Wheelchair provision guidelines

ISPO

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International Society of Wheelchair Professionals

World Health Organization

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Foreword

Wheelchairs provide mobility, postural support and freedom to those who cannot walk or have difficulty walking, enabling them to move around, participate in everyday activities and live life on their own terms. As one of the most commonly used assistive products, wheelchairs are a vital asset, enabling access to places and activities that would otherwise be inaccessible. For children, wheelchairs provide a sense of freedom, independence, and inclusion necessary for their physical, emotional and social development. For older people, who make up a growing group of users, wheelchairs can enable continued participation in everyday activities, maintaining an active lifestyle, and living with dignity.

Increasing access to wheelchairs is necessary to realize the rights enshrined in the *United Nations Convention on the Rights of Persons with Disabilities*, and to meet the Sustainable Development Goals. Having a wheelchair that meets their needs enables people with disabilities, health conditions or injuries to secure and maintain education and job opportunities; participate in their communities; and access health care and other essential services. Additionally, reliable access to wheelchairs can help reduce poverty, as this allows people with mobility limitations to become more productive and financially independent. Ultimately, systematic wheelchair access can help promote social inclusion and the goal of leaving no one behind.

The World Health Organization (WHO), the International Society for Prosthetics and Orthotics, and the International Society of Wheelchair Professionals have developed *Wheelchair provision guidelines* in recognition of significant global unmet need and inequity of access to quality, appropriate wheelchairs. The guidelines are intended to support all Member States in developing or strengthening health and other systems and services that will ensure wheelchair users everywhere have the opportunity for timely access to, and support to use, a wheelchair that meets their individual needs. Relevant to all contexts, and all types of wheelchairs, these guidelines build on the

2008 WHO *Guidelines on the Provision of manual wheelchairs in less resourced settings* and draw on a growing body of evidence. They set out an ambition for the provision of wheelchairs that emphasizes a service delivery model and availability of trained personnel to support wheelchair users in wheelchair selection, fitting, use and follow up.

As leaders, it is our responsibility to ensure that all members of our communities have access to the resources they need to live healthy and fulfilling lives; and we therefore appeal to decision-makers in health, education, social welfare and other relevant stakeholders including civil society to take up these guidelines and play their part in implementing the recommendations. Wheelchairs provide independence, mobility, and access to the world around us. By increasing access to wheelchairs, we can empower more people to reach their full potential. We have the power to make a difference in the lives of all those in need, and it starts with taking action. Investing in wheelchair provision is an investment in a better future, and it is up to us to make sure that everyone has the opportunity to pursue their dreams.

Mr David Constantine
ISWP Founding Board Chair

Mr Claude Tardiff
ISPO President

Dr Hanan H. Balkhy
WHO Assistant Director-General, Antimicrobial resistance

WHO Assistant Director-General a.i, Access to Medicines and Health Products

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Guideline Development Group

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Guideline methodologist

WHO gratefully acknowledges the input from guidelines methodologist Eddy Lang.

Guideline authors

The guideline document was written by Kylie Shae (WHO), Rachel Cowan (University of Alabama Birmingham, US), and Sarah Sheldon (Independent consultant). Web Annexes A and B were prepared by Rachel Cowan.

Systematic review team

Thank you to the systematic review team from iCAHE, International Centre for Allied Health Evidence, University of South Australia, Australia: Steve Milanese, Kobie Boshoff, Brad Stenner, Janine Dizon, Narasimman Swaminathan.

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Abbreviations and acronyms

ATscale	Global Partnership for Assistive Technology
APL	Assistive products list
CBR	Community-based rehabilitation
ERG	External Review Group
GATE	Global Cooperation on Assistive Technology
GDG	Guideline Development Group
GRADE	grading of recommendations, assessment, development, and evaluations
ISPO	International Society for Prosthetics and Orthotics
ISWP	International Society of Wheelchair Professionals
ISO	International Organization for Standardization
LMIC	low- and middle-income country
PICO	person, intervention, comparator, outcome
SDGs	Sustainable Development Goals
TAP	Training in assistive products
UHC	Universal health coverage
UN	United Nations
UNICEF	United Nations Children's Fund
WEP	wheelchair educators' package
WHO	World Health Organization
WIN	Wheelchair International Network
WTSP	wheelchair service training packages

Document overview

These *Wheelchair provision guidelines* are divided into four sections:

Section one: About the guidelines

Section one outlines the purpose, rationale, scope and target audience for these guidelines, and describes how the recommendations were developed. The section also highlights four principles that underpin these guidelines; the right to mobility; universal health coverage; equity; and a people-centred approach.

Section two: Introduction to wheelchair provision

Section two highlights the benefits of appropriate wheelchairs, need for equitable access, and underscores that access requires a service delivery model. Wheelchair users are identified, noting their diversity and individual needs. The section also outlines the role of a well functioning and sustainable wheelchair service with well trained personnel, supported by policies and the risks for wheelchair users when such services are absent. Examples of different wheelchair service settings are introduced, the roles of different stakeholders identified, and common barriers to effective access shared.

Section three: Recommendations and implementation guidance

Section three presents service and system level evidence-based recommendations and implementation guidance to support countries and stakeholders to develop or strengthen essential, affordable, accessible, effective, efficient, safe and sustainable wheelchair services.

- **Service level** recommendations emphasize the key roles wheelchair services and their personnel play in ensuring an individualized approach to wheelchair selection, fitting, training and follow up for each wheelchair user.
- **System level** recommendations support seamless, coordinated wheelchair provision through wheelchair services and well-defined referral networks, to support and promote equitable and effective access to wheelchairs for all those in need. The guidelines further recommend that processes to monitor, evaluate and improve wheelchair services are in place for continuous monitoring and learning, to improve outcomes for individuals and overall efficiencies.

Section four: Next steps

This section outlines next steps for the sector, such as mapping and strengthening relevant policies, strengthening guidance for manufacturers on minimum quality standards and design, creation of blueprint wheelchair service step protocols tailored to the main groups of wheelchair users to support increased access through health and other care services, and development of a model competency framework covering the various wheelchair service system roles.

Terminology

For the purpose of these guidelines, the following terms are used as defined below:

Assistive products	Assistive products include any external product (including devices, equipment, instruments or software), specially produced or generally available, the primary purpose of which is to maintain or improve an individual's functioning and independence and thereby promote their well-being. Assistive products may also prevent impairments and secondary health conditions[1].
Assistive technology	The application of organized knowledge and skills related to assistive products, including systems and services. Assistive technology is a sub-set of health technology[1].
Health condition	An umbrella term for disease (acute or chronic), disorder, injury or trauma. Health conditions may also include circumstances such as pregnancy, ageing, stress, congenital anomaly or genetic predisposition[2].
Impairment	Problems in body function and structure such as significant deviation or loss[2].
Telehealth	Telehealth uses information and communications technology (ICT) for the exchange of information for the diagnosis and treatment (management) of diseases and injuries, research and evaluation, and for continuing education of health professionals[3].
Wheelchair	Inclusive of all types of wheeled mobility devices including manual, power, power assisted, wheelchairs, tricycles and scooters, and essential components or features such as wheelchair cushions and postural supports. An **appropriate wheelchair** meets the user's needs and environmental conditions, provides proper fit and postural support, is safe and durable, is available in the country; and can be obtained and maintained and services sustained in the country at an affordable cost[4].

[1] Priority Assistive Products List (APL). Geneva: World Health Organization; 2016 (https://www.who.int/publications/i/item/priority-assistive-products-list, accessed 22 February 2023)

[2] International classification of functioning, disability and health (ICF). Geneva: World Health Organization; 2001 (https://www.who.int/standards/classifications/international-classification-of-functioning-disability-and-health, accessed 22 February 2023).

[3] WHO-ITU global standard for accessibility of telehealth services. Geneva: World Health Organization and International Telecommunication Union; 2022 (https://www.who.int/publications/i/item/9789240050464, accessed 22 February 2023).

[4] Guidelines on the provision of manual wheelchairs in less resourced settings. Geneva: World Health Organization; 2008 (https://www.who.int/publications/i/item/9789241547482, accessed 22 February 2023).

	Terms used for wheelchair components align with WHO publication *Assistive product specifications and how to use them*[5].
Wheelchair service	Service through which wheelchair users access trained personnel to assess their needs; assist in selecting an appropriate wheelchair; receive information and training in the use and maintenance of their wheelchair; and ongoing support, follow up and referral to other services where appropriate.
Wheelchair user	A person who has difficulty in walking or cannot walk, and uses a wheelchair for their mobility[5]. The term "potential user" is applied to those who might benefit from using a wheelchair for the same reason but do not yet have access.

[5] Assistive product specifications and how to use them. Geneva: World Health Organization; 2021 (https://www.who.int/publications/i/item/9789240020283, accessed 22 February 2023).

Executive summary

Introduction

Mobility and movement are essential for human health and well-being. For people who rely on wheelchairs for mobility, an appropriate wheelchair is a primary need, necessary to ensure physical and mental health and development, function, participation and inclusion. However, standardized practice within wheelchair provision is globally uneven and access to appropriate wheelchairs remains a significant challenge. Multiple barriers exist, resulting in wheelchair users either not having a wheelchair, or accessing one without trained guidance, potentially receiving an inappropriate wheelchair with the associated risks. And yet, there is a large and growing need for appropriate wheelchairs. The World Health Organization (WHO) has estimated 80 million people (or 1% of the world's population) are likely to require a wheelchair to assist their mobility, with this number set to grow as the global population ages and other trends such as an increase in chronic health conditions continue.

Purpose and scope

These *Wheelchair provision guidelines* aim to support improved access to appropriate wheelchairs, for all those in need, including children, older persons, people with mobility disabilities, and those with chronic health conditions. They are relevant for all countries, and apply to all wheelchair users and types of wheelchairs. They emphasize that the best outcomes in wheelchair access occur when wheelchair users have the benefit of wheelchair selection following an individual process of assessment, fitting, training and follow up, provided by appropriately trained personnel. It is understood that this requires effective wheelchair provision systems that are integrated within health and other sectors, inclusive of effective referral networks and will likely require task-shifting and other strategies to mobilize the required workforce. **Ultimately, the purpose of these guidelines is to ensure that wheelchair users have timely access through wheelchair services that are people-centred and responsive to their needs.**

Achieving equitable access to appropriate wheelchairs requires an overall strategy that places people at the centre, and focuses equal attention on policy, products, provision and personnel as interconnected elements that must come together for a holistic result. These guidelines focus primarily on the area of provision. They offer service and system level recommendations (see table) and implementation guidance towards optimizing wheelchair service models, delivering wheelchair service activities, ensuring training for all personnel that play a role in wheelchair provision, strengthening systems to monitor and evaluate wheelchair provision, and encouraging a supportive policy environment. These guidelines include examples from diverse contexts that illustrate how they may be put into practice. They have built on the WHO *Guidelines on the provision of manual wheelchairs in less-resourced settings* released in 2008 and benefitted from a growth in available literature and documented best practice catalysed by that publication.

