o processo sempre que possível.
### Planejamento Observação

<table>
<thead>
<tr>
<th>CREAB</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Data</td>
<td></td>
</tr>
<tr>
<td>Usuário:</td>
<td></td>
</tr>
</tbody>
</table>

O que está sendo feito?

---

**Obs.**
Appendix 11> Example of filled observation schedule for Study 2


**Planejamento de Observação**

<table>
<thead>
<tr>
<th>CREAB</th>
<th>PR</th>
<th>Datas (12/14/2019)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Usuário:**

O que está sendo feito?

- (c) fez um pedido e recebeu respostas.
- (c) perguntou se conseguia concordar com a sessão.
- (c) perguntou se conseguiria enviar ao homem.
- (c) explicou um ponto.

(c) explicou que colocar todas as análises numa pasta de nome TEx e pegar outras pastas por favor O S e tecer em Onix que foi e de um fornecedor próprio para poder tecer o tecido (c) confirmou que agora que ele está com a tecer um grão acaba entrego e diga que fez melhorado.

(c) comentou que como trabalha shooter às vezes entrega para deixa debrilhado quantas pessoas está em atendimento (c) diz que gosta de com a tecer e entregar a embalagem com os tecidos e embora se bem é que (c) e (d) comentaram que podem muito tempo no trabalho. (c) "este malboro é bem quente".

**Obs:**

- comentou que não precisou de uma APAC, nem conversa para lembrar ao pessoal. Disse que ela preferiu order o pedido antes de APAC
dilema com colégio para entrada a colégio para adiantar o serviço. Disse que quando entra em imprensa não lembra tão que precisar de APAC na mão.
Appendix 12> Estudo 2.1 Perguntas para a equipe do CReab

Estudo 2.1 – Perguntas para equipe do Creab

ACOLHIMENTO

1. Descreve em detalhes o procedimento para agendar a avaliação e medida do usuário após a etapa do acolhimento.
2. Quantos dias da semana os profissionais deste CReab ficam disponíveis para o atendimento dos serviços de cadeira de rodas?
3. Que tipos de informações específicas são inseridos no SISREDE e SISREG?

AVALIAÇÃO & MEDIDA

1. Quando uma cadeira de rodas de ferro é prescrita e quando uma cadeira de rodas de alumínio é prescrita?
2. Durante a avaliação, se constatada a necessidade de uma cadeira padrão com assento ergonômico ou outro item de posicionamento disponível em modelos padrões, é necessário encaminhar o usuário para avaliação e medida de cadeira adaptada ou é possível solicitar diretamente a cadeira padrão com o item de posicionamento necessário?

PROVA DE CADEIRA ADAPTADA

1. A lista SIA/SUS exige que um profissional treinado deva conduzir os procedimentos relacionados à cadeira de rocas adaptada. Como os CReabs garantem que a equipe dos fornecedores possuam o treinamento e qualificação necessária para prover os serviços de cadeira adaptada?

ENTREGA

1. Que tipo de informação os profissionais do CREAB anotam no laudo de autorização ao final da entrega da cadeira de rodas? São anotadas as modificações previstas e não previstas?

FUNCIONAMENTO GERAL DO SERVIÇO

1. Existe a possibilidade de avaliar ou testar as cadeiras de rodas a serem entregues antes do período de entrega?
2. Qual é o órgão que produz e autoriza as fichas padrões utilizadas no CReabs?
3. Com a possibilidade da AMR de fazer modificações nas cadeiras de rodas, é possível que estas sejam feitas anterior ao período da garantia da cadeira ou
do período mínimo de dois anos exigido pelos CReabs para solicitar nova cadeira de rodas?

4. Esclareça os tipos de serviço de cadeiras de rodas oferecidos por cada fornecedor de cadeira de rodas dos CReabs.
Appendix 13> Study 2.1 Interview Schedule for CReab staff (English)

Study 2.1 - Interview schedule to CReab Staff

SCREENING STAGE
1. Can you describe me in detail the procedure to schedule an user appointment ensure to schedule an user appointment?
2. How many days in the week staff at this CReab has available to care about the wheelchair service?
3. What specific type of information are inserted in SISREDE and SISREG?

ASSESSMENT STAGE
4. When does a steel wheelchair is prescribed and when does an aluminium wheelchair is prescribed?
5. During an assessment, when is identified the need of a standard wheelchair with an ergonomic seat or another postural support device available to standard wheelchairs, is it necessary to schedule another assessment specific for adapted wheelchair or is it possible to prescribe and order a standard wheelchair with the necessary postural support device?

ADAPTED WHEELCHAIR FIT-TEST STAGE
6. SIA/SUS list requires that a trained professional should conduct the procedures related to the adapted wheelchair. How CReabs ensure that suppliers staff have the necessary training qualification to provide adapted wheelchair services

DELIVERY STAGE
7. What kind of information does CReab staff make notes at authorization report at wheelchair delivery? Do they record the modifications predicted and not predicted?

OVERALL FUNCTIONING
8. Is there an opportunity to check or test the wheelchairs to be delivered before the delivery stage?
9. Who produces and who authorises the forms and checklist used at CReabs?
10. With the possibility of the AMR supplier to make modifications and repairs to the wheelchair, is it possible that these are made before the supplier guarantee or before the two years minimum period to request a new wheelchair?
11. Could you clarify the service provided by each of the wheelchair suppliers?
Appendix 14> Estudo 2.1 Formulário de entrevista para Coordenação de Reabilitação

<table>
<thead>
<tr>
<th>Entrevista Coordenação de Reabilitação</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrevistados:</td>
</tr>
<tr>
<td>Data:</td>
</tr>
</tbody>
</table>

As perguntas focaram nas etapas sugeridas nas boas-práticas existentes, principalmente as sugeridas pela OMS e AAATE, e que ainda não acontecem no serviço de cadeira de rodas oferecido pelo SUS. O objetivo é o de entender quais são os dificultadores, quais são as oportunidades e identificar a existência de alguma iniciativa ou previsão de implementação destas etapas.

1. Uma das etapas mais importantes sugeridas nas melhores práticas em serviços de T.A é a de testar diferentes opções de T.A antes de chegar a uma decisão, o que deveria ser feito no momento da avaliação. No caso da cadeira de rodas isto requer adquirir pelo menos um modelo de cada cadeira para que fique à disposição dos profissionais. O que precisa ser feito para que isto ocorra no futuro? Quais os atuais dificultadores para que isto ocorra no momento?

2. Outra etapa fundamental para o funcionamento ideal do serviço é a etapa de acompanhamento após a entrega da cadeira, o que poderia ser feito tanto pelos profissionais dos CREabs quanto pelos profissionais do NASF. Alguns profissionais mencionaram que esta etapa vem sido discutida. Em qual estágio se encontra a inclusão da etapa de acompanhamento? O que precisa ser feito para que isto ocorra no futuro? Quais os atuais dificultadores para que isto ocorra no momento?

3. Como este acompanhamento está sendo pensado, pela equipe do NASF, dos CREABs ou em conjunto? Com que frequência?

4. Outra etapa sugerida pela AAATE e OMS que não ocorre no serviço é o treinamento das habilidades para o usuário cadeirante. Os principais dificultadores relatados foram os da falta de espaço, falta de treinamento dos profissionais e falta de tempo e equipe dedicada aos serviços da cadeira. O que precisa ser feito para que a etapa de treinamento do usuário ocorra?
5. Durante as entrevistas foram investigadas as principais dificuldades encontradas pelos profissionais em implementar as melhores práticas existentes para o serviço de cadeira de rodas. Vários profissionais mencionaram a necessidade de haver uma equipe dedicada aos serviços de cadeira de rodas. O que precisa ser feito para que isto aconteça? Quais são os requisitos para se abrir vaga para o serviço?

6. Outro tema abordado tanto pelos profissionais quanto pelos fornecedores foi em relação aos problemas de pagamento aos fornecedores (atrasos) e baixo valor pago por itens da tabela.
   a. Qual foi o último aumento de valor nos itens pagos na lista?
   b. Durante a observação, na etapa de teste e entrega de cadeiras personalizadas, os profissionais disseram que haveria uma mudança na forma de pagar os itens de personalização da cadeira. O que foi modificado no novo contrato em relação a isto?
   c. Quais são as principais modificações na renovação dos contratos com os fornecedores? (além de ajustes financeiros, quais itens inclusos, procedimentos modificados)
   d. O programa Viver sem Limites disponibiliza verbas federais para o pagamento dos itens e diz que valores pagos podem ser superiores ao da tabela se orçamento for complementado pelo Estado ou Município. O governo do estado ou a prefeitura de BH complementa o orçamento da tabela OPMAL em algum sentido? Complementa o orçamento das T.A.s Como? Quanto?

7. Quais são as perspectivas para os CReabs se tornarem CER? O que isto implicaria? O que falta para isto acontecer?

Obs.
Appendix 15> Study 2.1 Interview schedule to Coordenação da Reabilitação

Study 2.1 Coordenação de Reabilitação Interview

The questions will focus on the stages suggested in the existing best practices, particularly those suggested by AAATE and WHO which are not yet occurring at Belo Horizonte SUS wheelchair service. The aim is to understand the barriers and opportunities to its implementation. Also to identify the existence of any current initiative that might or could include these best practices.

1. One of the most important stages suggested in AT service best practice is to test different ATs and/or AT models before taking a decision. In case of the wheelchair, this would require purchasing at least one model each of the wheelchairs provided for each CReabs. What are the current barriers for this to happen at the moment? What needs to be done for this to happen in the future?

2. Other required stage for an ideal service functioning is the Follow Up stage after the wheelchair delivery. Some CReab staff had mentioned this has being discussed. What are the progresses towards that? What are the current barriers for the Follow Up stage to happen at the moment? What needs to be done for this to happen in the future?

3. Who would conduct the Follow Up stage? Is it the CReab staff, the NASF staff, a joint work between them? What will be the frequency?

4. Other stage suggested by AAATE and WHO that does not occur at current service is training the user in the required wheelchair skills. The main barriers reported by CReab staff were the lack of space, lack of staff training and lack of time or a dedicate team to the wheelchair services. What needs to be done for this training to happen in the future?
5. During the interviews various members of CReab staff mentioned the need to have a team
dedicated to the wheelchair services. What needs to be done for this to happen in the future?
What are the requirements to open vacancies at the CReab services?

6. Two other matters reported by both CReab staff and supplier staff were related to the delays
paying the suppliers and the low price paid to SIA/SUS list items.
   a. When does the last increase on SIA/SUS list items payments happened?
   b. During observations staff mention that a change will happen in the way to pay the
      wheelchair adaptations. What will it be modified and when will it start applying?
   c. What will be the main modifications in the suppliers’ contract?
   d. The federal programme *Viver Sem Limites* put available federal allocation to the
      SIA/SUS list price and states that superior values could be paid if the Estate and the
      Municipalities allocates additional resources. Does the Minas Gerais state or Belo
      Horizonte prefecture complements the federal allocation? In which way? How much?

7. What is the current perspective to CReabs becomes CERs? What would this implicate?
What needs to be done for this to happen in the future?

PS.
Appendices

Appendix 16> Study 2.1 Original Interview schedule

_lista_de_perguntas_

1. Você possui alguma certificação ou já participou de algum treinamento específico relacionado a serviços de cadeiras de rodas?

2. Sobre a aplicabilidade do **Formulário de Encaminhamento para Serviços de Cadeira de Rodas** nos serviços oferecidos pelo CREAB, quais das afirmações melhor expressa sua opinião:

   - Não se aplica ao serviço oferecido no CREAB.
   - Aplica-se ao serviço oferecido no CREAB sem necessidade de modificações.
   - Aplica-se ao serviço oferecido no CREAB, mas modificações são necessárias.
   - Seria melhor aprimorar o formulário utilizado atualmente.
   - Seria melhor desenvolver um formulário/ lista de verificação/ ferramenta específico para o serviço.

3. Sobre a aplicabilidade do **Formulário de Avaliação para Serviços de Cadeira de Rodas** nos serviços oferecidos pelo CREAB, quais das afirmações melhor expressa sua opinião:

   - Não se aplica ao serviço oferecido no CREAB
   - Aplica-se ao serviço oferecido no CREAB sem necessidade de modificações.
   - Aplica-se ao serviço oferecido no CREAB, mas modificações são necessárias.
   - Seria melhor melhorar o formulário utilizado atualmente.
   - Seria melhor desenvolver um formulário/ lista de verificação/ ferramenta específico para o serviço.

4. Sobre a aplicabilidade do **Formulário de Resumo da Cadeira de Rodas** nos serviços oferecidos pelo CREAB, quais das afirmações melhor expressa sua opinião:

   - Não se aplica ao serviço oferecido no CREAB
   - Aplica-se ao serviço oferecido no CREAB sem necessidade de modificações.
   - Aplica-se ao serviço oferecido no CREAB, mas modificações são necessárias.
   - Seria melhor melhorar o formulário utilizado atualmente.
   - Seria melhor desenvolver um formulário/ lista de verificação/ ferramenta específico para o serviço.

5. Sobre a aplicabilidade do **Formulário de Prescrição (Seleção) de Cadeira de Rodas** nos serviços oferecidos pelo CREAB, quais das afirmações melhor expressa sua opinião:

   - Não se aplica ao serviço oferecido no CREAB.
   - Aplica-se ao serviço oferecido no CREAB sem necessidade de modificações.
   - Aplica-se ao serviço oferecido no CREAB, mas modificações são necessárias.
   - Seria melhor aprimorar o formulário utilizado atualmente.
   - Seria melhor desenvolver um formulário/ lista de verificação/ ferramenta específico para o serviço.
6. Sobre a aplicabilidade da **Lista de Verificação: A Cadeira de Rodas é Segura e está Pronta para Uso?** nos serviços oferecidos pelo CREAB, quais das afirmações melhor expressa sua opinião:

- [ ] Não se aplica ao serviço oferecido no CREAB.
- [ ] Aplica-se ao serviço oferecido no CREAB sem necessidade de modificações.
- [ ] Aplica-se ao serviço oferecido no CREAB, mas modificações são necessárias.
- [ ] Seria melhor aprimorar o formulário utilizado atualmente.
- [ ] Seria melhor desenvolver um formulário/ lista de verificação/ ferramenta específico para o serviço.

7. Sobre a aplicabilidade da **Lista de Verificação da Adequação da Cadeira de Rodas** nos serviços oferecidos pelo CREAB, quais das afirmações melhor expressa sua opinião:

- [ ] Não se aplica ao serviço oferecido no CREAB.
- [ ] Aplica-se ao serviço oferecido no CREAB sem necessidade de modificações.
- [ ] Aplica-se ao serviço oferecido no CREAB, mas modificações são necessárias.
- [ ] Seria melhor aprimorar o formulário utilizado atualmente.
- [ ] Seria melhor desenvolver um formulário/ lista de verificação/ ferramenta específico para o serviço.

8. Sobre a aplicabilidade da **Lista de Verificação do Treinamento de Usuários** nos serviços oferecidos pelo CREAB, quais das afirmações melhor expressa sua opinião:

- [ ] Não se aplica ao serviço oferecido no CREAB.
- [ ] Aplica-se ao serviço oferecido no CREAB sem necessidade de modificações.
- [ ] Aplica-se ao serviço oferecido no CREAB, mas modificações são necessárias.
- [ ] Seria melhor aprimorar o formulário utilizado atualmente.
- [ ] Seria melhor desenvolver um formulário/ lista de verificação/ ferramenta específico para o serviço.

9. Sobre a aplicabilidade da **Formulário de Acompanhamento para Serviços de Cadeira de Rodas** nos serviços oferecidos pelo CREAB, quais das afirmações melhor expressa sua opinião:

- [ ] Não se aplica ao serviço oferecido no CREAB.
- [ ] Aplica-se ao serviço oferecido no CREAB sem necessidade de modificações.
- [ ] Aplica-se ao serviço oferecido no CREAB, mas modificações são necessárias.
- [ ] Seria melhor aprimorar o formulário utilizado atualmente.
- [ ] Seria melhor desenvolver um formulário/ lista de verificação/ ferramenta específico para o serviço.
10. Marque na caixa de respostas 6 formulários que você acredita ser de maior urgência a implementação. Marque 1,2,3 conforme a ordem de prioridade dos formulários mais importantes na forma como serviço funciona atualmente. Marque 4,5,6 conforme a ordem de prioridade dos formulários mais importantes para que os serviços funcionem de forma ideal.

<table>
<thead>
<tr>
<th>Formulário de Encaminhamento para Serviços de Cadeira de Rodas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formulário de Avaliação para Serviços de Cadeira de Rodas</td>
</tr>
<tr>
<td>Formulário de Resumo da Cadeira de Rodas</td>
</tr>
<tr>
<td>Formulário de Prescrição (Selecção) de Cadeira de Rodas</td>
</tr>
<tr>
<td>Lista de Verificação: A Cadeira de Rodas é Segura e está Pronta para Uso?</td>
</tr>
<tr>
<td>Lista de Verificação da Adequação da Cadeira de Rodas</td>
</tr>
<tr>
<td>Lista de Verificação do Treinamento de Usuários</td>
</tr>
<tr>
<td>Formulário de Acompanhamento para Serviços de Cadeira de Rodas</td>
</tr>
</tbody>
</table>

**Follow-up respostas**

Não se aplica ao serviço oferecido no CREAB

1. Por quê?

Aplica-se ao serviço oferecido no CREAB sem necessidade de modificações.

1. Se este formulário/lista de verificação fosse implementada no serviço, haveria resistência?
2. Caso sim, por quê?
3. O que poderia ser feito para amenizar esta resistência?

Aplica-se ao serviço oferecido no CREAB mas modificações são necessárias.

1. Que tipo de modificação você sugeriria para que este formulário pudesse ser inserido no serviço?
2. Que tipo de informação você adicionaria?
3. Por quê?
4. Como você sugeriria coletar e gravar esta informação?
5. Que tipo de informação você excluiria?
6. Por quê?
7. Se esta ferramenta de auxílio fosse implantada no serviço, haveria resistência?
8. Por quê?
9. O que poderia ser feito para amenizar esta resistência?
Seria melhor aprimorar o formulário utilizado atualmente.

1. Que tipo de informação você adicionaria?
2. Por quê?
3. Como você sugeriria coletar e gravar esta informação?
4. Que tipo de informação você excluiria?
5. Por quê?

Seria melhor desenvolver um formulário/Lista de verificação/ferramenta específico para o serviço.

1. Que formato este formulário/lista de verificação/ferramenta deveria ter?
2. Que tipo de informação este formulário/lista de verificação/ferramenta deveria conter?
3. Quais das informações citadas ainda não são coletadas?
4. Como você sugeriria coletar estas informações?
5. Em quais sentidos estas informações poderiam auxiliar?
Appendix 17> Study 2.2 - Interview schedule (English)

Introductory script

Thanks for taking part on this interview which is mostly about the applicability of WHO Forms and Checklist in the SUS, forms and checklist of which you received previously in order to be familiar and answer to the questionnaire I gave you regarding each form and checklist. The interview questions will be based on your answers to the questionnaire. Hence, let me known if you are not sure about any specific answer so we can clarify any misunderstanding. Also let me known if you change your mind about your answer so I can make you the correct follow questions.

Before we start the questions regarding the WHO forms and checklist I would like to ask you:

1. Do you have any certification or undertook any specific training related to wheelchair services or wheelchair prescription?
   a. When?
   b. Could you tell me a bit more about the content of the training/certification?
   c. How long did this training last?

2. About the applicability of the WHO Wheelchair Referral Form in CREAB services, which of the statements below best represent your belief:
   a. It does not apply to the service offered by CREAB
   b. It applies to the service offered by CREAB without the need of modifications
   c. It applies to the service offered by CREAB but modifications are needed
   d. It would be better to improve the current form/checklist/tool used at the service.
   e. It would be better if a form/checklist/tool is specifically designed to
the service

Answer follow-up

**It does not apply to the service offered by CREAB.**

1. Why?

**It applies to the service offered by CREAB without the need of modifications.**

1. If this tool were to be implemented in the service, would there be resistance?
   2. In case answer is yes, why?
   3. What could be made to mitigate this resistance?

**It applies to the service offered by CREAB but modifications are needed**

1. What modifications would you suggest so that this form could be implemented?
   2. What kind of information would you add?
   3. Why?
   4. How would you collect and record the information added?
   5. What kind of information would you exclude?
   6. Why?
   7. If this tool were implemented in the service, would there be resistance?
   8. Why?
   9. What could be made to mitigate this resistance?
It would be better to improve the current form/checklist/tool used at the service.

1. What kind of information would you add?
2. Why?
3. How would you collect and record the information added?
4. What kind of information would you exclude?
5. Why?

It would be better if a form/checklist/tool is specifically designed to the service

1. What format do you think this form/checklist/tool should have?
2. What kind of information this form/checklist/tool should comprise?
3. Which of the information cited are not current collected?
4. How would you collect and record this information?
5. In what ways this information could be useful?