Wheelchair provision service and system level recommendations

SERVICE LEVEL RECOMMENDATIONS	
1. Select: Wheelchairs must be provided using a process of individual assessment and selection Strong recommendation, low certainty evidence	*Individualized **assessment** and **selection** are the process by which a wheelchair user, in collaboration with appropriately trained personnel, defines their physical, functional, environment and lifestyle needs and preferences; and then selects the wheelchair and features that best meets those needs.*
2. Fit: Wheelchairs must be prepared and fitted to each person based on their individual assessment Strong recommendation, low certainty evidence	***Preparation** involves assembling the wheelchair and any accessories before fitting. **Fitting** involves adjusting and modifying the wheelchair, wheelchair cushion, postural support devices, and any other accessories to achieve optimal fit, mobility, postural support and function.*
3. Train: Training must be provided for wheelchair users and those who assist them to enable maximum use including: • **Skills to use a wheelchair** Strong recommendation, moderate certainty evidence • **Use of wheelchair components** Strong recommendation, moderate certainty evidence • **Guiding others with whom they interact** Strong recommendation, very low certainty evidence • **Wheelchair maintenance and repairs** Conditional recommendation, very low certainty evidence	*Training in skills including transferring in and out of the wheelchair and wheelchair mobility, how to use the components, how to guide others in assisting them, as well as wheelchair maintenance and simple repairs, will enable wheelchair users to gain maximum benefit and avoid harm.*
4. Follow up: Ongoing follow up is an integral part of wheelchair service delivery and should be offered and available to all wheelchair users throughout their life Conditional recommendation, very low certainty evidence	*Follow up has two components: review and remediation. Review involves collaboration between a wheelchair user and service provider to identify how well the wheelchair continues to meet the wheelchair user's needs. Remediation involves addressing and resolving any identified problems.*
SYSTEM LEVEL RECOMMENDATIONS	
5. Competent workforce: Wheelchair provision roles must be performed by people who have role-specific competencies Strong recommendation, moderate certainty evidence	*Competency is the ability to integrate skills, knowledge, attitudes and behaviours to successfully achieve a desired result. Fulfilling the different wheelchair provision roles, including identification and referral, service delivery (clinical and technical) and management, requires the availability of appropriately trained personnel with the competencies required to perform their role.*

6. Seamless referral and access: Wheelchair provision including identification of need, referral and service delivery should be seamless and integrated across all levels of health systems and other relevant sectors Strong recommendation, very low certainty evidence	*Seamless wheelchair provision is characterized by consistency, continuity and coordination of identification, referral and service steps in a timely manner with minimal barriers and delays. Integrated means that wheelchair provision is part of a comprehensive health service at all levels (primary, secondary, tertiary), and as appropriate, part of other relevant sectors such as educational, vocational or social welfare.*
7. Systematic evaluation: Processes to measure and evaluate the performance of wheelchair provision should be implemented to inform ongoing strengthening of people-centred, equitable access to appropriate wheelchairs Conditional recommendation, very low certainty evidence	*Measurement includes the routine collection of information about service users, personnel, provision, and/or products provided. Evaluation involves reviewing information collected and other methods to determine whether wheelchair provision is meeting, exceeding or falling short of desired targets. Strengthening means making changes to wheelchair provision when evaluation indicates a weakness.*

Target audiences

The primary audiences for these guidelines are stakeholders with a role in planning, delivery, monitoring and evaluation of wheelchair provision. This includes policy-makers, wheelchair service personnel, and wheelchair user representative organizations.

Guiding principles

Four overarching principles underpin this document. The first, **access to an appropriate wheelchair is a human right,** recognizes the right to personal mobility enshrined in the *Convention on the Rights of Persons with Disabilities* and other rights-based frameworks including the *Convention on the Rights of the Child*, and *Convention on the Elimination of All Forms of Discrimination Against Women*. The second principle, **wheelchair provision services and systems should place people at the centre,** reflects the importance of user engagement and choice, rather than people being regarded as passive recipients of wheelchairs. The third principle, **wheelchair provision should be an integral component of universal health coverage** signals the importance of health care leadership in establishing effective access to wheelchairs for all those in need, without causing financial hardship. This principle also highlights that 'leaving no one behind' in achieving the Sustainable Development Goals (SDGs) means ensuring that all those who need a wheelchair for their health, mobility, inclusion and participation have access. The fourth and final principle is that **access to appropriate wheelchairs should be equitable.** Equity in wheelchair services refers to a fair and just system that gives everyone in need the support they need to access an appropriate wheelchair, regardless of gender, age, socioeconomical status, geographical location, or any other factor.

Guideline development process

The development of the guidelines followed the WHO Guideline methodology. A 16-member Guidelines Development Group (GDG) led the work, supported by a WHO Steering Group and External Review Group. The recommendations were developed through a systematic review of available evidence, with the results integrated with both practice-based and lived experiences. For each recommendation, explicit consideration was made with regards to the overall balance of benefits and harms, human rights, sociocultural acceptability, health equity, equality and non-discrimination, societal implications, financial and economic considerations, feasibility and health system considerations, as well as quality of evidence. The Box below provides an explanation of the grading of recommendations. Additional implementation guidance following each recommendation was drawn from literature, as well as experience and practice examples contributed by GDG members and other experts, however was not the subject of systematic review and grading of evidence.

Understanding the recommendation strength and certainty

For each recommendation, a level of strength (strong or conditional) and certainty of evidence has been given. The Guideline Development Group (GDG) was responsible for determining the strength and certainty of evidence for each recommendation, with guidance from the Guidelines methodologist.

Strength: Recommendations were assigned "strong" when the GDG determined that a recommendation met the following conditions:

- The benefits of the recommendation, including preventing harms caused by not doing so, outweighed any possible harms; warranted the cost of implementation; and applied in all contexts;
- The recommendation was feasible in lower *and* higher resourced settings.

Recommendations were assigned "conditional" when one or more members of the GDG believed at least one of the conditions for assigning a strong level of strength were not met. All recommendations were in favour of implementation, whether assigned conditional or strong.

Certainty of evidence: Certainty of evidence is a grading of the overall quality and precision of the scientific evidence returned by systematic review.

Next steps

Substantial progress has been made within the wheelchair sector in recent decades, however the need to strengthen wheelchair provision systems and improve access remains. These guidelines have responded to a call from the sector to establish global guidelines on wheelchair provision as a priority. These guidelines also support the World Health Assembly (WHA.71) resolution on assistive technology WHA71.8 (2018), and are a tool to assist Member States in increasing access to wheelchairs as a priority product. They also have the potential to inform development of the broader assistive technology sector.

Implementation will support Member States in fulfilling their obligation towards progressive realization of the *Convention on the Rights of Persons with Disabilities* and in meeting each of the SDGs, in particular goal three (ensure healthy lives and promote well-being for all at all ages, goal four (ensure inclusive and equitable access to education) and goal ten (reduced

inequalities). Next steps for Member States and other stakeholders include continuing to develop the evidence base, mapping and strengthening related policies, increasing the availability and affordability of appropriate wheelchairs, continuing to develop and share best practice models of service delivery and workforce development.

People do say they feel sorry for me or hope I get better soon and it is completely unnecessary. They don't need to feel sorry, because for me, my wheelchair is a good thing. It means I can get out of the house and move around. It means I don't get as tired. The wheelchair means I can do things like study medicine. As far as other people are concerned, you don't need to treat me differently just because I am in a wheelchair. Seeing the wheelchair as a failure, as a last resort or as the worst-case scenario is something that needs to change. It is not a worst-case scenario for me. The worst-case scenario would be not being able to do the things I enjoy.

Katy Shaw, the United Kingdom

© Maaz Awan

About these guidelines

This section outlines the purpose, rationale, scope and target audiences for these guidelines, and describes how the recommendations that are included were developed. It also highlights the four guiding principles that underpin these guidelines: the right to mobility; universal health coverage (UHC); equity; and people-centred approaches.

1.1 Purpose

The *Wheelchair provision guidelines* aim to support equitable access to appropriate wheelchairs for all those in need, by providing a clear set of recommendations for Member States to use in developing or strengthening wheelchair provision.

Implementation of the guidelines will support governments in fulfilling their obligation to implement the United Nations (UN) *Convention on the Rights of Persons with Disabilities (1)* and in meeting all of the Sustainable Development Goals (SDGs) *(2)*, in particular goal three (ensure healthy lives and promote well-being for all at all ages), goal four (ensure inclusive and equitable access to education) and goal ten (reduced inequalities).

1.2 Scope

The World Health Organization (WHO)-GATE 5P framework (Figure 1)[6] describes an overall strategy for strengthening assistive technology capacity in any context. This strategy places people at the centre, and focuses equal attention on policy, products, provision and personnel as interconnected elements that must come together to ensure equitable access to assistive technology, including wheelchairs *(3)*. The framework also emphasizes the role assistive technology plays in enabling Member States to meet their obligations under the *Convention on the Rights of Persons with Disabilities (1)*, to strengthen universal health coverage (UHC) *(4)*, and ensure no one is left behind as the world strives towards achieving the SDGs *(2)*.

Figure 1: The WHO-GATE 5P framework: a person-centred strategy for increasing access to assistive technology

The focus of these guidelines is primarily on the 'provision' element of the WHO-GATE 5P framework. The recommendations and implementation guidance provided supports Member States to develop or enhance wheelchair provision through:

- optimizing wheelchair service delivery models;
- delivering core wheelchair service activities;
- ensuring appropriate training for all personnel with a role in wheelchair provision;
- systematic gathering and evaluation of data to inform and strengthen wheelchair provision;
- ensuring a supportive policy environment for establishing and sustaining wheelchair provision.

[6] GATE is the Global Cooperation on Assistive Technology, initiated by WHO in 2014, to draw together all stakeholders invested in strengthening access to assistive technology.

The guidelines are relevant for all countries, wheelchair users and types of wheelchairs.