Repeat these answer follow up to the following forms and checklist

3. About the applicability of the WHO Wheelchair Assessment Form in CREAB services, which of the statements below best represent your belief:
   
a. It does not apply to the service offered by CREAB
   
b. It applies to the service offered by CREAB without the need of modifications
   
c. It applies to the service offered by CREAB but modifications are needed
   
d. It would be better to improve the current form/checklist/tool used at the service.
   
e. It would be better if a form/checklist/tool is specifically designed to
4. About the applicability of the WHO Wheelchair Summary Form in CREAB services, which of the statements below best represent your belief:

a. It does not apply to the service offered by CREAB
b. It applies to the service offered by CREAB without the need of modifications
c. It applies to the service offered by CREAB but modifications are needed
d. It would be better to improve the current form/checklist/tool used at the service.
e. It would be better if a form/checklist/tool is specifically designed to the service

5. About the applicability of the WHO Wheelchair Prescription (selection) Form in CREAB services, which of the statements below best represent your belief:

a. It does not apply to the service offered by CREAB
b. It applies to the service offered by CREAB without the need of modifications
c. It applies to the service offered by CREAB but modifications are needed
d. It would be better to improve the current form/checklist/tool used at the service.
e. It would be better if a form/checklist/tool is specifically designed to the service

6. About the applicability of the WHO Checklist: Is the Wheelchair Safe and Ready to use? in CREAB services, which of the statements below best represent your belief:
a. It does not apply to the service offered by CREAB

b. It applies to the service offered by CREAB without the need of modifications

c. It applies to the service offered by CREAB but modifications are needed

d. It would be better to improve the current form/checklist/tool used at the service.

e. It would be better if a form/checklist/tool is specifically designed to the service

7. About the applicability of the WHO Wheelchair fitting checklist in CREAB services, which of the statements below best represent your belief:

a. It does not apply to the service offered by CREAB

b. It applies to the service offered by CREAB without the need of modifications

c. It applies to the service offered by CREAB but modifications are needed

d. It would be better to improve the current form/checklist/tool used at the service.

e. It would be better if a form/checklist/tool is specifically designed to the service

8. About the applicability of the WHO Wheelchair User Training Checklist in CREAB services, which of the statements below best represent your belief:

a. It does not apply to the service offered by CREAB

b. It applies to the service offered by CREAB without the need of modifications

c. It applies to the service offered by CREAB but modifications are needed

d. It would be better to improve the current form/checklist/tool used at the service.
e. It would be better if a form/checklist/tool is specifically designed to the service

9. About the applicability of the WHO Wheelchair Follow Up Form in CREAB services, which of the statements below best represent your belief:

a. It does not apply to the service offered by CREAB

b. It applies to the service offered by CREAB without the need of modifications

c. It applies to the service offered by CREAB but modifications are needed

d. It would be better to improve the current form/checklist/tool used at the service.

e. It would be better if a form/checklist/tool is specifically designed to the service

10. In the answer box below provide the priority order of the 6 forms you believe to be more urgent its implementation. Write 1,2,3 to the forms and checklist you consider priority its implementation thinking the current state of the service (without any system modifications) and 4,5,6 to the forms you consider priority thinking in the system functioning in a ideal manner (including system modifications).

a. Wheelchair Referral Form ______

b. Wheelchair Assessment Form ______

c. WHO Wheelchair Summary Form ______

d. Wheelchair Prescription(selection) Form ______

e. Checklist: Is the Wheelchair Safe and Ready to use? ______

f. Wheelchair fitting checklist ______

g. Wheelchair User Training Checklist ______

h. Wheelchair Follow Up Form ______
### Appendix 18> SIA/SUS specifications for wheelchair, bath chair and wheelchair adaptations

<table>
<thead>
<tr>
<th>Item</th>
<th>SIA/SUS list code</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>07.01.01.002-9</td>
<td>Adult/Infant wheelchair (standard type)</td>
<td>Standard wheelchair (infant/juvenile/adult) made of aluminium tube/alloy/steel, chromed or with electrostatic powder coating foldable with removable armrests standard backrest in nylon or resistant leader, seat in nylon or resistant leader, with high density foam cushion with 03 (three) cm thickness, lined with same material and Velcro for attachment; large rear wheel with pushing rings, solid or inflatable tyres, bilateral brakes, small front wheels with solid or inflatable tyres and armoured ball-bearings, height adjustable pedal and removable or swing away, calf support and/or back to the heel.</td>
</tr>
<tr>
<td></td>
<td>07.01.01.004-5</td>
<td>Quadriplegic wheelchair (standard type)</td>
<td>Wheelchair made of aluminium tube/alloy/steel, chromed or with electrostatic powder coating, foldable, with removable armrests, reclining high backrest in nylon or resistant leader, large strap (12-15cm) adapted to the backrest, seat in nylon or resistant leader, with high density foam cushion with 03 (three) cm thickness, lined with same material and Velcro for attachment, large rear wheel with pushing rings, and projection hand rims, bilateral brakes, small front wheels with solid or inflatable tyres and armoured ball-bearings, adjustable footrest (until complete knee extension) swivel function or removable, calf support and/or back to the heel.</td>
</tr>
<tr>
<td></td>
<td>07.01.01.020-7</td>
<td>Rigid Wheelchair</td>
<td>Bespoke wheelchair, made of aluminium tube, chromed or with electrostatic powder coating, foldable into L shape, with removable or retractable armrest or with no armrest, quick-release in the four wheels, backrest and seat with nylon or resistant leader lining, with high density foam cushion with 5(five) cm thickness, lined with same material and Velcro for attachment, with or without thoracic strap (5-7cm), with or without pelvic strap, with or without calf support, retractable skirt guard with flaps or mudguard style, 24” rear wheels with push rings with or without projection hand rims, solid or inflatable tyres, bilateral brakes, 5” or 6” removable front wheels with solid or inflatable tyres with armoured ball-bearings, with or without anti-tippers; fixed or removable ergonomic footrest with adjustable and height and tilt. Optional camber. Wheelchair dimensions to be provided by specifications from a qualified health-care professional.</td>
</tr>
<tr>
<td>07.01.021-5</td>
<td>Wheelchair for over 90kg user</td>
<td>Bespoke wheelchair, made of aluminium tube/alloy/steel, chromed or with electrostatic powder coating, rigid or foldable into X shape, with removable or retractable armrest. Quick-release feature in the large wheels, backrest and seat with nylon or resistant leader lining, with high density foam cushion with 5(five) cm thickness, lined with same material and Velcro for attachment, with or without thoracic strap (5-7cm), with or without pelvic strap, with or without calf support, skirt guard, 24” rear wheels with push rings with or without projection hand rims, solid or inflatable tyres, bilateral brakes, 6” or 8” removable front wheels with solid or inflatable tyres with armoured ball-bearings, removable or retractable footrest with optional height adjustment. Standard width: 50cm and 60cm. Weight tolerance: depending on manufacture: 120kg and 160kg. Wheelchair dimensions to be provided by specifications from a qualified health-care professional.</td>
<td></td>
</tr>
<tr>
<td>07.01.022-3</td>
<td>Power wheelchair Adult/Infant</td>
<td>Power wheelchair, bespoken, made of Duralumin tube weldless chassis, foldable into X shape, with injected aluminium connections, batteries container, 12” rear wheels and 8” front wheels with nylon rims, both wheels with tubeless PU tyres in grey colour, 35mm X 17mm solid caster wheel; armoured ball-bearings; power from two 200W electric direct current motors and a permanent magnet, with transmission gear system, with enough torque to transport a 130kg user. 50A micro processed drive that allows linear acceleration/deceleration and 0 to 6km/h speed, installed in the right or left side own module joystick, or by mental foramen or by head control or by suck-blow switch, regenerative engine brake system, electromagnetic parking brake, digital control panel with switch on/off button, speed limiter, horn and battery charge indicator, two 12v x 34A batteries no servicing, enabling 30km autonomy, rechargeable by smart charger, micro processed; backrest and seat fixed without screws, padded and lined. Adjustable, retractable or removable armrest and footrest. Nylon upholstery. Plan seat cushion (with foam). Equipped with safety straps that can be two points style, shirt style, thoracic strap or pelvic trap, and calf strap. May have reclining backrest with, in this case, two anti-tippers wheels, removable padded headrest with height and/or depth adjustments, height adjustable footrest. May or may not have tilt adjustment in the infant chairs. Wheelchair dimensions to be provided by specifications from a qualified health-care professional.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Seat adaptation for hip deformity</td>
<td>Bespoke cushion made of polyurethane foam with different density layers added, may or may not have knee separator pad, may or may not be made over base. Anterior part may be higher than front with the goal to reduce the tonus, with better hip positioning. Lined with automotive fabric. Should be removable, to allow folding the chair. Favour a correct positioning and pressure distribution, should prevent deformity and pressure sores, or fit, through foam contoured cushions, existing deformities. Dimensions to be provided by specifications from a qualified health-care professional.</td>
<td></td>
</tr>
<tr>
<td>Wheelchair adaptations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Backrest adaptation for trunk deformity</strong></td>
<td>Bespoke cushion made of polyurethane foam with different density layers added, may or may not be made over base. Used to prevent and/or fit deformities. Dimensions to be provided by specifications from a qualified health-care professional.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Footrest adaptation</strong></td>
<td>Bespoke, made of wood, propylene or metal, one or two-ply thickness, adjustable height, fixed or removable, retractable, articulated (to raise), lined or not with automotive fabric, padded or not. May have bespoke strap in high resistant and anti-allergic material, that should also be non-elastic, Velcro closure, 5-7cm width, that fixed to the footrest stabilize the lower limbs. Indicated for patients who requirements are not met by the original wheelchair footrest. Dimensions to be provided by specifications from a qualified health-care professional.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Trunk side pads at 3 or 4 points</strong></td>
<td>Trunk side pad fixed to the backrest with adjustable height and width, padded with polyurethane foam or different density layers and lined with automotive fabric. Individualized according to patient size and deformity. Used to prevent and/or fit trunk deformities. Should be removable to facilitate patient transfer. May have two straps to position over the shoulder and two tight to the seat, made by high resistant and synthetic material, locking with Velcro, karabiner, pressure button or airplane seatbelt, may or may not be padded, to position correctly the seating patient may or may no be shirt style, four points or thoracic. Indicated where there is a trunk balance deficit or kyphotic posture. Indicated for the patient safety and trunk positioning. Dimensions to be provided by specifications from a qualified health-care professional.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pelvis side pad</strong></td>
<td>Pelvis side pad padded with polyurethane foam or different density foam, lined with automotive fabric. To position the lower limbs in a neutral position, restraining an excessive abduction and external rotation. Can be fixed to the seat or through mechanism with width and depth adjustments, or removable to facilitate the patient transfer. May have pelvic strap or Y shape belt, supporting the hip area, made of synthetic and high resistant material, locking with Velcro, karabiner, pressure button or airplane seatbelt, may or may not be padded, fixed between the seat and the backrest at an angle of 45°, to position correctly the seating patient. Dimensions to be provided by specifications from a qualified health-care professional.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Shaped headrest</strong></td>
<td>Headrest with aluminium flaps, padded with polyurethane, lined with automotive fabric, fixed to the backrest through metal shaft with three types of adjustments: depth, height and tilt. May also be made of polyurethane fixed to the backrest by Velcro. Indicated to patients with cervical control deficit. Dimensions to be provided by specifications from a qualified health-care professional.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Adaptation to armrest</strong></td>
<td>Bespoke, made of wood, high temperature thermo-forming material or metal, may be fixed, retractable, swinging away or removable, lined with automotive fabric, padded or not. Contemplate gutters to position the upper limbs on the wheelchair. Dimensions to be provided by specifications from a qualified health-care professional.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Wheelchair adaptations

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>07.01.01.003-7</td>
<td>Bath chair with toilet seat</td>
<td>Bath chair with toilet seat made of tubular aluminium or steel, electrostatic powder coating, design that enable fitting over a standard toilet seat. Fixed armrest, standard backrest, containing four small wheels, with solid tyres, the rear fixed and the front swivel tyres, bilateral brakes with leverage system, footrest.</td>
</tr>
<tr>
<td>07.01.01.023-1</td>
<td>Children Bath chair in Scoop Style</td>
<td>Infant bath chair in a scoop shape made of polyurethane, with water exit holes, aluminium support, Epoxy paint, swivel wheels with lock, with or without head support. Dimensions to be provided by specifications from a qualified health-care professional.</td>
</tr>
<tr>
<td>07.01.01.024-0</td>
<td>Bath chair with reclining backrest</td>
<td>Bath chair with toilet seat, adjustable headrest, removable straps, removable leg strap (calf strap) and trunk strap, reclining backrest lined with polyester fabric, base support with wheels and lock. Dimensions to be provided by specifications from a qualified health-care professional.</td>
</tr>
<tr>
<td>07.01.01.025-8</td>
<td>Bath chair with push rings</td>
<td>Bath chair with toilet seat made of tubular aluminium, electrostatic powder coating, disassembled, design that enable fitting over a standard toilet seat. With retractable or removable armrests. Standard backrests. 20” or 24” rear wheels with push rings, with solid or inflatable tyres and 6” solid front castors. Removable or swing away pedals. Wheelchair dimensions to be provided by specifications from a qualified health-care professional.</td>
</tr>
</tbody>
</table>
## Appendix 19 > Types of information given by supplier at delivery stage

<table>
<thead>
<tr>
<th>INFORM &amp; TEACH Users or carer</th>
<th>31</th>
<th>73</th>
</tr>
</thead>
<tbody>
<tr>
<td>Give WARRANTY and explain</td>
<td>27</td>
<td>28</td>
</tr>
<tr>
<td>Give flyer with CONSERVATION and POSITIONING tips</td>
<td>22</td>
<td>23</td>
</tr>
<tr>
<td>Teach by doing how to DISASSEMBLE the WC</td>
<td>17</td>
<td>21</td>
</tr>
<tr>
<td>Teach by doing how to adjust the SHOULDER HARNESS strap</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>Teach by doing ANTI-TIP bar function and adjustment</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Teach by doing how to adjust the PELVIC STRAP</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Teach by doing how to adjust TILT function</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>Inform about SHOULDER HARNESS function and adjustment</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Inform about PELVIC STRAP function and adjustment</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Teach by doing how to POSITIONING user in the chair</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Inform about initial use and discomfort</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Inform about TILT function</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Teach by doing how to adjust the BRAKE</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Teach by doing how to adjust the FOOTRES and FOOT STRAP</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Give ACTIVITY TRAY and explain</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Inform about HEADREST function</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Inform about POSITIONING</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Inform about PADS adjustments procedure</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Inform about TYRE</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Inform about CONSERVATION tips</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Inform the procedure in case adjustments is needed</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Teach by doing how to adjust the ACTIVITY TRAY</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Teach by doing how to adjust the ARMREST height</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Teach by letting carer do POSITIONING &amp; STRAP adjustment</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Inform about PRESSURE SORE</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Inform about FOOTWEAR OR ORTHOTICS use when at the WC</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Teach about BREATHING OR FEEDING support adjustment</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Inform about CARVED BACKREST</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Inform about usage time and changing wheelchair procedure</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Inform user cannot use the old chair</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
## Appendix 20: Types of information given by CREAB staff at delivery stage

<table>
<thead>
<tr>
<th>CREAB Staff</th>
<th>34</th>
<th>99</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INFORM &amp; TEACH Users</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inform user or carer about AT and CREAB services offered</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Teach by doing how to DISASSEMBLE the WC</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Inform about usage time and changing wheelchair procedure</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Inform about new WC adjustment service</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Teach by doing how to POSITIONING user in the chair</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Give and inform about WARRANTY</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Inform about PELVIC STRAP function and adjustment</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Teach by doing how to adjust the PELVIC STRAP</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Teach CONSERVATION tips</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Teach by doing ANTI-TIP bar function and adjustment</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Teach by doing BRAKE function and adjustment</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Teach by doing how to adjust the SHOULDER HARNESS strap</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Inform about PADS adjustments procedure</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Inform about SHOULDER HARNESS function and adjustment</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Teach by doing the STRAP function and adjustment</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Teach user or carer to assemble and adjust the LEGREST</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Inform about ACTIVITY TRAY and its function</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Inform about HEADREST function</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Inform about TILT function and positioning</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Inform carer about wc HANDLE HEIGHT</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Teach by doing how to adjust the ARMREST</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Teach by doing how to adjust TILT function</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Inform about PRESSURE SORE</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Teach by letting the user or carer to DISASSEMBLE</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Teach exercise to RELEASE THE PRESSURE</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Inform how to PUSH</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Inform about the CUSHION</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Teach user or carer to adjust ANTI TIP by themselves</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Teach by letting the user test the BRAKE</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Appendix 21> Other activities performed by CReab staff at delivery stage

<table>
<thead>
<tr>
<th>Activity</th>
<th>Test &amp; ADJUST WC</th>
<th>CHECK user positioning in the WC</th>
<th>CONFIRM User &amp; WC specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test or Adjust FOOTREST position FOOT STRAP</td>
<td>9</td>
<td>16</td>
<td>7</td>
</tr>
<tr>
<td>Test or Adjust the SHOULDER HARNESS strap</td>
<td>6</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>Test or Adjust the PELVIC STRAP</td>
<td>5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Test or Adjust TRUNK SIDE PAD</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Test or Adjust HEADREST position</td>
<td>3</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>check frontal positioning</td>
<td>15</td>
<td>18</td>
<td>7</td>
</tr>
<tr>
<td>check lateral positioning</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Confirm WC specifications agreed in the test stage</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Confirm user information</td>
<td>4</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Read medical record and other user info</td>
<td>3</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Ask supplier if activity tray was required</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
Wheelchair Referral Form

**Sample referral form:** This form can be adapted by wheelchair services and provided to referral sources to help them refer wheelchair users to the wheelchair service.

Please complete referral form and post to:  
Wheelchair Service Name and Address:

<table>
<thead>
<tr>
<th>Name of referral person:</th>
<th>Organization you work for:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Referral person contact details (the best way to contact you):</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wheelchair user’s name:</th>
<th>Date of Birth:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent / carer’s name:</td>
<td></td>
</tr>
<tr>
<td>Address:</td>
<td></td>
</tr>
</tbody>
</table>

How can the wheelchair user be contacted?

- [ ] Post  
- [ ] Own Telephone  
- [ ] Friend / neighbour’s telephone

If by telephone, what is their phone number:

Wheelchair user’s disability if known:

- [ ] Has no wheelchair
- [ ] Has a broken wheelchair
- [ ] Has a wheelchair that does not meet their needs

Reason for referral:

Please add any other information about the wheelchair user that you think it is important that the wheelchair service knows:

<table>
<thead>
<tr>
<th>Has the wheelchair user agreed to being referred to the wheelchair service?</th>
<th>Yes [ ] No [ ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signature of referring person:</td>
<td></td>
</tr>
<tr>
<td>Date:</td>
<td></td>
</tr>
</tbody>
</table>
Formulário de Encaminhamento para Serviços de Cadeira de Rodas

Por favor, complete o formulário de encaminhamento e envie para:

- CReab Centro Sul (CGR) - Rua Domingos Viera 463, Santa Efigênia, Tel: 3277-9841
- CReab Leste (Sagrada Família) - Rua Bicas 58, Sagrada Família, Tel: 3277-7620
- CReab Noroeste (URS Padre Eustáquio)-Rua Pe. Eustáquio 1951/3º, Padre Eustáquio, Tel: 3277-7113

Informações da pessoa que está encaminhando:

| Nome: | Ass: |

| Centro de Saúde / Clínica: | NASF: (se aplicável) |

Detalhes de contato da pessoa que está encaminhando (melhor maneira de entrar em contato com você):


Informações do usuário

| Nome do usuário: | Data de Nascimento: |
| Nº Cartão Nacional de Saúde: | RG: |

| Sexo | Idade (em anos) | Prontuário na unidade básica: |

| masculino | feminino |

| Nome dos Pais / Responsáveis: |

| Endereço: |

| Telefone particular: | Telefone de amigo/vizinho: |

Deficiência do usuário, se conhecida:

| Usuário consegue sentar-se ereto com facilidade? Sim [ ] Não [ ] |

Informações do encaminhamento

| Motivo do encaminhamento: | Se possui cadeira de rodas, a cadeira: |
| Não possui cadeira de rodas | - Foi fornecida pelo SUS? Sim [ ] Não [ ] |
| A cadeira de rodas está quebrada | - Há quanto tempo possui a cadeira? ________ |
| Tem uma cadeira de rodas que não atende às suas necessidades | - Obs. __________________________ |

Informações do ambiente do usuário (entregar ficha e fita de medidas caso usuário não possua a informação)

| Medidas das portas da residência | Marque se a residência / acesso à residência possui: |
| Porta de acesso à moradia ________ cm | Degraus [ ] Banheiro adaptado [ ] |
| Porta de acesso ao banheiro ________ cm | Tapete solto [ ] Rampa de acesso [ ] |
| Porta de acesso ao quarto ________ cm | Obs. __________________________ |
Appendix 24> Ficha para o usuário sobre condição do ambiente
PILOTO

<table>
<thead>
<tr>
<th>Informações do ambiente</th>
<th>Informações do estado de saúde</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medida de largura da:</td>
<td>Traz informações que já possuía sobre o estado de saúde</td>
</tr>
<tr>
<td>- Porta de acesso à moradia cm</td>
<td>(* não é necessário fazer novos exames caso não possua as informações).</td>
</tr>
<tr>
<td>- Porta de acesso ao banheiro cm</td>
<td></td>
</tr>
<tr>
<td>- Porta de acesso ao quarto cm</td>
<td></td>
</tr>
</tbody>
</table>

Marque se a residência/ acesso à residência possui:
- Dormitório
- Banheiro adaptado
- Rampa de acesso

Favor trazer as seguintes informações para etapa de avaliação e medida de cadeira de rodas.

LISTA DE MEDICAMENTOS USADOS

RADIOLOGIA
- Rádio de coluna ou quadril
- Relatório médico sobre o diagnóstico e/ou relatório de internação.