- *Countries:* Although barriers to implementation and their solutions are often specific to given contexts, the recommendations offer a foundation for all countries to strengthen access to wheelchairs.
- *Wheelchair users:* The recommendations are relevant for all wheelchair users, regardless of age, gender, cultural background, socioeconomic status, identity as a marginalized or non-marginalized individual, housed or unhoused status, status as a refugee or migrant, rural or urban location, distance from services, and the frequency, duration or reason of need for a wheelchair.
- *Type of wheelchair:* The recommendations apply to all types of wheelchairs. This includes all types of wheeled mobility devices including manual, powered and power assisted wheelchairs, tricycles and scooters, and essential components or features such as wheelchair cushions and postural supports.

These guidelines are not intended to offer detailed clinical or technical guidance related to the specifics of wheelchair selection, fitting, training or use. They recognize the need for access to a range of quality wheelchairs and related products including wheelchair cushions and postural supports, but they do not address in detail guidelines for such products or product-related processes such as procurement.

1.3 Target audiences

The guidelines have been developed for all those with roles in planning, delivery, monitoring and evaluation of wheelchair provision and related activities. This includes policy-makers, leaders of health services (e.g. treatment, rehabilitation and palliative care) and systems, wheelchair service personnel and managers, leaders of other relevant service sectors (e.g. education and social welfare), representatives of wheelchair users including leaders of organizations of people with disabilities and older persons. The guidelines are relevant to government and non-government actors, not-for-profit organizations, donor agencies, advocacy groups, training institutions and private sector entities.

1.4 Guiding principles

These guidelines are informed by four overarching principles.

Access to an appropriate wheelchair is a human right

Along with other mobility assistive products and associated services, an appropriate wheelchair supports the right to personal mobility enshrined in the *UN Convention on the Rights of Persons with Disabilities (1)*. The Convention states that assistive technology is essential to enable people with disabilities to be independent, to participate in all aspects of life, to exercise their personal rights and to ensure and maintain health, and facilitate inclusion, equity and participation. Other rights-based frameworks similarly support access to assistive technology, such as the *Convention on the Rights of the Child (5)*, and the *Convention on the Elimination of All Forms of Discrimination against Women (6)*.

Wheelchair provision services and systems should place people at the centre

People-centred services and systems reflect the importance of user engagement and choice, rather than people being regarded as passive recipients of wheelchairs *(7,8)*. Active engagement by wheelchair users in each step along the provision pathway ensures individuals receive a wheelchair and associated supports that are appropriate for their needs. The engagement of wheelchair users and their representatives in policy making, service planning, product design and workforce training is critical to the progressive realization of equitable access to wheelchairs.

Wheelchair provision should be an integral component of universal health coverage

Universal health coverage (UHC) means that all individuals and communities receive essential health services without experiencing financial hardship *(4)*. UHC includes the full spectrum of essential, quality health services, from health promotion to prevention, treatment, rehabilitation and palliative care across the life course. The 2030 Agenda for Sustainable Development places good health and well-being at the centre of the development vision *(2)*. It emphasizes UHC to ensure sustainable development, so that everyone, everywhere can access the health services they need. UHC can only be advanced inclusively if people are able to access quality assistive technology, including wheelchairs, when and where they need them *(9)*. 'Leaving no one behind' in achieving the SDGs means ensuring that all those who need a wheelchair for their health, mobility, inclusion and participation have access.

Access to appropriate wheelchairs should be equitable

Equity in wheelchair services refers to a fair and just system that gives everyone in need equal opportunity to access an appropriate wheelchair, regardless of gender, age, socioeconomical status, geographical location, or any other factor.

Achieving equity requires recognition that each person has different circumstances, and ensures the allocation of the resources and opportunities required for equal outcomes. Wheelchair provision systems should be designed to ensure the most vulnerable people and communities are provided with additional support to achieve the same outcomes as others.

1.5 Development process

The Wheelchair provision guidelines were developed following the methods outlined in the WHO *Handbook for guideline development (2nd edition) (10)*. The work was driven by a 16-member Guideline Development Group (GDG), including representatives across WHO regions, age groups, genders, different settings, and with experience of accessing services, health and/or wheelchair service delivery and policy development. A WHO Steering Group was selected to include members from WHO headquarters and six regional offices whose work is related to the topic. The Steering Group provided oversight to ensure that the guidelines align

with other related work and activities relevant and useful to Member States and in diverse contexts across the six WHO regions.

An External Review Group (ERG) was selected with the assistance of WHO regional and country offices, to represent people who may use or implement the guidelines or be impacted by them. The ERG reviewed the guidelines considering clarity and implications for implementation.

The development process included preparation of a guideline planning proposal, review and approval of the planning proposal by the WHO Guidelines Review Committee; a survey and in-depth interview with GDG members and initial literature review; formulation of background and foreground questions; selection and rating of outcomes; development of PICO (person, intervention, comparator, outcome) questions *(2)*; completion of systematic reviews summarizing the scientific and practice-based evidence using the GRADE framework *(11)*; evidence evaluation using the WHO-INTEGRATE framework *(12)*; selection of the direction and strength of the recommendations; formulation of each recommendation; preparation of implementation guidance and writing of the guidelines.

To inform the planning proposal and selection of PICO questions, the authors conducted an online survey of members of the GDG, followed by in-depth interviews. Through a series of remote meetings, candidate topics were identified and refined into six PICO questions by the GDG in an iterative process. A systematic review to investigate the six PICO questions and evaluate the results was commissioned *(11)*. The GDG interpreted the scientific evidence, and integrated both practice-based and lived experiences to formulate the recommendations, with explicit consideration of the overall balance of benefits and harms, human rights, sociocultural acceptability, health equity, equality and non-discrimination, societal implications, financial and economic considerations, feasibility and health system considerations, as well as quality of evidence *(12)*. The implementation guidance to support each recommendation was drafted using relevant information from the 2008 WHO wheelchair guidelines *(13)*, research studies included in the systematic review, and information gathered by GDG members and collectively reviewed. The scientific evidence base for each recommendation can be found in the *Wheelchair provision guidelines web annex A: Summary of evidence.*

WHO technical officers, guidelines authors and GDG members convened a three-day meeting in Geneva in October 2022, to gather consensus on the final recommendations and draft implementation guidance. Key global stakeholders – including professional associations directly involved in wheelchair service provision – attended the second day of the meeting, to provide feedback on the recommendations and contribute to planning for next steps including implementation and dissemination strategies. In addition to this meeting, the draft guidelines were reviewed by the GDG and ERG in two review rounds, and finalized in accordance with their feedback and guidance.

The guidelines were approved by the WHO Guidelines Review Committee on 3 May 2023 having met the minimum reporting requirements in place at that time. It is anticipated that the recommendations in the guidelines will remain valid until 2028. The Department of Health Products, Policy and Standards at WHO headquarters will be responsible for initiating a review.

1.6 Rationale for these guidelines

The development and implementation of standardized practice and policy within the field of wheelchair provision is globally uneven *(14)*. Although some countries have advanced the development of structured frameworks for wheelchair provision and funding, global service quality benchmarks are lacking. Equitable access to wheelchairs and related services remains a significant challenge.

In 1993, the UN General Assembly adopted the *Standard rules on the equalization of opportunities for persons with disabilities (15)*. Although not a legally binding instrument, they acted as a catalyst for a change in the way support services for people with disabilities are planned. This was followed in 2006, by the UN *Convention on the Rights of Persons with Disabilities*, which identified access to mobility aids, assistive devices and technologies as a human rights obligation *(1)*. The World Health Organization (WHO) subsequently developed *Guidelines on the provision of manual wheelchairs in less resourced settings* (2008) *(13)* through a consensus-driven process, offering guidelines for wheelchair products, services, training and policy. The guidelines outlined the first definition of an 'appropriate wheelchair', which continues to be used in the current guidelines. The 2008 guidelines defined eight wheelchair service steps required to ensure safe access to an appropriate wheelchair.

WHO followed the publication of the 2008 guidelines with the development of a set of open-source *Wheelchair service training packages* (WSTPs) *(16–19)* to provide training materials for those involved in the provision of manual wheelchairs. In 2015, the International Society of Wheelchair Professionals (ISWP) was launched to provide a focus for the improvement of wheelchair service delivery on a global scale, including training and policy *(20)*. The development by ISWP of a basic knowledge test, taken by over 6000 wheelchair service providers in its first five years *(21)*, has attracted keen interest among service providers seeking assessment of their competencies and opportunities for certification *(22)*. Resources such as the WSTPs and other tools have supported countries in building national wheelchair provision capacity (Box 1).

While significant overall progress has been made in the wheelchair sector, global policy and standards for wheelchair provision remain a distinct need. In 2018, a Wheelchair Stakeholders' Meeting held in Bangalore, India, identified establishment of global service standards as one of ten key priorities for the sector *(23)*. In the same year, the 71st World Health Assembly endorsed the first resolution on assistive technology *(24)*, calling for the development of policies on assistive technology, and requesting Member States to contribute to and engage in the development of minimum standards for priority assistive products and services, in order to promote their safety, quality, cost-effectiveness and appropriateness. These new guidelines are a direct response by WHO to assist Member States in this work. While focused on wheelchairs, the current guidelines hold the potential to inform development of the broader assistive technology sector.

Box 1. Tools supporting wheelchair provision capacity (Paraplegic Center Peshawar, Pakistan)

In 2014, a programme in Pakistan designed to close gaps in access to wheelchairs provided training for clinicians and technicians from health facilities in the country using the WHO WSTPs. The programme established a dedicated wheelchair service at the Paraplegic Center Peshawar (PCP), and also integrated wheelchair services into existing prosthetic and orthotic services in the country.

In strengthening their work, the Paraplegic Centre Peshawar has drawn on the launch of the Global Cooperation on Assistive Technology (GATE) *(25)* the 'GReAT' Summit *(26)*, the WHO Training in assistive products (TAP) *(27)*, and other online learning platforms. These resources and networks have supported ongoing capacity building of personnel, including the development of a unit focused on mobility and postural support solutions for people with more complex seating needs.

1.7 Alignment with other WHO documents

This document was written in the light of the WHO and United Nations Children's Fund (UNICEF) *Global report on assistive technology (28)*. It reflects the WHO *World report on disability (29)*, the framework for action *Everybody's business: Strengthening health systems to improve health outcomes (30)* and the WHO *Global report on health equity for persons with disabilities (31)* and fully aligns with the principles of UHC. It complements the 2008 WHO *Guidelines on the provision of manual wheelchairs in less resourced settings (13)*, which outlined guidelines for wheelchair provision, personnel, policy and products in less resourced settings and the derivative WHO *Wheelchair service training packages (16–19)*. Given the scope beyond less resourced settings, and with a focus on evidence-based recommendations, the coverage of the current guidelines includes all types of wheelchairs and all populations of wheelchair users across the life course. The guidelines describe four key service delivery steps whereas eight steps were presented in the 2008 guidelines. This consolidation is intended to ensure a greater relevance across all settings, and reflects both the development of the sector and ongoing expansion of audiences. The document also takes note of two recent World Health Assembly resolutions: on assistive technology (2018) *(24)* and on the best attainable health for persons with disability (2021) *(32)*. The guidelines also complement the *WHO standards for prosthetics and orthotics (33)*, *Community-based rehabilitation: CBR guidelines (34)*, *Rehabilitation in health systems (35)*, the WHO *Rehabilitation competency framework (36)*, and WHO's work on the UN Decade of Healthy Ageing (2021–2030) *(37)*.

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Introduction to wheelchair provision

Section two highlights the benefits of appropriate wheelchairs and the need for equitable access, and underscores that access requires a service delivery model. Wheelchair users are identified, noting their diversity and individual needs. The section also outlines the role of a well functioning and sustainable wheelchair service with well trained personnel, supported by policies *(38)* and the risks that exist for wheelchair users when such services are absent. Examples of different wheelchair service settings are introduced, the roles of different stakeholders identified, and common barriers to effective access shared *(39,40)*.

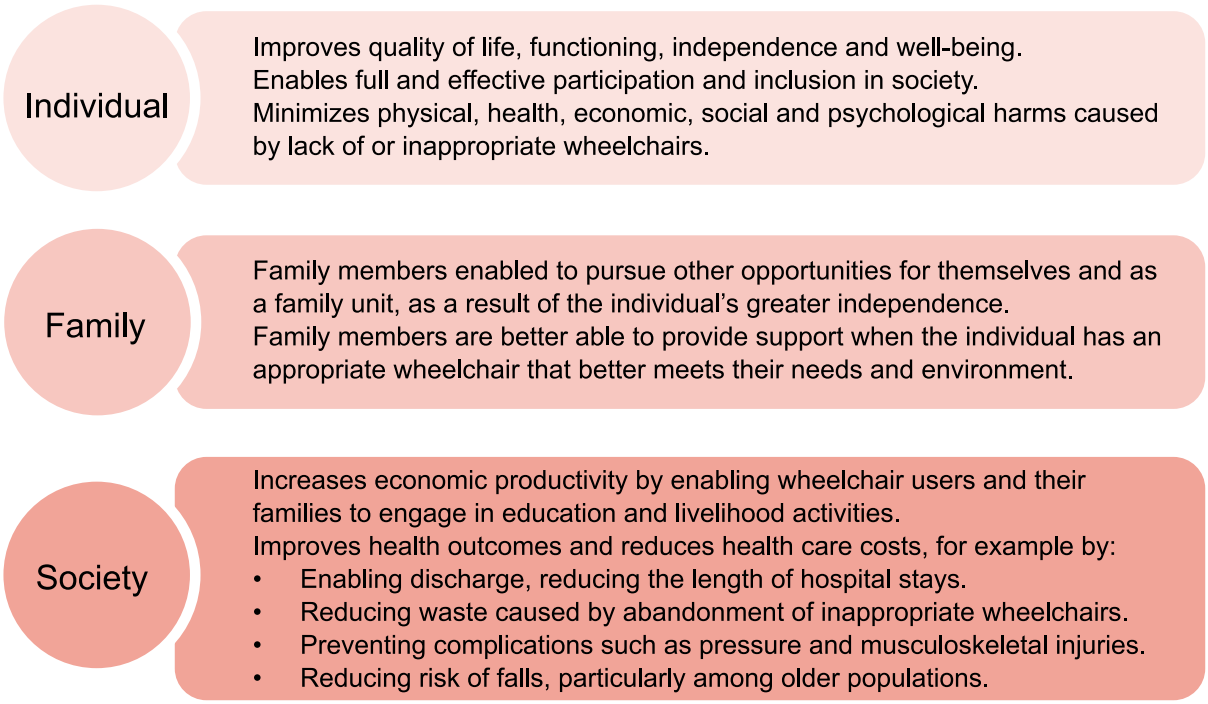
2.1 Appropriate wheelchairs

WHO defines a wheelchair as 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; and
- can be obtained, maintained and serviced in the country at an affordable cost *(13)*.

An appropriate wheelchair enables mobility *(41–43)*, health *(40,44,45)* and function *(46,47)* and is also a means by which to exercise human rights *(45,48–50)*. An appropriate wheelchair is a pre-requisite for inclusion and participation for many, and provides important benefits for individuals, families and society as shown in Figure 2. In contrast, inappropriate wheelchairs can lead to poor outcomes for wheelchair users. This may include decreased health and mobility *(51)*, development of secondary complications – which in cases of people with spinal cord injuries and similar conditions can cause premature death *(52)* – participation barriers, and/or wheelchair breakdown resulting in disruption in use *(46–48,53,54)* and a loss of means by which to exercise human rights.

Figure 2. Examples of the benefit of appropriate wheelchairs for individuals and society



“Before receiving a wheelchair, I couldn't leave the house or even my room. It was tough not being able to move around on my own. With the help of my physiotherapist, I got my first wheelchair from the National Orthotics and Prosthetics Services when I was a teenager. At last, I was able to move around by myself. I could sit comfortably for as long as I wanted and do my work. My parents were freed as I needed less assistance.

After two years, I received my secondary school certificate and went on to graduate from business college with a diploma in accounting. With the help of the wheelchair everything became possible, and I accomplished everything I put my mind to. My wheelchair gave me a second chance at life; I really appreciate who I've become and what I've accomplished.

Jorynna Joram, Papua New Guinea

2.2 People who use wheelchairs

Wheelchair use does not discriminate: any person could become a wheelchair user in their lifetime. In these guidelines, wheelchair users include those already using a wheelchair as well as people who could benefit from using a wheelchair but who, as yet, do not have access.

Wheelchair users require a wheelchair due to a mobility impairment restricting their ability to walk. This may be related to a health condition, aging, disability, or other reasons. Some wheelchair users may be unable to walk at all. Others may have a limited ability to walk safely and use a wheelchair as needed, for example for longer distances. Walking ability exists along a continuum and appropriate wheelchairs can be a valuable part of a multi-faceted strategy to optimize an individual's mobility throughout their life.

"I can walk for a minute or so, but after that, I become light-headed and must lie down. I do not need a wheelchair in my house – we have places to rest everywhere! But my six year-old child has a full life out of the house, and without my reclining powerchair, I'd miss it. Lying on the ground outside their school just wouldn't work.

Thanks to my wheelchair and the trailer that transports it, I can hold my child's hand on the walk into school, watch them hug the principal in the playground, and chat with the teacher. The details and vibrancy of my child's life would be lost if I could not be physically present for these moments. I get to overhear my child's interactions with friends and carry their backpack and discarded jacket when the day is over.

Jessica Slice, United States of America

Wheelchair users are a diverse group with differing needs, goals and life roles. They may:

- be of any age or gender;
- have one or more of a wide range of mobility impairments related to (or co-occurring with) a health condition, ageing or other causes;
- need a wheelchair for any frequency or duration;
- be of any socioeconomic status;
- live, study and work in any environment including rural, peri- or semi-urban and urban;
- live at home, or in assisted living or care environments.

A wheelchair user may use their wheelchair all day every day, part of the time every day or only when their capacity to walk is exceeded. A wheelchair may be needed for life, or until a health event has resolved. For example, a person who has a permanent mobility impairment and cannot walk is likely to use a wheelchair all day, every day throughout their life, in all indoor and outdoor environments typically encountered in the course of daily life, in comparison to

a person experiencing declining mobility due to ageing, who may use a wheelchair only when they are outside of the house. As another example, a person with a lower limb amputation who has a prosthesis may use a wheelchair in specific environments, while a person with a fractured leg may only need a wheelchair while the fracture heals. No matter the frequency or duration of wheelchair need, the recommendations outlined in this guideline are relevant to ensure safe and optimal use of a wheelchair while it is needed.

Some groups of people are more likely to need wheelchairs, or require special consideration to ensure their mobility needs are equitably met. This includes children, older persons, people with mobility disabilities, and those with chronic health conditions.

- **Children:** Children require timely access to wheelchairs as soon as a mobility impairment is identified, in order to maximize physical, cognitive and social development *(55–58)*. Children require frequent adjustments and adaptations to their wheelchairs to respond to their growth, development and changes in environment as they progress through schooling. Therefore, regular access to wheelchair services is a high priority for children, to minimize disruption to their development, inclusion and participation.
- **Older people:** The number of people over the age of 65 is growing exponentially and is expected to double by 2050 *(59)*. Higher rates of mobility difficulties are present in the older population due to increased frailty *(60)*, accumulation of health conditions, disease, injury and chronic illness throughout life. Secondary analysis of data gathered from 30 countries for the WHO and UNICEF Global report on assistive technology *(28)* highlights older persons as the largest age group in need of a wheelchair. An appropriate wheelchair can support older persons to maintain independence and dignity as they age, mitigating against frailty and other health impacts.

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- **People with disabilities:** Many people with disabilities experience mobility impairments, requiring access to an appropriate wheelchair. This includes people with diverse, often lifelong conditions such as amputation, cerebral palsy, stroke, multiple sclerosis, muscular dystrophy, arthritis, spinal cord injury, neurodegenerative diseases and acquired neural/brain injuries. Depending on the specific condition, wheelchair services need to be able to adapt to the individual's specific needs, as with all groups of wheelchair users.
- **Chronic health conditions:** People with chronic health conditions are a major group of wheelchair users. The global trend in increasing prevalence of noncommunicable diseases such as stroke, heart conditions and diabetes, which frequently result in mobility impairment, will see this group continuing to grow *(61)*. A timely response to mobility needs is important as such conditions occur and their impacts on the individual evolve, in order to improve health and functional outcomes, and maximize quality of life.

“I am 77 years old and living in Meru County, Kenya. I have arthritis and am no longer able to move about without using a wheelchair; without it I am grounded in my house. I am happy my wheelchair has enabled me to continue farming and earn a living just like the other people in my community and thus, I am treated with respect and involved in the community activities despite my disability.