IMPORTANTÉ: Traz a cadeira de rodas atual, se possuir uma.
Wheelchair Assessment Form

For assessment of wheelchair users who can sit upright easily. Wheelchair users who cannot sit upright easily may need assessment by a person with 'intermediate' level training. Keep this form in the wheelchair user's file.

Assessor's name: __________________________ Date of assessment: __________________________

1: Interview Assessment

Information about the wheelchair user

Name: __________________________ Number: __________________________
Age: __________________________ Male □ Female □
Phone no.: __________________________ Address: __________________________

Goals: __________________________

Physical condition

Cerebral palsy □  Polio □  Spinal cord injury □  Stroke □
Frail □  Spasms or uncontrolled movements □
Amputation: R above knee □  R below knee □  L above knee □  L below knee
Bladder problems □  Bowel problems □
If the wheelchair user has bladder or bowel problems, is this managed? Yes □  No □
Others: __________________________

Lifestyle and environment

Describe where the wheelchair user will use their wheelchair:

Distance travelled per day: Up to 1 km □  1 – 5 km □  More than 5 km □
Hours per day using wheelchair? Less than 1 □  1-3 □  3-5 □  5-8 □  more than 8 hours □
When out of the wheelchair, where does the user sit or lie down and how (posture and the surface)? __________________________

Transfer: Independent □  Assisted □  Standing □  Non Standing □  Lifted □  Other □
Type of toilet (if transferring to a toilet): Squat □  Western □  Adapted □
Does the wheelchair user often use public/private transport? Yes □  No □
If yes, then what kind: Car □  Taxi □  Bus □  Other □

Existing wheelchair (if a person already has a wheelchair)

Does the wheelchair meet the user’s needs? Yes □  No □
Does the wheelchair meet the user’s environmental conditions? Yes □  No □
Does the wheelchair provide proper fit and postural support? Yes □  No □
Is the wheelchair safe and durable? (Consider whether there is a cushion) Yes □  No □
Does the cushion provide proper pressure relief (if user has pressure sore risk)? Yes □  No □
Comments: __________________________

If yes to all questions, the user may not need a new wheelchair. If no to any of these questions, the user needs a different wheelchair or cushion, or the existing wheelchair or cushion needs repair or modifications.
2: Physical Assessment

Presence, risk of or history of pressure sores

<table>
<thead>
<tr>
<th>III = does not feel</th>
<th>O = previous pressure sore</th>
<th>• = existing pressure sore</th>
<th>Can feel normally?</th>
<th>Yes</th>
<th>☐</th>
<th>No</th>
<th>☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous pressure sore?</td>
<td>Yes</td>
<td>☐</td>
<td>No</td>
<td>☐</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current pressure sore?</td>
<td>Yes</td>
<td>☐</td>
<td>No</td>
<td>☐</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If yes, is it an open sore (stage 1 – 4)?</td>
<td>Yes</td>
<td>☐</td>
<td>No</td>
<td>☐</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Duration and cause: ________________________________

Is this person at risk* of a pressure sore? *A person who cannot feel or has 3 or more risk factors is at risk. Risk factors: cannot move, moisture, poor posture, previous / current pressure sore, poor diet, ageing, under or over weight. Yes | ☐ | No | ☐ |

Method of pushing

How will the wheelchair user push their wheelchair? Both arms ☐ Left arm ☐ Right arm ☐
Both legs ☐ Left leg ☐ Right leg ☐ Pushed by a helper ☐
Comment: ________________________________

Measurements

<table>
<thead>
<tr>
<th>Body Measurement</th>
<th>Measurement (mm)</th>
<th>Change body measurement to ideal wheelchair size</th>
<th>Wheelchair measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Hip width</td>
<td>360mm</td>
<td>Hip width = seat width</td>
<td>360mm</td>
</tr>
<tr>
<td>B Seat depth</td>
<td>L 400mm R 400mm</td>
<td>B less 30 – 50 mm = seat depth (if length is different, use shorter one)</td>
<td>370mm</td>
</tr>
<tr>
<td>C Calf length</td>
<td>L 380mm R 380mm</td>
<td>= top of seat cushion* to footrests height or = top of seat cushion* to floor for foot propelling</td>
<td>330mm</td>
</tr>
<tr>
<td>D Bottom of rib cage</td>
<td>310mm</td>
<td>= top of seat cushion* to top of backrest (measure D or E – depending on the user’s need)</td>
<td>360mm</td>
</tr>
<tr>
<td>E Bottom of shoulder blade</td>
<td>420mm</td>
<td></td>
<td>470mm</td>
</tr>
</tbody>
</table>

*check the height of the cushion that the wheelchair user will use.
# Formulário de Avaliação para Serviços de Cadeira de Rodas

**Nome do avaliador:**  
**Data da avaliação:**  
**Horário de Início:**

## Parte 1: Entrevista de Avaliação

### Informações do usuário

<table>
<thead>
<tr>
<th>Nome:</th>
<th>Prontuário:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Acompanhante/Cuidador</th>
<th>Sim</th>
<th>Não</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acompanhante presente é o cuidador do usuário?</td>
<td>Sim</td>
<td>Não</td>
</tr>
</tbody>
</table>

### Condição física

#### Diagnóstico

- Paralisia cerebral
- Lesão medular
- AVC/trombose cerebral
- Lesão cerebral
- Espinha Bífida
- Pólio
- Distrofia muscular
- Pós cirúrgico/fratura
- Artrite
- Outro

#### Níveis de Amputação

- Transfemural (acima do joelho: E / D)
- Transtibial (abaixo do joelho: E / D)
- Desarticulação do joelho (é retirada toda a articulação do joelho para baixo: E / D)
- Desarticulação do quadril (é retirada toda a perna: E / D)
- Outro

### Questões físicas

- Espasmos ou movimentos involuntários
- Tons muscular: alto/baixo
- Fragilidade
- Deslocamento de quadril
- Fatiga
- Epilepsia
- Dor, descreva o local:
- Problemas de bexiga (está sendo gerenciado? S/N)
- Problemas intestinais (está sendo gerenciado? S/N)
- Faz uso de: Traqueostomia
- Gastrostomia
- Oxigênio
- Outro

### Estilo de vida e ambiente

#### Atividades/ Objetivos

Descreva porque o usuário almeja a cadeira e o que deseja conseguir fazer com ela.

#### Independência

- Transferência: Independente
- Assistida
- Fica em pé
- Não fica em pé
- Erguido
- Outro

Outras atividades dependentes:

Outras atividades independentes:

### Locomoção

- Onde o usuário utilizará sua cadeira de rodas: Ambiente interno
- Ambiente externo: Área rural
- Área urbana
- Outros

- Distância percorrida na cadeira por dia:
  - Até 1 km
  - 1 - 5 km
  - Mais de 5 km

- Horas de uso da cadeira de rodas por dia:
  - Menos de 1
  - 1-3
  - 3-5
  - 5-8
  - Mais de 8 horas

- O usuário utiliza transporte público/privado com regularidade? Sim
- Não

- Se sim, que tipo: Carro
- Táxi
- Onibus
- Metrô
- Outro

- Quando fora da cadeira de rodas, onde o usuário se senta ou deita, e como (postura e superfície)?

### Cadeira de Rodas - CR e Cadeira de Banho - CB atual (quando a pessoa já possui uma)

- Tem cadeira de banho em casa? Sim
- Não

- Tem cadeira de rodas em casa? Sim
- Não

- Usa a quanto tempo?

- Tem cadeira de rodas na escola/casa de cuidado/outras? Sim
- Não

- CR pertence ao próprio usuário
- CR pertence à escola/casa de cuidado/outras

- Consegue transportar CR para escola/casa de cuidado/outras? Sim
- Não

- Características da CR da escola/casa de cuidado/outras

---

Formulário em fase de testes. Favor não reproduzir/retirar em outros serviços que não do ACS sem autorização prévia da coordenação dos CReachs.
Condição/Adequação da cadeira atual

| A cadeira atende às necessidades do usuário? | Sim ✔ | Não □ |
| A cadeira atende às condições do ambiente do usuário? | Sim ✔ | Não □ |
| A cadeira é segura e durável? (CR-verificação se há almofoada) | Sim ✔ | Não □ |
| A cadeira oferece adequação correta e suporte postural? | Sim ✔ | Não □ |
| A almofoada alivia adequadamente a pressão (no caso de risco de úlceras/feridas de pressão)? | Sim ✔ | Não □ |

Comentários/Características da cadeira atual:

Se a resposta for "sim" para todas as perguntas, o usuário pode não precisar de uma cadeira de rodas nova. Se for "não" para qualquer uma das perguntas, o usuário precisa de uma cadeira de rodas ou almofoada diferente; ou a cadeira de rodas ou a almofoada atual precisam de reparos ou modificações.

Parte 2: Avaliação Física

Presença, risco ou histórico de úlceras/feridas de pressão

| // = não sente | O = úlceras de pressão prévia | ● = úlceras/feridas de pressão atual |
| Tem sensibilidade normal? | Sim ✔ | Não □ |
| Úlceras/feridas de pressão prévia? | Sim ✔ | Não □ |
| Úlceras/feridas de pressão atual? | Sim ✔ | Não □ |
| Se sim, é uma ferida instalada (estágio 1 - 4)? | Sim ✔ | Não □ |

Duração e causa: ____________________________________

Controle Postural/Assentado

| Tem controle de cabeça? | Sim ✔ | Não □ |
| Em aquisição □ |
| Tem controle de tronco? | Sim ✔ | Não □ |
| Em aquisição □ |
| Situação da pelve: Neutro □ | Anteverão □ | Retroverão □ |
| Rotação com adução do membro inferior □ | Inclinação lateral para a direita □ | esquerda □ |
| Situação da coluna: Retificada □ | Presença de escoliose □ | Estruturada? Sim ✔ | Não □ |
| Gobosidade □ | Presença de cifose □ | Estruturada? Sim ✔ | Não □ |

Comentários:

Informações Sensoriais

Possui alguma das seguintes deficiências:

| Visual | □ Obs. |
| Audita | □ Obs. |
| Tático | □ Obs. |
| Mental | □ Obs. |

Sobre o estado de cognição:

É lúcido/consciente □ | Comunica verbalmente □ | Comunica com gestos/expressão facial □ |
Entende o que lhe é dito/percebe o que acontece ao seu redor □ | Não interage □ |

Modo de Impulso

| Como o usuário impulsionará a cadeira? | Dois braços □ | Braço esquerdo □ | Braço direito □ |
| Membros inferiores □ | Membro inferior esquerdo □ | Membro inferior direito □ |
| Cadeira Motorizada: Joystick instalado no lado esquerdo □ | Joystick instalado no lado direito □ |
| Controle mentoniano(queixo) □ | Controle de cabeça □ | Controle de sugar/soprar □ |
| Impulsionada por um assistente □ | Comentário: |

Horário de Término: p. 2/2
Wheelchair fitting checklist

1. Is the wheelchair ready?

Has the wheelchair been checked to make sure it is safe to use and all parts are working? [ ]

2. Check size and adjustments

<table>
<thead>
<tr>
<th>Seat width:</th>
<th>Seat depth:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Should fit closely.</td>
<td>Two fingers’ gap between the back of the knee and the seat/cushion.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Footrests height:</th>
</tr>
</thead>
<tbody>
<tr>
<td>The thighs are fully supported on the cushion with no gaps. The feet are fully supported on the footrests with no gaps.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Backrest height:</th>
</tr>
</thead>
<tbody>
<tr>
<td>The wheelchair user has the support they need and freedom to move their shoulders to push (if self-propelling).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rear wheels position (for hand propelling):</th>
</tr>
</thead>
<tbody>
<tr>
<td>The wheelchair user’s arm should be in line with the rear axle when hanging down. When hands are placed on the push rims, the user’s elbows should be at a right angle.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Brakes: Are the brakes working?</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Seat height (for foot propelling):</th>
</tr>
</thead>
<tbody>
<tr>
<td>With the wheelchair user sitting upright, the back should be comfortably supported by the backrest, with feet resting flat on the floor.</td>
</tr>
</tbody>
</table>

3. Check posture

Is the wheelchair user able to sit upright comfortably? [ ]

Check posture from the side. [ ]

Check posture from front/back. [ ]
4. Check pressure

Check pressure under seat bones for all wheelchair users at risk of developing a pressure sore.