When I was trying to get a wheelchair, some people discouraged me by saying that I was not disabled but old, and I should instead be applying for the social protection fund for older persons from the Government. I am glad I ignored them.

Consolata Kamau, Kenya

2.3 Need, access and demand for wheelchairs

Estimated need for wheelchairs

The WHO Global report on health equity *(31)* states that worldwide there are more than 1.3 billion people living with a disability, representing 16% of the global population. There is limited data on the number of people within this population who may need wheelchairs, however WHO has estimated that at least 80 million people (or 1% of the world's population) are likely to require a wheelchair to assist their mobility *(62)*.

Analysis of data gathered from 27 countries[7] as a part of the WHO Rapid assistive technology assessment (rATA) multi-country study protocol supports these estimates, with 1.6% of all participants reporting having a need for a wheelchair[8] *(63)*. In this analysis, the need was highest among people 65 years of age and older (6.5% of all participants age 65+). These data further indicate that 12.0% of all participants have some degree of mobility difficulty, with 10.1% of this group self-reporting need for a wheelchair. A clinically assessed need could be higher than self-reported need, as 65–75% of people with any degree of mobility impairment have a need for rehabilitation services or assistive products *(64)*.

The need for wheelchairs is predicted to increase for a number of reasons, including an exponential increase in the number of older persons *(65)*, increased rates of road traffic injury, occupational injury, violence and humanitarian crisis *(66)*, and a global increase in noncommunicable diseases *(67)*. Prevalence of wheelchair use in children is also increasing due to more infants with disability surviving early years, and more children with disabilities surviving to adulthood *(68)*.

[7] rATA survey results reported in these guidelines are based on data from 22 national samples (Azerbaijan, Bhutan, Burkina Faso, Djibouti, Dominican Republic, Georgia, Indonesia, Iran (Islamic Republic of), Iraq, Italy, Jordan, Kenya, Liberia, Maldives, Mongolia, Myanmar, Nepal, Poland, Rwanda, Senegal, Togo, Ukraine) and five sub-national samples (China, Guatemala, India, Malawi, Tajikistan). Results reported are unadjusted for potential confounders such as age, gender and country income.

[8] The rATA survey tool includes under wheelchair: basic manual, postural manual, push manual, electric and tricycle.

Estimated access to wheelchairs

Evidence suggests that the majority of people who need a wheelchair live in low- and middle-income countries (LMICs), and these countries also account for the highest unmet need for wheelchairs *(69)*.

The WHO and UNICEF Global report on assistive technology *(28)* shows that globally between 65% and 95% of those who need a wheelchair do not have access to one. Although unmet need is high globally, some groups are more likely than others to have an unmet need for a wheelchair.[7] Participants in the rATA survey countries[6] reporting any mobility difficulty were more likely to report an unmet need for a wheelchair if they were living in low-income or lower middle income countries in comparison to upper middle- and high-income countries; or a child (aged between 2–17 years) or older person (aged 65 or above) in comparison to an adult (aged between 18–64 years). Although rATA survey *(63)* participants in low- or middle-income countries with any mobility difficulty were more likely to report an unmet need for a wheelchair, 56% of participants with any mobility difficulty living in upper middle- or high-income countries lacked access to a wheelchair.

The gap between need and access to an appropriate wheelchair creates a negative impact on health and well-being, denial of basic human rights, isolation and exclusion from participating in society *(48)*.

Growing the demand

Low awareness of what is meant by an appropriate wheelchair, as well as the systems required for their effective provision, leads to weak demand. Available data, particularly at national level, often does not reflect the true need for wheelchairs, further compounding the situation. However, demand is important to stimulate all stakeholders, and in particular policy-makers, to respond to the need for wheelchairs and wheelchair services. Therefore, efforts by all stakeholders to increase awareness, build evidence and strengthen the demand for access to quality wheelchairs through services is a priority, in order to narrow the gaps between need, access and demand.

2.4 Wheelchair provision through services

Wheelchair provision through a service helps to ensure the wheelchair meets the individual needs of wheelchair users, resulting in positive outcomes *(38,40,42,70–78)*. Effective people-centred wheelchair services require the support of the other interrelated components of the WHO-GATE 5P framework: policy, products and personnel *(3)* (see Figure 1).

Wheelchair services enable wheelchair users to: access appropriately trained personnel to facilitate assessment of their needs and selection of an appropriate wheelchair; receive information and training in the use and maintenance of their wheelchair; as well as ongoing support and referral to other services, where appropriate *(13)*.

Wheelchair services may be delivered in different ways and exist in a range of settings. Within health systems, this may include wheelchair services provided through primary, secondary and tertiary health facilities, as a component of treatment, rehabilitation and other services

such as geriatric or palliative care and/or provided through dedicated specialist wheelchair clinics. Wheelchair services may also be provided in education, social welfare and other settings. Services may be centre-based, or delivered through outreach to wheelchair user's homes or other locations such as school, workplace or community facilities. Services may also be a combination of both centre- based and facilitated through outreach.

Wheelchair services cannot always be fully provided close to users' communities. Therefore, to ensure equitable access, service providers often need to utilize solutions such as proactive engagement and task-shifting to networks and/or local providers that can assist in aspects of service delivery. For example, follow-up support or wheelchair repair may be managed by different providers situated closer to where people live. Outreach models and telehealth can also be used to bridge distance gaps. Box 2 provides an example of a combination of outreach, supporting local personnel and telehealth to address the needs of people with complex mobility and postural support needs.

Box 2. Outreach services in New Zealand

Enable New Zealand offers a person-centred mobile outreach service for complex wheelchair and seating solutions. They provide support through therapists in the community who need the specialist skills of Enable New Zealand personnel to meet the wheelchair needs of their clients.

Referrals to the service are made by the local therapists, who book an appointment for their client (with their permission) at clinics scheduled throughout the year in different locations. The clinics are carried out in different settings, such as local hospitals, health centres, schools or within the wheelchair user's home. Telehealth may also be used when it is not possible to hold an in-person clinic or where an additional appointment is essential.

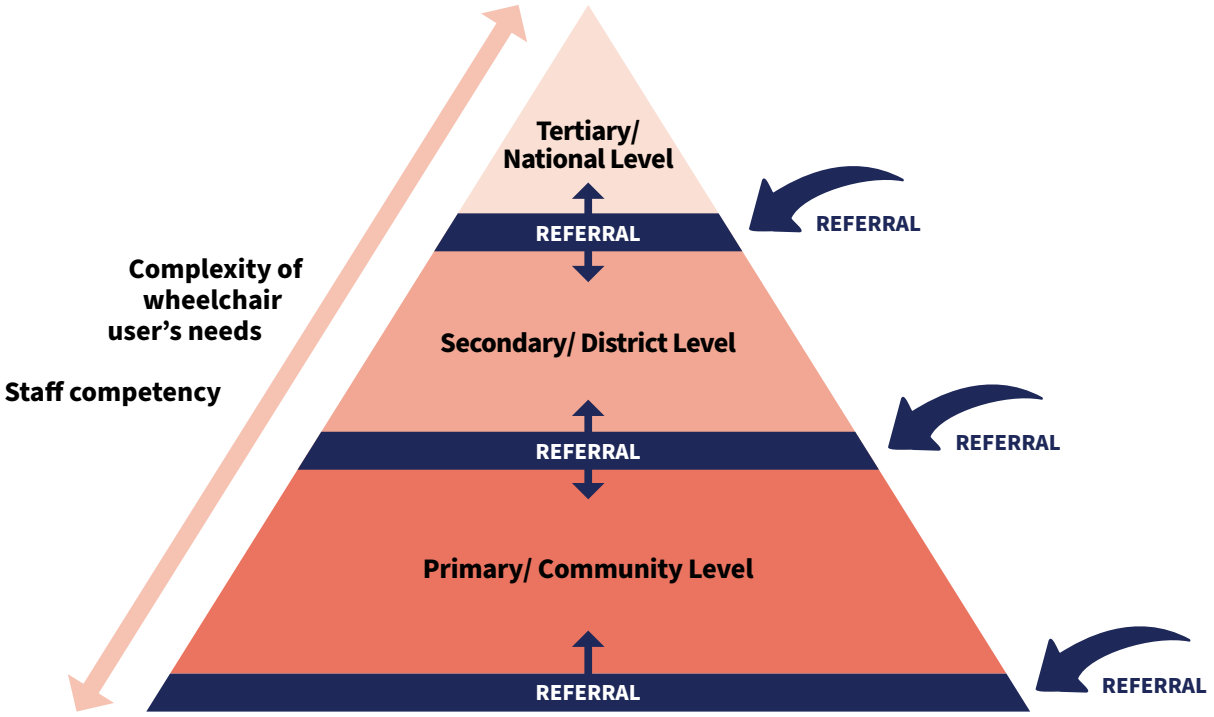
At the clinic appointment, the wheelchair user's goals are identified, and an assessment completed. Solutions are discussed, and the most appropriate wheelchair and seating is selected. Alternatively, adjustments may be made to an existing solution. Apart from the clinical personnel, the wheelchair user and their family, equipment suppliers and/or a wheelchair and seating technicians may be present. A plan for follow up is made, which may include further consultation with Enable New Zealand. Another key outcome of the clinic is enhanced knowledge and skills of the local therapist.

Health care systems are well placed to lead on wheelchair service delivery in many countries. Timely access to wheelchair services for health service users can be strengthened through integrating the identification of wheelchair needs and referral through all levels of the health system, a coordinated approach and defined referral criteria and pathways *(79)*. Timely referrals to health care-led wheelchair services from other sectors – such as education and social welfare – are enabled by established and well communicated referral pathways, as stressed in a joint statement by the International Society for Prosthetics and Orthotics (ISPO) and WHO *(80)*. This includes ensuring a high degree of awareness of wheelchair services across all levels of relevant sectors, how to gain access to them, and who might benefit from them.

WHO defines the complexity of wheelchair users' mobility and postural support needs as: basic, intermediate and advanced *(13)*. Anecdotal evidence from wheelchair service providers suggests that the distribution of complexity of postural support in particular tends towards an intermediate level. These levels can be helpful in structuring and staffing wheelchair services, as more complex mobility and postural support needs require more staff time

and competencies, as well as additional technical resources. However, there are other factors that determine the overall complexity of a person's needs and the corresponding requirements of a wheelchair service system to meet these needs. Examples of complexity factors include the physical and social context a person lives in, risk of pressure injury or falls, and multiple assistive technology needs that impact the choice of wheelchair. Identification and referral processes need to be responsive to the needs of individuals and support referral to wheelchair services with the personnel and resources appropriate to their needs. Depending on availability of resources, as well as capacity and training level of the workforce, many wheelchair users' needs can be met through wheelchair services provided at the primary health level. Wheelchair users with more complex needs may need to access secondary or tertiary level services that are equipped with more resources and personnel with more knowledge, experience and training (see Figure 3).

Figure 3. Wheelchair services at different levels of the health system



The various categories of roles that personnel fulfil in wheelchair service delivery include identification and referral of those who may benefit from a wheelchair, clinical, technical, training, management and procurement. These roles may be managed by one person in some instances, but in most situations a team of people with differentiated roles is required. In particular, identification of and referral should be task-shared across the health system and other sectors such as educational, vocational and social welfare. Personnel making up the referral network may also provide additional simple support such as assistance with basic maintenance, and identifying when a follow-up appointment or re-assessment are needed *(81)*.

In addition to the core roles described above, wheelchair services may also work to: raise awareness about wheelchair services among all stakeholders including wheelchair users; train personnel across referral networks to identify, refer and support wheelchair users; support

workforce capacity development for wheelchair service delivery; participate in actions to improve wheelchair designs, range, standards and quality; provide information on home and/or workplace adaptations to facilitate use of a wheelchair; and ensure monitoring and evaluation to inform future wheelchair service and policy development.

2.5 Wheelchair provision in humanitarian contexts

In an emergency situation, wheelchairs may be needed rapidly due to lost or damaged equipment, injury or illness caused by the emergency situation, or for people who do not normally use a wheelchair who need support to travel long distances *(82)*.

In an emergency, a wheelchair user's priorities may change and the service provider's capacity to deliver may be impacted by safety and logistics. Referral networks may be established through emergency response organizations as well as functioning local health services. Due to the nature of crises, the wheelchairs provided may not be ideal, especially for power wheelchair users and users with complex mobility and postural support needs *(83)*. While follow up as soon as feasible after the initial response is critical, wheelchair users may change location during the crisis, highlighting the importance of records and communication to support subsequent services and to locate and follow up wheelchair users.

Supporting existing health systems to progressively realize the right to wheelchairs during the immediate crisis and during the recovery phase can be achieved through handover of emergency wheelchair provision to local health services or other longer-term actors *(84)*. Where there is a pre-established emergency wheelchair response and strong wheelchair provision systems already in place, there is higher likelihood of a swifter and more effective response *(85)*. Box 3 provides an example of meeting the need for wheelchairs during a crisis.

Box 3. WHO emergency wheelchair response in Ukraine

WHO worked in partnership with the Ukraine Ministry of Health to meet the immediate mobility and self-care assistive technology needs of internally displaced people and those affected by conflict in Ukraine. The programme focused on establishing rapid service delivery of ten priority assistive products identified for internally displaced people and refugees, including two types of wheelchairs.

To ensure people receive the most appropriate product, and could use it safely and effectively, wheelchairs and cushions were provided within a service delivery framework that had been adapted to the context. The WHO online Training in assistive products (TAP) – a free interactive learning resource that teaches how to provide simple assistive products through four steps: select; fit; train; and follow up – was used to provide training for personnel involved in provision. Where possible, referrals were made for further care and future follow up. Meeting the immediate need through this emergency response provided an opportunity for personnel to address the need for wheelchair provision, but also highlighted the need for further training in the sector.

2.6 Barriers impacting access to wheelchairs

In many countries, wheelchair services continue to be an absent or underdeveloped part of health care packages and other service sectors. Multiple barriers exist, which can result in users either not having access to a wheelchair or purchasing one without professional guidance, and as a result potentially receiving an inappropriate wheelchair without the benefit of training and follow up *(39,40)*.

Barriers occur across each of the interconnected elements of the WHO-GATE 5P framework, and are summarized in Table 1. Identifying barriers as they relate to each specific context is important to systematically identify and address root causes. It is important that the process of identifying and addressing barriers consider equity and also actively engages wheelchair users.

Table 1. Summary of barriers impacting access to wheelchairs

People	
Wheelchair users are disempowered	**Individual:** Barriers can be related to age, gender, type and extent of mobility impairment, living environment, socioeconomic and education status *(86)*. **Stigma:** Cultural beliefs and stigma surrounding wheelchair use can discourage those in need from accessing wheelchair services, weakening demand *(87)*. **Information:** Wheelchair users and their families lack information about appropriate wheelchairs and the benefits of wheelchair services, and are therefore not empowered to demand appropriate wheelchairs through wheelchair service delivery models. **Participation:** A lack of representation from different groups of wheelchair users limits equitable planning and delivery of these services.
Policy	
Restrictive or absent policies	**Policy:** Absence of policies and national wheelchair provision planning, and/or existing policies that cause restrictions, for example limiting funding or product ranges *(88)*. **Data:** Limited data regarding the need for wheelchair provision *(89)* hampers demand. **Priorities:** Medical models of disability have prioritized restoration of walking over optimized mobility, contributing to gatekeeping of access to wheelchair provision *(90)*.
Insufficient and inequitable funding	**Funding:** Insufficient funding within systems for personnel, products, equipment, spares, consumables, maintenance and repairs required for wheelchair provision *(91)*. **Funding mechanisms:** Complex funding mechanisms, often with built-in restrictions such as price and/or feature caps, or which environments are considered medically necessary, are difficult for wheelchair users and service providers to navigate *(92)*. **Affordability:** Even low-cost appropriate wheelchairs may be unaffordable within public funding schemes and/or for individual wheelchair users *(63,93)*.[9]

[9] 71.3% of rATA survey participant with an unmet need for a wheelchair indicated 'cannot afford' as a reason for the unmet need. rATA results reported in these guidelines are based on data from 22 national samples (Azerbaijan, Bhutan, Burkina Faso, Djibouti, Dominican Republic, Georgia, Indonesia, Iran (Islamic Republic of), Iraq, Italy, Jordan, Kenta, Liberia, Maldives, Mongolia, Myanmar, Nepal, Poland, Rwanda, Senegal, Togo, Ukraine,) and 5 subnational samples (China, Guatemala, India, Malawi, Tajikistan). Results reported are unadjusted for potential confounder such as age, gender, and country income.

Products	
Limited availability, access, and choice of appropriate products	**Distribution:** Barriers to product distribution within a country limit access and choice (e.g. shipping, contracts with distributors, supply chain access). **Design:** A limited number of appropriate and affordable wheelchairs limits choice, and ability to meet the diversity of wheelchair users' needs including their different physical environments. **Inequity:** The global market is driven by high-income country market demand and funding. Many leading global wheelchair manufacturers do not focus on low- and middle-income countries due to limited public funding for procurement and provision of wheelchairs in these countries *(94)*. **Regulatory:** Payment policies and burdensome bureaucracy acts as a disincentive for wheelchair producers to bring new models to established markets or existing models to new markets. Absence of national product standards and/or lack of legislation requiring such standards, or excessively high product standards for safety, effectiveness and efficacy to get approval for distribution, contribute to regulatory barriers. **Information:** Limited clear and unbiased information for personnel and wheelchair users impedes informed decisions to select the most appropriate product.
Provision	
Limited need identified for wheelchair services	**Awareness:** Purpose and value of wheelchairs and wheelchair services is not widely understood by key stakeholders, leading to distribution of poor quality, inappropriate wheelchairs outside of a wheelchair service model *(14)*. **Operating in silos:** Wheelchair programmes functioning independently from national health systems *(95)*, often not staffed by trained service providers, leading to confusion, lack of ongoing support for wheelchair users, as well as wasted resources.
Inconsistent, fragmented and inadequate quality wheelchair services	**Fragmentation:** Weak referral networks and links between wheelchair service delivery steps result in many people's needs not being met in a timely manner (if at all). **Access:** Many people are unable to access wheelchairs through wheelchair services (especially centre-based models) due to distance, limited accessible public transport and costs, and economics of accommodating disability in a family income. **Timeliness:** Low capacity, bureaucracy and lack of funding leads to long wait periods for new wheelchair users, and/or follow-up support (e.g. training and repairs) *(96)*
Poor maintenance, repair and follow-up systems	**Waste:** A lack of systems to maintain and repair wheelchairs result in wheelchair abandonment and/or shortened wheelchair lifespans; while an absence of systems to refurbish and recycle wheelchairs and/or spare parts results in wasted resources. **Follow up:** Lack of follow up puts wheelchair users at risk of health consequences and wheelchair breakdown.

Personnel	
Insufficient numbers of trained workforce	**Quality:** Limited and inconsistent training programmes for wheelchair service personnel, particularly at the national level *(21)*, limits quality wheelchair provision. **Quantity:** An inadequate number of appropriately trained personnel, exacerbated by training being limited to higher level professionals, whereas involvement of mid-level and community-level personnel could expand the workforce who are able to deliver identification, referral and service steps *(97,98)*. **Competencies:** Entry-level competencies for clinically trained personnel providing wheelchair services often do not exist *(99)*, resulting in low and untested competencies.

2.7 Roles of stakeholders

A range of stakeholders representing different responsibilities and inputs are required to establish, strengthen and maintain wheelchair provision. Good coordination and collaboration between stakeholders are essential to ensure effectiveness, efficiency and avoid duplication of services. Siloed and fragmented efforts by individual groups can hinder change, whereas coalitions with and across all stakeholder groups and development of a shared strategic plan help to generate change. The following describes key stakeholders and the roles they may play in ensuring access to wheelchairs.

National and local governments

National and local governments are responsible for signalling wheelchair provision as a priority within the context of UHC, and leading planning towards improving equitable access. Governments are also responsible for creating the right policy, legislative and regulatory environment for equitable, effective and safe wheelchair provision through both the private and public sectors, as well as for creating conditions for sustainable financing. Ministries and local government authorities responsible for health care are the natural lead for wheelchair provision – given the workforce required and recognizing wheelchairs as a health product – working in coordination with other ministries and authorities including social welfare, education, vocational services and others.

Wheelchair users, families and caregivers

Wheelchair users have important knowledge and experience to contribute to the design, implementation and evaluation of wheelchair services. Active engagement of wheelchair users as individuals or through their representative bodies in strengthening wheelchair provision, through systematic processes, is essential to ensure services are truly person-centred. Family members and caregivers also have unique perspectives and should be engaged in providing input and feedback on services.