<table>
<thead>
<tr>
<th>Step</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Explain the test to the wheelchair user.</td>
</tr>
</tbody>
</table>
| B    | Ask wheelchair user to lean forward or push up.  
     | Place fingertips under wheelchair user’s seat bone. |
| C    | Ask the wheelchair user to sit back down on your fingers.  
     | Make sure they sit upright with hands on thighs. |
| D    | Identify the pressure:  
     | **Level one = safe**: Finger tips can wriggle up and down 5mm or more.  
     | **Level two = warning**: Finger tips cannot wriggle, but can easily slide out.  
     | **Level 3 = unsafe**: Finger tips are squeezed firmly. It is difficult to slide fingers out. |
| E    | Repeat under the second seat bone. |

5. Check fit while the wheelchair is moving

<table>
<thead>
<tr>
<th>Question</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the backrest allow the wheelchair user freedom to move their shoulders to push?</td>
<td>✗</td>
</tr>
<tr>
<td>Does the backrest give the wheelchair user enough support?</td>
<td>✗</td>
</tr>
<tr>
<td>Do the wheelchair user’s feet stay on the footrests?</td>
<td>✗</td>
</tr>
<tr>
<td>Is the rear wheels position correct for the user?</td>
<td>✗</td>
</tr>
</tbody>
</table>

6. Action?

<table>
<thead>
<tr>
<th>Question</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is there any further action necessary? Write any actions in the wheelchair user’s file.</td>
<td>✗</td>
</tr>
</tbody>
</table>

**Remember:** The next step after fitting is user instruction.
Lista de Verificação da Adequação da Cadeira de Rodas

Nome do profissional: | Data da Verificação: | Horário de Início:
---|---|---

### Informações do usuário

Nome: | Prontuário:
---|---

#### 1. A cadeira de rodas está pronta?
- A cadeira de rodas foi verificada para garantir que é segura e todas as partes estão funcionando?  
- Os freios estão funcionando?  
- A cadeira foi produzida conforme especificado? Verificar:  
  - Apoio de cabeça  
  - Cintos  
  - Placas laterais (apoio de tronco)  
  - Lado funcional (no caso de usuário hemiplégico)

#### 2. Verificação do tamanho e ajustes

**Largura da cadeira**
- O assento deve ficar bem ajustado.  
- O tronco se adequa confortavelmente entre a estrutura da cadeira ou entre os apoios laterais de tronco.  
- As coxas se adequam confortavelmente entre os apoios de braços, guarda lama/saia ou almofadas para apoio da pélvis.

**Profundidade do assento:**
- Espaço livre de dois dedos entre a parte de trás do joelho e o assento/almofada.

**Altura do apoio do pé:**
- A coxa está totalmente apoiada no assento, sem espaços livres.  
- Os pés estão totalmente apoiados no apoio para os pés, sem espaços livres.

**Altura do encosto:**
- O usuário tem suporte necessário e liberdade para mover os ombros para impulsionar a cadeira (se ele mesmo a impulsiona).

**Posição das rodas traseiras (para impulso com as mãos):**
- Quando pendentes ao lado do corpo, os membros superiores do usuário devem estar alinhados com o eixo traseiro.  
- Quando as mãos estiverem colocadas nos aros de impulsação, os cotovelos devem estar em um ângulo reto.

**Altura do assento (para impulso com o pé):**
- Com o usuário sentado ereto, as costas devem estar confortavelmente apoiadas no encosto e os pés apoiados inteiramente no chão.
3. Verificação da postura
- O usuário está apto a sentar-se ereto de forma confortável?  
- Verificação da postura pela lateral.  
- Verificação da postura pela frente/costas.

4. Verificação da pressão
Verifique a pressão sob o osso do ísquio nos usuários que correm risco de desenvolver

A  
Explique o teste para o usuário.

B  
Peça ao usuário que se incline para frente ou erga o corpo. Coloque a ponta dos dedos debaixo do osso do ísquio do usuário.

C  
Peça para o usuário sentar-se novamente sobre os seus dedos. Tenha certeza de que ele se sentou ereto, com as mãos sobre as coxas.

D  
Identifique a pressão:  
Nível 1 = seguro: A ponta dos dedos pode mover-se 5 mm ou mais para cima ou para baixo.  
Nível 2 = atenção: A ponta dos dedos não pode mover-se, mas desliza facilmente para fora.  
Nível 3 = inseguro: A ponta dos dedos está comprimida firmemente. É difícil deslizar os dedos.

E  
Repita em ambos os lados do osso do ísquio.

5. Verificação da adequação enquanto a cadeira de rodas se move
- O encosto permite ao usuário movimentar os ombros livremente para impulsionar a cadeira?  
- O encosto dá suporte suficiente ao usuário?  
- Os pés do usuário permanecem no apoio para os pés?  
- As rodas traseiras estão na posição correta para o usuário?

6. Ação?

É necessária alguma outra ação? Escreva qualquer ação no prontuário/processo clínico do usuário.

*Entregar folheto sobre ulcera de pressão agora ou antes na avaliação

Horário de Término:
Appendices

Appendix 29>

Como úlceras/feridas de pressão podem ser evitadas?

**Usar uma almofada para alívio de pressão:**
Uma almofada para alívio de pressão ajudará a reduzir a pressão. Qualquer pessoa em risco de desenvolver úlceras/feridas deve ter uma almofada para alívio de pressão.

**Alimentar-se adequadamente e beber boa quantidade de água:**
Uma dieta balanceada, com verduras frescas, frutas e carne pode ajudar a evitar úlceras/feridas. Beber bastante água ajuda a manter a pele saudável e evitar úlceras/feridas. Se estiver em dúvida quanto à sua dieta, procure auxílio de um nutricionista.

**Sentar-se ereto:**
Sentar-se ereto ajuda a distribuir o peso do corpo proporcionalmente. Isso reduz a pressão sobre as partes com ossos proeminentes e ajuda a reduzir úlceras/feridas causadas por pressão.

**Evitar fricção:**
Certifique-se de que a cadeira de rodas está corretamente ajustada e não possui arestas pontiagudas. Tenha cuidado ao transferir-se da cadeira de rodas.

**Usar técnicas para alívio da pressão:**
Aliviar regularmente a pressão pode ser eficaz para evitar úlceras/feridas. Veja na tabela abaixo mais informações sobre como aliviar a pressão.

**Evitar umidade:**
Roupas molhadas ou sujas devem ser trocadas logo e almofada molhada não deve ser usada. Um programa de controle da bexiga e intestinos pode ajudar a reduzir problemas com umidade.
Verificar a pele todos os dias:
Úlceras/feridas podem se desenvolver rapidamente. É importante identificá-las logo e tomar as medidas necessárias. Verifique sua pele diariamente com um espelho, ou pedindo ajuda a um familiar.
Se encontrar uma área vermelha ou escura na pele tome as medidas necessárias imediatamente para aliviar a pressão nesse local.

Quando deitado ou sentado, mudar de posição regularmente:
Mudar de posição regularmente ajuda a aliviar a pressão. Por exemplo, mudar de sentado para deitado. Isso é particularmente importante para pessoas que tenham se curado recentemente de úlceras/feridas.
Pessoas que não possam mudar sozinhos de posição estão em risco.

Técnicas para alívio da pressão
Você pode aliviar a pressão sob o osso do isquio na cadeira de rodas.
O modo de fazer isso varia dependendo da sua força e do seu equilíbrio.
Verifique com seu terapeuta quais dos seguintes exercícios são os mais adequados pra você.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Um método adequado para a maioria dos usuários.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inclinar-se de um lado para outro:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Método adequado para usuários com força e equilíbrio limitados.</td>
<td>Alguns usuários podem prender a mão sob a manopla para apoio.</td>
<td></td>
</tr>
</tbody>
</table>

Fonte: © Organização Mundial da Saúde 2012 & © Secretaria de Estado dos Direitos da Pessoa com Deficiência de São Paulo 2014
Appendix 30> Estudo 3 Formulário de entrevista

Entrevista Fisio e T.Os

Entrevistado:
Data:

A entrevista será dividida em duas partes. Primeiramente passaremos item-a-item do formulário para verificar quais foram as dificuldades e investigar possíveis sugestões de modificação. Na segunda parte conversaremos sobre as modificações necessárias na organização e estrutura do serviço e também sobre as melhorias percebidas com a utilização dos formulários e listas de verificação.

1ª Parte
Sobre o Formulário
1. Sobre o item............
   a. Houve alguma dificuldade no entendimento dos itens? Quais?
   b. O form./lista de verificação/campo específico atende como está?
   c. O que deve ser modificado e por quê?
   d. Você tem alguma sugestão para esta modificação?

2ª Parte
Sobre os benefícios, as dificuldades gerais e possíveis modificações na estrutura e organização do serviço.
1. Como os formulários e listas de verificação têm ajudado na melhoria da qualidade do serviço oferecido?

2. Que tipo de benefício você acredita que o usuário do serviço terá com a implementação dos formulários e listas de verificação?

3. Quais foram as dificuldades gerais encontradas para utilizar os formulários e listas de verificação durante o atendimento ao usuário cadeirante?

4. Quantos usuário/turno você acredita que é possível agendar com tempo suficiente para fazer uma avaliação de qualidade?

5. Que tipo de modificação no serviço você acredita ser necessária para a implementação definitiva dos formulários e listas de verificação?
6. As modificações no serviço necessárias são passíveis de serem feitas no momento?
   a. Caso não, quais medidas são necessárias?

7. Ao fim da pesquisa, até que a implementação final ocorra, você pretende continuar utilizando os formulários e listas de verificação? Por quê? Em quais circunstâncias você usaria ou não usaria os formulários e listas de verificação?

Obs.
Appendix 31> Study 3 Interview Questions

Study 3 Interview with O.T and Physio.

This interview will be divided in two parts. First we will go through item by item from the tested form/checklist. The aim is to investigate what were the difficulties in its use and to collect your likely suggestions for its modifications. In the second part, we will talk about the necessary modifications in the structure and functioning of the service in order to implement the proposed interventions. We will also discuss what were the perceived benefits so far and other likely benefits by officially implementing these interventions at the service.

1st Part

Considering the form tested:

1. About the field...
   a. Was there any difficulty to understand the listed items? Which of them?
   b. Does the form/checklist/specific field attend the way it is?
   c. What needs to be changed and why?
   d. Do you have any suggestion for this modification? What would it be and how?

2. About the entry form delivered to the user at the screening stage aiming to collect information about his/her environment:
   a. Did you received back any entry form from the user during the study?
   b. Does the entry form attend the way it is?
   c. What needs to be changed and why?
   d. Do you have any suggestion for this modification? What would it be and how?
2nd Part

1. About the benefits, the overall difficulties and possible modifications in the structure and functioning of the service:

2. Does the form/checklist have helped to improve the quality of the service offered? How?

3. If any, what benefits do you believe the user will have by implementing this form/checklist in the service?

4. Considering your daily routine at the service, what were the overall difficulties to use this form/checklist in addition to your daily tasks?

5. Considering a four hours shift, how many users per shift you believe are possible to be scheduled to you without sacrificing the quality of your service?

6. What are the necessary modifications in the service, if any, in order to officially implement this form/checklist?

7. Are these modifications enforceable to the present moment?
   a. If not, what are the necessary measures?

8. At the end of this research stage, until the suggested modifications are made to the form/checklist, do you intend to keep using this form/checklist? In what circumstances would you used or not used it? Why?
## Appendix 32: Chi Square Calculation of Average Care Time Using the Forms

<table>
<thead>
<tr>
<th></th>
<th>CReab1</th>
<th>CReab2</th>
<th>CReab3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Expected Results</strong></td>
<td>22</td>
<td>33</td>
<td>36</td>
</tr>
<tr>
<td><strong>Observed Results</strong></td>
<td>24</td>
<td>37.6</td>
<td>38</td>
</tr>
<tr>
<td><strong>Degrees of Freedom</strong></td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Chi Square**

\[ X^2 = \sum \frac{(o-e)^2}{e} \]

\[ X^2 = \frac{(24-22)^2}{22} + \frac{(37.6-33)^2}{33} + \frac{(38-36)^2}{36} \]

\[ X^2 = \frac{4}{22} + \frac{21.16}{33} + \frac{4}{36} \]

\[ X^2 = 0.181 + 0.823 + 0.111 \]

\[ X^2 = 1.1158 \]

**Significance level**

0.05

**Result**

0.5
Appendix 33 > Areas left in blank in the assessment form pilot

<table>
<thead>
<tr>
<th>Area</th>
<th>Blank in Pilot</th>
<th>Blank in Entire Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>SENSORY observation field</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>Posture condition</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Pressure sore LOCATION FIGURE</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Distance traveled per day</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>BOWEL problems</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>ALL pressure sore information section</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>BLADDER problems</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Does the cushion provide proper pressure relief</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Patient RECORD N</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Independent activities</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Does the WC user often use private or public transport</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Can FEEL NORMALLY</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>ALL Current BATH chair section</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>For how long uses the previous wheelchair</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>When out of th wc where it sit or lie</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Type of transport used</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Pressure sore STAGE</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Method of pushing</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>ALL Current WC section</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Dependent activities</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Cognition condition</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Evaluation DATE</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>HOURS per day using wc</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Muscular tonus</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Pain location</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Is the companion at assessment the current carer</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Trunk control</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Companion or Carer present</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Where the wc user will use the wc</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Pelvis condition</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Does wc provide proper fit nd postural support</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>User NAME</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>DIAGNOSIS</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Assessor NAME</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Pressure sore DURATION AND CAUSE</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Physical condition</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Does wc user has a BATH CHAIR</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Transfer type</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Is the wc safe and durable</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
## Formulário de Encaminhamento para Serviços de Cadeira de Rodas

Por favor, complete o formulário de encaminhamento e envie para:

- CReab Centro Sul (CGR) - Rua Domingos Viera 463, Santa Efigênia, Tel: 3277-9840
- CReab Leste (Sagrada Família) - Rua Bicas 58, Sagrada Família, Tel: 3277-7620
- CReab Noroeste (URS Padre EustáQUIo) - Rua Pe. EustáQUIo 1951/3º, Padre EustáQUIo, Tel: 3277-7113

### Informações da pessoa que está encaminhando:

<table>
<thead>
<tr>
<th>Nome</th>
<th>Ass.</th>
<th>Data:</th>
</tr>
</thead>
</table>

**Centro de Saúde / Clinica:**

**Detalhes de contato da pessoa que está encaminhando (melhor maneira de entrar em contato com você):**

### Informações do usuário

<table>
<thead>
<tr>
<th>Nome do usuário:</th>
<th>Data de Nascimento:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Nº Cartão Nacional de Saúde:</th>
<th>RG:</th>
</tr>
</thead>
</table>

**Sexo**

- masculino [ ]  
- feminino [ ]

<table>
<thead>
<tr>
<th>Idade (em anos)</th>
<th>Prontuário na unidade básica:</th>
</tr>
</thead>
</table>

**Nome dos Pais / Responsáveis:**

**Endereço:**

**Telefone particular:**

**Telefone de amigo/vizinho:**

**Deficiência do usuário, se conhecida:**

**Usuário consegue sentar-se ereto com facilidade?**

- Sim [ ]  
- Não [ ]

**Obs.:**

### Informações do encaminhamento

**Motivo do encaminhamento:**

- Não possui cadeira de rodas [ ]
- A cadeira de rodas está quebrada [ ]
- Tem uma cadeira de rodas que não atende às suas necessidades [ ]

**Se possui cadeira de rodas, a cadeira:**

- Foi fornecida pelo SUS? Sim [ ]  
- Há quanto tempo possui a cadeira?  
- Obs.

### Informações do ambiente do usuário (entregar ficha e fita de medidas caso usuário não possua a informação)

**Medidas do vão livre da:**

- Porta de acesso à moradia cm
- Porta de acesso ao banheiro cm
- Porta de acesso ao quarto cm

**Marque se a residência /acesso à residência possui:**

- Degraus [ ]  
- Banheiro adaptado [ ]
- Tapete solto [ ]  
- Rampa de acesso [ ]

**Obs.:**
**Ficha de Informações do Ambiente do Usuário**

Nome: 

**Informações do ambiente**

Com uma **fita métrica no chão** (1), tire a medida entre a **face da porta** (2) e o **batente da porta** (3).

Medida de largura do vão livre da:
- Porta de acesso à moradia: ............ cm
- Porta de acesso ao banheiro: ............ cm
- Porta de acesso ao quarto: ............ cm

Marque se a residência / acesso à residência possui:
- [ ] Degraus
- [ ] Banheiro adaptado
- [ ] Tapete solto
- [ ] Rampa de acesso

Obs.:
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________

**Informações do estado de saúde**

Trazer informações **que já possua** sobre o estado de saúde

(* **NÃO é necessário fazer novos exames caso não possua as informações**).

- [ ] Raio X de coluna ou quadril.
- [ ] Relatório médico sobre o diagnóstico e/ou relatório de internação.
- [ ] Lista de medicamentos usados.

**IMPORTANTE:** Trazer a cadeira de rodas atual, se possuir uma.
**Appendix 36>**
Formulário de Avaliação para Serviços de Cadeira de Rodas

Nome do avaliador:   Data da avaliação:  

### Parte 1: Entrevista de Avaliação

**Informações do usuário**

<table>
<thead>
<tr>
<th>Nome:</th>
<th>Prontuário:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acompanhante/Cuidador</td>
<td></td>
</tr>
<tr>
<td>Acompanhante presente é o cuidador do usuário?</td>
<td>Sim [ ] Não [ ]</td>
</tr>
</tbody>
</table>

**Condição física**

**Diagnóstico**

- Paralisia cerebral [ ]
- Lesão medular [ ]
- AVC/trombose cerebral [ ]
- Lesão cerebral [ ]
- Espinha Bífida [ ]
- Pólio [ ]
- Distrofia muscular [ ]
- Pós cirúrgico/fratura [ ]
- Artrose [ ]
- Outro [ ]

<table>
<thead>
<tr>
<th>Tempo de Diag.:</th>
<th>Obs.:</th>
</tr>
</thead>
</table>

**Níveis de Amputação**

- Desarticulação do quadril (é retirada toda a perna: E / D) [ ]
- Transformal (acima do joelho: E / D) [ ]
- Desarticulação do joelho (é retirada toda a articulação do joelho para baixo: E / D) [ ]
- Transtibial (abaixo do joelho: E / D) [ ]

<table>
<thead>
<tr>
<th>Obs.:</th>
</tr>
</thead>
</table>

**Questões físicas**

- Espasmos ou movimentos involuntários [ ]
- Tonus muscular: alto/baixo [ ]
- Fragilidade [ ]

<table>
<thead>
<tr>
<th>Deslocamento de quadril</th>
<th>Fadiga</th>
<th>Epilepsia</th>
<th>Dor</th>
<th>descreva o local:</th>
</tr>
</thead>
</table>

|---------------------------------------------|---------------------------------------------|

<table>
<thead>
<tr>
<th>Faz uso de:</th>
<th>Traqueostomia</th>
<th>Sonda</th>
<th>Gastrostomia</th>
<th>Oxigênio</th>
<th>Respirador</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Obs.:</th>
</tr>
</thead>
</table>

**Estilo de vida e ambiente**

**Actividades/ Objetivos**

<table>
<thead>
<tr>
<th>Descreva porque o usuário almeja a cadeira e o que deseja conseguir fazer com ela (investigar: trabalho, estudo, lazer)</th>
</tr>
</thead>
</table>

** Independência**

<table>
<thead>
<tr>
<th>Quando fora da cadeira de rodas, onde o usuário se senta ou deita, e como (postura e superfície)?</th>
</tr>
</thead>
</table>

| Transferência: | Independente [ ] Assistida [ ] Fica em pé [ ] Não fica em pé [ ] Erguido [ ] Outro [ ] |
|----------------|------------------------------------------|----------------|------------------------------------------|