Organizations of representative groups

User-led organizations that represent people who use wheelchairs such as organizations of persons with disabilities, older persons or specific diagnostic groups can help to shape policy development and practice for wheelchair provision. User-led groups represent the perspectives and needs of their members in decision-making, aiming to achieve outcomes that contribute to successful, equitable, people-centred provision. Representative groups can also play an important role in advocacy, awareness-raising, identification and referral of potential wheelchair users, and providing wheelchair related support such as peer counselling and training, follow up, repair and maintenance, collection of user feedback and impact assessments.

Wheelchair designers, manufacturers and suppliers

Wheelchair designers, manufacturers and suppliers hold responsibilities within the supply chain of the products required to meet the diverse needs of wheelchair users in different contexts. Their roles collectively include designing, trialling, testing, developing and producing a range of appropriate wheelchairs and spare parts that meet nationally agreed standards. Suppliers may also provide product-specific training and after-sale support to service providers and/or individual wheelchair users. All those involved in the supply chain have a responsibility to seek feedback from wheelchair users and service providers regarding the effectiveness and suitability of their wheelchairs.

Training and academic institutions

Given the general lack of trained personnel available to support wheelchair provision, training and academic institutions have a critical role to play in increasing access to competency-based training. There are opportunities to integrate content on wheelchair provision in training curricula *(100)* relevant to the wheelchair provision roles of different members of the workforce. Within health, this includes but is not limited to, physiotherapists, occupational therapists, prosthetists and orthotists, doctors, nurses, pharmacists and community health and rehabilitation workers. Due to their roles in workforce preparation, training institutions should be directly involved in sector planning so that workforce roles, capacity and training needs are well defined, and met in a timely manner. National and regional training institutions also play an important role in initiating, conducting and promoting research.

Agencies responsible for funding wheelchair provision

Funding for wheelchair provision may be provided through a range of agencies such as national and local governments, insurance companies, charities and corporate social responsibility schemes. Funding agencies can strengthen or impede access to appropriate wheelchair provision, depending on the design of their funding models and/or policies. Engagement of funding agencies in wheelchair provision planning, can help to increase their understanding of the implications of specific funding models and/or policies, and maximize the impact of available funds. Funding is discussed in more detail in section 3.4 (Policy and finance issues).

Professional associations

National and international associations of the different professions involved in wheelchair provision play a key role in representing the perspectives of these professions and in shaping the sector. Professional associations can advocate for and provide input into wheelchair provision policy, planning and development. They may also contribute to the development of training competencies and standards and training curricula as these relate to their professional group.

Service personnel

Service personnel include all those involved in identification and referral, wheelchair service delivery and management. The roles of wheelchair service personnel and the different groups of people that may deliver these roles are outlined in sections 2.4 and 3.2. Service personnel also include those providing other services accessed by wheelchair users, such as health services including curative, rehabilitation and palliative care; education; or social welfare. These personnel have a stake in their clients accessing a wheelchair that meets their needs and can play a valuable role in informing the sector and advocating for their clients' wheelchair needs.

International agencies

International agencies with a specific interest in wheelchair provision are able to act as a global resource for all stakeholders working towards increased access to appropriate wheelchairs. Depending on their focus and expertise, these agencies may play a role in activities such as market shaping, developing product and/or wheelchair service standards, and/or development of advocacy, education and training resources. International agencies also play an important role in global information exchange, helping to disseminate innovation and support national efforts. They may further provide direct technical assistance. See Box for a summary of four key international agencies.

Box 4. International agencies addressing wheelchair provision

- **The Global Cooperation on Assistive Technology (GATE)**[10] was formed in 2014 in partnership with a range of stakeholders to improve access to high-quality affordable assistive products globally. Hosted by WHO, the GATE initiative uses the WHO-GATE 5P framework for action. GATE draws together a community of assistive technology users and their representative bodies, service providers, policy-makers, training institutions, professional associations, academics and others to develop and disseminate tools to support countries in developing national policy and programmes to ensure everyone, everywhere can access assistive technology.
- **The International Society of Prosthetics and Orthotics (ISPO)**[11] is a global, multidisciplinary, nongovernmental organization aiming to improve the quality of life for people who may benefit from prosthetic, orthotic, mobility and assistive devices. ISPO provides a platform for the exchange and communication on all aspects of the science, practice and education associated with the provision of prosthetic and orthotic care, rehabilitation engineering, wheelchairs and therapy, and other related areas. Activities include promoting multidisciplinary practice, facilitating professional education to improve quality care, promoting research and evidence-based practice, facilitating innovative and appropriate technology, fostering international collaboration and consensus, and facilitating knowledge exchange.
- **The International Society of Wheelchair Professionals (ISWP)**[12] was launched in 2015 with a mission to serve as global resource to coordinate wheelchair service standards and provision through advocacy, education, standards, evidence-based practice, and innovation and to provide a platform for information exchange. Some of its outputs include: Wheelchair basic test; Basic and intermediate certifications and trainer's certificate; Wheelchair educators' package (WEP), Wheelchair International Network (WIN) website, Product Wiki, and policy advocacy toolkit, which aim to promote quality and appropriate wheelchair assessment and provision.
- **The Global Partnership for Assistive Technology (ATscale)**[13] addresses prioritization, coordination and investment in assistive technology as well as market challenges in key product areas at global and country levels. ATscale is a cross-sector partnership with a mission to catalyse change, amplify existing work and coordinate and mobilize stakeholders with unified strategies to strengthen the enabling ecosystem and increase the availability of and access affordable and appropriate assistive technology.

[10] See: https://www.who.int/initiatives/global-cooperation-on-assistive-technology-(gate)

[11] See: https://www.ispoint.org/

[12] See: https://wheelchairnetwork.org/

[13] See: https://atscalepartnership.org/

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Recommendations and implementation guidance

This section presents service and system level evidence-based recommendations and implementation guidance to support countries and stakeholders to develop or strengthen essential, affordable, accessible, effective, efficient, safe and sustainable wheelchair services.

Four service level recommendations emphasize the key role wheelchair services and their personnel play in ensuring an individualized approach to wheelchair selection, fitting, training and follow up for each wheelchair user.

Three system level recommendations support seamless, coordinated wheelchair provision through wheelchair services and well-defined referral networks, to support and promote equitable and effective access to wheelchairs for all those in need. The guidelines further recommend that processes to monitor, evaluate and improve wheelchair services are in place for continuous monitoring and learning, to improve outcomes for individuals and overall efficiencies.

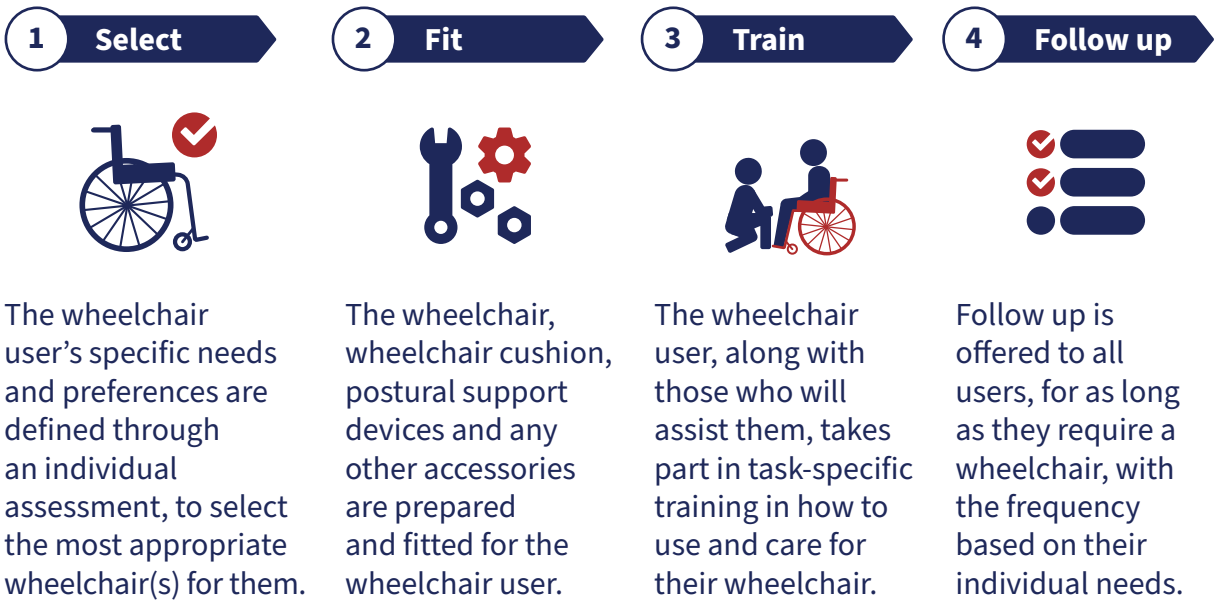
Service level recommendations

3.1 Wheelchair service steps

WHO recommends wheelchair provision through a service model, which provides, as a minimum: individual assessment and selection; preparation and fitting of the wheelchair for the wheelchair user; information and training for wheelchair users to maximize their safe and efficient use and care of the product; and follow up to ensure the wheelchair continues to meet the user's needs.

These activities can be summarized as four service steps: 1) Select; 2) Fit; 3) Train; 4) Follow up (see Figure 4).

Figure 4. Four wheelchair service steps



These four steps begin once a person identifies, or has been identified, as needing a wheelchair and accesses a wheelchair service. The same four steps apply each time a person is assessed or reassessed for a new wheelchair.

Resources

As noted in section 2.4 (Wheelchair provision through services), there are different models of wheelchair service delivery, and each of the four steps may occur in a range of settings. Common to all settings, however, is the availability of adequate space for wheelchair users and personnel to interact and complete the service steps. This requires an accessible and barrier-free physical space that is appropriately equipped, offers a safe environment for users and personnel, and enables privacy.