<table>
<thead>
<tr>
<th>Beneficiária com uso de prancha para transferência?</th>
<th>Sim [ ] Não [ ] Já possui [ ]</th>
</tr>
</thead>
</table>

**AVDs/AIVDs dependentes:**

<table>
<thead>
<tr>
<th>AVDs/AIVDs independentes:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Beneficiária com uso de mesa de atividades?</th>
<th>Sim [ ] Não [ ] Já possui [ ]</th>
</tr>
</thead>
</table>

**Locomoção**

<table>
<thead>
<tr>
<th>Onde o usuário utilizará sua cadeira de rodas:</th>
<th>Ambiente interno [ ] Ambiente externo:</th>
<th>Área rural [ ]</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Área urbana [ ] Obs.: (escola/trabalho/lazer)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Distância percorrida na cadeira por dia:</th>
<th>Até 1 km [ ] 1 – 5 km [ ] Mais de 5 km [ ]</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Horas de uso da cadeira de rodas por dia:</th>
<th>Menos de 1 [ ] 1-3 [ ] 3-5 [ ] 5-8 [ ] Mais de 8 horas [ ]</th>
</tr>
</thead>
</table>

| Tipos de transporte utilizados: | Carro [ ] Táxi [ ] Ônibus [ ] Metrô [ ] Outro [ ] |
|--------------------------------|--------------------------------|--------------------------------|----------------|----------------|

<table>
<thead>
<tr>
<th>Obs.:</th>
</tr>
</thead>
</table>

**Cadeira de Rodas - CR e Cadeira de Banho - CB atual (quando a pessoa já possui uma)**

<table>
<thead>
<tr>
<th>Como toma banho?</th>
<th>Precisa de CB Sim [ ] Não [ ]</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Tem cadeira de rodas?</th>
<th>Sim [ ] Não [ ] Emprestada [ ]</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Idade da CR atual?</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Características da CR/CB atual:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condição/Adequação da cadeira atual</td>
</tr>
<tr>
<td>------------------------------------</td>
</tr>
<tr>
<td>A cadeira atende às necessidades do usuário?</td>
</tr>
<tr>
<td>A cadeira atende às condições do ambiente do usuário?</td>
</tr>
<tr>
<td>A cadeira é segura e durável? (CR-verify se há almofada)</td>
</tr>
<tr>
<td>A cadeira oferece adequação correta e suporte postural?</td>
</tr>
<tr>
<td>A almofada alivia adequadamente a pressão</td>
</tr>
<tr>
<td>Comentários/Carac. da CR atual: (no caso de risco de úlceras/feridas de pressão)?</td>
</tr>
<tr>
<td>A cadeira oferece adequação correta e suporte postural?</td>
</tr>
<tr>
<td>A cadeira é segura e durável? (CR-verify se há almofada)</td>
</tr>
<tr>
<td>A cadeira atende às necessidades do usuário?</td>
</tr>
<tr>
<td>Se sim, descreva o modelo:</td>
</tr>
<tr>
<td>Beneficiaria com prescrição de almofada para a prevenção de úlceras de pressão?</td>
</tr>
<tr>
<td>Obs.:</td>
</tr>
</tbody>
</table>

Se a resposta for “sim” para todas as perguntas, o usuário pode não precisar de uma cadeira de rodas nova. Se for “não” para qualquer uma das perguntas, o usuário precisa de uma cadeira de rodas ou almofada diferente; ou a cadeira de rodas ou a almofada atual precisam de reparos ou modificações.

## Parte 2: Avaliação Física

### Presença, risco ou histórico de úlcera/ferida de pressão

<table>
<thead>
<tr>
<th>= não sente</th>
<th>= úlcera / ferida de pressão atual</th>
</tr>
</thead>
<tbody>
<tr>
<td>/ = úlcera / ferida de pressão prévia</td>
<td></td>
</tr>
</tbody>
</table>

| Tem sensibilidade normal? | Sim [ ] Não [ ] |
| Úlcera/ferida de pressão prévia? | Sim [ ] Não [ ] |
| Úlcera/ferida de pressão atual? | Sim [ ] Não [ ] |
| Se sim, é uma ferida instalada (estágio 1 – 4)? | | |
| Duração e causa: | | |

Essa pessoa corre risco* de desenvolver úlceras/feridas de pressão? | Sim [ ] Não [ ] |

*Corre risco a pessoa que não tem sensibilidade ou tem três ou mais fatores de risco. Fatores de risco: Imobilidade, umidade, má postura, úlcera/ferida de pressão prévia/atual, má alimentação, envelhecimento, peso acima ou abaixo do normal.

Beneficiaria com prescrição de almofada para a prevenção de úlceras de pressão? | Sim [ ] Não [ ] |

Se sim, descreva o modelo: | |

### Controle Postural/Assentado

| Tem controle de cabeça? | Sim [ ] Não [ ] |
| Tem controle de tronco? | Sim [ ] Não [ ] |

Situacao do femur em relação à pelve: Neuto [ ] Anteroversão [ ] Retroversão [ ]

Rotação com adução do membro inferior [ ] Inclinação lateral para a direita [ ] esquerda [ ]

Situação da coluna: Retificada [ ] Presença de escoliase [ ] Escoliase é estruturada? Sim [ ] Não [ ]

Presença de cifose [ ] Cifose é estruturada? Sim [ ] Não [ ] Gibosidade [ ]

Obs.: | |

### Informações Sensoriais

Possui alguma das seguintes deficiências: Visual [ ] Auditiva [ ] Tátil [ ] Mental [ ]

Obs.: | |

### Sobre o estado de cognição:

É lúcido/consciente [ ] Comunica verbalmente [ ] Comunica com gestos/expressão facial [ ]

Entende o que lhe é dito/percebe o que acontece ao seu redor [ ] Não interage [ ]

### Modo de Impulso (Como o usuário impulsionará a cadeira)

Impulsionada por um assistente [ ] Dois braços [ ] Braço esquerdo [ ] Braço direito [ ]

Membros inferiores [ ] Membro inferior esquerdo [ ] Membro inferior direito [ ]

**Cadeira Motorizada:** Joystick instalado no lado esquerdo [ ] Joystick instalado no lado direito [ ]

Controle mentoniano(queixo) [ ] Controle de cabeça [ ] Controle de soprar [ ]

Comentário: | |
### Lista de Verificação da Adequação da Cadeira de Rodas

<table>
<thead>
<tr>
<th>Informações do usuário</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nome:</strong></td>
</tr>
</tbody>
</table>

1. **A cadeira de rodas está pronta?**
   - Sugestões de preenchimento: ✔️ e (padrão / adaptação)
     - A cadeira de rodas foi verificada para garantir que é segura e todas as partes estão funcionando? ☐
     - Os freios estão funcionando? ☐
     - A cadeira foi produzida conforme especificado? **Verificar e marcar todos os itens abaixo a serem entregues**
   - Modelo ☐  Tamanho ☐  Cor ☐  Cintos ☐  Apoio de cabeça ☐ (padrão/adaptação)
   - Placas laterais de tronco ☐ (padrão/adaptação)
   - Rodas ☐  Tipo de aro ☐  Lado funcional (Hemiplegia) ☐
   - Apoio de pé ☐ (padrão/adaptação)
   - Almofada para alívio de pressão ☐  Mesa de atividades ☐
   - **Adaptações:** Assento ☐  Encosto ☐  Placas laterais de quadril ☐  Cavalo abdutor ☐  Outro ☐

2. **Verificação do tamanho e ajustes**
   - Sugestão de preenchimento: Sim ☑  Não ☒  Não Atende ☐
   - **Largura da cadeira**
     - O assento deve ficar bem ajustado.
     - O tronco se adequa confortavelmente entre a estrutura da cadeira ou entre os apoios laterais de tronco.
     - As coxas se adequam confortavelmente entre os apoios de braços, guardas lama/saia ou almofadas para apoio da pélvis.
     - **Obs.**:
   - **Profundidade do assento:**
     - Espaço livre de dois dedos entre a parte de trás do joelho e o assento/almofada.
     - **Obs.**:
   - **Altura do apoio do pé:**
     - A coxa está totalmente apoiada no assento, sem espaços livres.
     - Os pés estão totalmente apoiados no apoio para os pés, sem espaços livres.
     - **Obs.**:
   - **Altura do encosto:**
     - O usuário tem suporte necessário e liberdade para mover os ombros para impulsionar a cadeira (se ele mesmo a impulsiona).
     - **Obs.**:
   - **Posição das rodas traseiras (para impulso com as mãos):**
     - Quando pendentes ao lado do corpo, os membros superiores do usuário devem estar alinhados com o eixo traseiro.
     - Quando as mãos estiverem colocadas nos aros de impulso, os cotovelos devem estar em um ângulo reto.
     - **Obs.**:
   - **Altura do assento (para impulso com o pé):**
     - Com o usuário sentado ereto, as costas devem estar confortavelmente apoiadas no encosto e os pés apoiados inteiramente no chão.
     - **Obs.**:
3. Verificação da postura

- O usuário está apto a sentar-se ereto de forma confortável?
- Verificação da postura pela lateral.
- Verificação da postura pela frente/costas.

4. Verificação da pressão

Verifique a pressão sob o osso do ísquio nos usuários que correm risco de desenvolver

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Explique o teste para o usuário.</td>
</tr>
<tr>
<td>B</td>
<td>Peça ao usuário que se incline para frente ou erga o corpo. Coloque a ponta dos dedos debaixo do osso do ísquio do usuário.</td>
</tr>
<tr>
<td>C</td>
<td>Peça para o usuário sentar-se novamente sobre os seus dedos. Tenha certeza de que ele se sentou ereto, com as mãos sobre as coxas.</td>
</tr>
</tbody>
</table>
| D | Identifique a pressão:  
Nível 1 = seguro: A ponta dos dedos pode mover-se 5 mm ou mais para cima ou para baixo.  
Nível 2 = atenção: A ponta dos dedos não pode mover-se, mas desliza facilmente para fora.  
Nível 3 = inseguro: A ponta dos dedos está comprimida firmemente. É difícil deslizar os dedos. |   |
| E | Repita em ambos os lados do osso do ísquio. |   |

Beneficiaria com prescrição de almofada para a prevenção de úlceras de pressão?  
Se sim, descreva o modelo:  
Sim □  Não □  n/a

5. Verificação da adequação enquanto a cadeira de rodas se move  
(Sim S  Não N  Não Atende n/a)

- O encosto permite ao usuário movimentar os ombros livremente para impulsionar a cadeira? □
- O encosto dá suporte suficiente ao usuário? □
- Os pés do usuário permanecem no apoio para os pés? □
- As rodas traseiras estão na posição correta para o usuário? □

6. Ação?  
(Sugestão de preenchimento: Sim S ou Não N)

É necessária alguma outra ação? Escreva qualquer ação aqui e no prontuário/processo clínico do usuário.

7. Entregar folheto sobre cuidados para evitar e aliviar ulceras de pressão □