1 Service step one: Select

Recommendation 1: Wheelchairs must be provided using a process of individual assessment and selection Strong recommendation, low certainty evidence

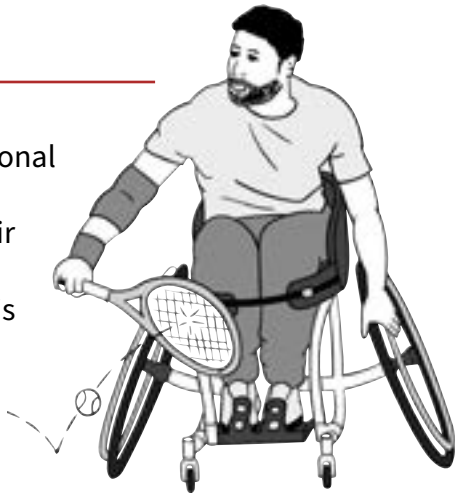
*Individualized **assessment** and **selection** are the processes by which a wheelchair user, in collaboration with appropriately trained personnel, defines their physical, functional, environmental, and lifestyle needs and preferences; and then selects the wheelchair and features that best meets those needs.*

***Recommendation rationale:** The GDG noted that potential harms of not using a process of individualized assessment and selection can be severe and can result in immediate and large impairments in health, function, mobility, as well as low satisfaction with the wheelchair. World-wide implementation of the WHO wheelchair service provision steps (13), including individualized assessment and selection, supports the feasibility of this recommendation in low- middle- and high-income settings and the ability to benefit all wheelchair users. In addition, the GDG judged that the benefits, especially the prevention of harms, warrant the cost of implementation. Thus, despite the low certainty research evidence, the recommendation was graded as "Strong."*

Assessment is the process of comprehensive evaluation of the physical, functional, environmental, and lifestyle needs and preferences of the wheelchair user. This evaluation must be a collaborative process between the wheelchair user and appropriately trained personnel. Assessment results in a clear understanding of the person's needs, that is then used to determine the appropriate features of the wheelchair that are required to best achieve the wheelchair user's desired health, function and participation goals. This includes requirements of the wheelchair cushion, postural support devices, and other features such as propelling options, power seat functions and power chair programming. In addition, the wheelchair user's training needs are defined to address task-specific skills of particular relevance to them.

Areas that may be assessed include, but are not limited to, activity and participation limitations and goals; environments where the wheelchair(s) needs to be used (including transportation); life roles and responsibilities; mental health; physical and cognitive limitations and abilities that support and impede activity and participation goals; risk of pressure injuries; postural support requirements; body dimensions; current wheelchair features; family, caregiver and/or social support; and current ability to perform task-specific skill levels.

Selection is the process of using the assessment information to identify the wheelchair(s), accessories, wheelchair cushion(s) and postural support devices that offer all the necessary features identified, and which are preferred by the wheelchair user, accommodate their postural support and pressure management needs, and will best enable them to achieve their activity and participation goals. It should be noted that many people may need more than one type of wheelchair, to have their full participation needs met. For example, an urban and rural terrain wheelchair, a power wheelchair and a manual wheelchair, or a manual wheelchair plus a power add-on device.



I use a sports wheelchair to play national and international tennis tournaments. I am passionate about disability sports and social inclusion. Sport can empower disabled people within their communities and society. Having an appropriate wheelchair is key to playing, improving and enjoying any wheelchair sport. It is very important to have the right wheelchair, which meets the specific regulations of the chosen sport and the wheelchair user's ability and aspirations in their sport. Not all wheelchair sports are the same and not all people have the same abilities, dreams and passions.

I became disabled at the age of two when I contracted polio. My right leg was paralysed. My wheelchair is designed specifically for tennis. It helps me to move around the court, but it doesn't restrict my left leg which helps me gain stability and prevents unnecessary discomfort. This gives me more confidence to improve my game to reach the best of my ability and enjoy the sport.

Manoj Soma, India

Resources

To ensure wheelchair users can be provided with a wheelchair that meets their individual needs, preferences and goals, a sufficient variety of products must be available to choose from (Box 5). No single model or size of wheelchair can meet the needs of all or most users, and a limited wheelchair range consisting of just a few different options, can result in an inappropriate wheelchair for most wheelchair users.

Member States should seek to ensure availability of a range of manual and (where possible) power wheelchairs, wheelchair cushions, postural supports and other accessories, corresponding to the diversity of user needs in their context. The selection should ensure the majority of people can achieve optimal mobility, seating and postural support and participation in a range of activities and environments. Documenting the most appropriate equipment, what can be funded and the impact of the difference if a wheelchair user does not gain access to the most appropriate recommended device, can help with prioritizing products and service planning. Box 6 describes collaboration between UN agencies to increase availability and accessibility of assistive products.

Box 5. Examples of wheelchair products

Many types of wheelchairs, wheelchair cushions and postural support devices exist. No single model or size of wheelchair can meet the needs of all users, and the diversity among users and their needs creates a need for a variety of wheelchair models to be available to choose from.

Wheelchairs can be propelled by the wheelchair user or an attendant (manual wheelchairs) or by a power source (powered or power assist wheelchairs, motorized mobility scooters). They can include different postural support features and options, be designed for specific activities such as sports or beach activities, or to address a certain need such as stair climbing.

In summary, all wheelchair designs share the same fundamental purpose: to provide mobility, seating and postural support, and to assist functional performance. The most appropriate combination of wheelchair design features must be selected to optimally address each wheelchair user's needs.

Box 6. UN Agencies working together to improve access to quality assistive products

WHO and UNICEF have collaborated to increase availability of affordable, quality assistive products through a range of initiatives.

WHO has developed **Assistive product specifications** for 26 priority assistive products including wheelchairs *(101)*, and a **Procurement manual** published with UNICEF *(102)*. Both of these guidance documents are designed to assist countries in their procurement processes, as well as being a signal for manufacturers and suppliers regarding the minimum requirements for assistive products.

New assistive products have been introduced to **UNICEF and WHO supply catalogues** *(103)* which are designed to increase the global availability of quality priority assistive products and assist countries in procuring these products at more affordable prices. The catalogues include different types of wheelchairs, wheelchair cushions and accessories, to support diverse needs across child and adult wheelchair users in different settings, with different levels of complexity.

Some examples of wheelchair features that impact these outcomes include (and are not limited to):

- **Mobility and other activities** such as moving around, transferring in and out of the wheelchair, carrying out tasks, transporting and storing the wheelchair are enhanced by features such as the frame design (folding or rigid), overall weight of the wheelchair, seat angle and height, foot and armrest designs, adjustability of rear wheel position, front castor width and diameter and, for power wheelchairs, the position of drive wheels, power seat functions and programming adjustability.
- **Postural support** is determined by features such as the adjustability of seat to backrest angle, seat angle, backrest height, seat depth, foot and armrest height, as well as the potential to add off-the-shelf or locally fabricated additional postural supports.
- **Participation in different environments** such as urban or rough terrain is determined by features such as frame design and weight, wheelbase and overall length, rear wheel and front castor width and diameter and position (front/mid/rear), strength and durability.

Member States can ensure a minimum, well selected range of wheelchairs that can be customized or adjusted to achieve proper fit is available through establishing a nationally agreed priority list of assistive technology which includes a minimum range of wheelchairs, wheelchair cushions and postural support features. Box 7 shares the experience of Liberia in developing an assistive products priority list that includes wheelchairs.

Box 7. Liberia National priority assistive products list

Liberia's first National priority assistive products aist (APL) *(98)* was published in 2021 as part of an overall national strategy towards strengthening access to assistive technology. The development of the list was led by the Liberia Ministries of Health, and of Gender, Children and Social Protection together with the National Commission on Disabilities and organizations of people with disabilities. Following an initial assistive technology country capacity assessment, these agencies convened a series of stakeholder consultation workshops to develop and validate the national APL.

The group began with a review of the WHO *priority assistive products list (104)*, and then adapted this list for the Liberia context, using a prioritization process that reflected local needs, priorities and resources. Two types of manual wheelchair were included in the final APL, among 33 other assistive products. The Liberia APL provides the foundation for further national action to increase access to assistive technology including:

- Development of technical standards to regulate assistive technology imports.
- Development of quality checklists and assistive technology service delivery guidelines.
- Advocacy for assistive technology funding and prioritization of products for procurement or donation.
- Training of health and non-health service providers on assistive technology service provision.
- Improving assistive technology data coverage.
- Advocacy for assistive technology inclusion in other national guidelines and policies methodology.

Priority product lists should be accompanied with product specifications to assist in procurement, as well as criteria that wheelchair service personnel can use in collaboration with wheelchair users to select the most appropriate wheelchair(s) from the range. Assessment of the quality, strength and other aspects of wheelchair products is aided by reference to international and/or national product standards. Box 8 provides an overview of international product standards that apply to wheelchairs.

Box 8. International product standards that relate to wheelchairs

The International Organization for Standardization (ISO) has developed a series of standards for wheelchairs (Series 7176), wheelchair cushions (ISO 16840 Part 2), and postural support devices (ISO 16840 Part 3). These standards are focused on the needs of a broad population and address overall safety and performance of a product. To ensure that products are appropriate to the context in which they are used, some regions and many countries use ISO standards to develop more specific requirements that relate specifically to their context. Sometimes countries establish an overall product standard. For example, in Europe, Australia and New Zealand, overall product standards for manual wheelchairs have been developed. In Europe this standard is EN12183Z and in Australia/New Zealand this standard is AS/NZS3695–1. These standards set overall requirements based on the tests and results from the ISO 7176 series noted above. Other standards and testing guidance for wheelchairs exist.

Not all wheelchair users' needs may be met through a pre-selected range, in which case opportunities for selecting outside of the list should be available. In addition, regular exploration of the market and evaluation of new and alternative products helps to ensure that the most appropriate products are in use.

"I like this wheelchair because it fits and is lighter than the old one. I can move around easier. I feel more comfortable in this chair, and don't lean to the side like before. When I go to visit my cousins, this wheelchair is easy to transport. I love it.

Nichapat Khamkaeo, Thailand

Time

The time required to carry out the Select step varies depending on the complexity of each wheelchair user's needs. Short-term users or those with less complex needs may be assessed more quickly than those with more complex requirements. For people with particularly complex needs, assessment will likely continue and blend with the second service delivery step (Fit). To better understand the time needed, wheelchair services may choose to monitor this over a period of time, asking service personnel to record the time spent against set characteristics of each wheelchair user. Such data can be used to assess current adequacy of workforce numbers, time allocated for the Select step, and funding for the time spent on select to assist in future service planning.

2 Service step two: Fit

Recommendation 2: Wheelchairs must be prepared and fitted for each person based on their individual assessment Strong recommendation, low certainty evidence

Preparation *involves assembling the wheelchair and any accessories before fitting.* ***Fitting*** *involves adjusting and modifying the wheelchair, wheelchair cushion, postural support devices, and any other accessories to achieve optimal fit, mobility, postural support and function.*

Recommendation rationale: *The GDG noted that potential harms of not preparing and fitting wheelchairs for people based on their assessment can be severe and can result in immediate and large impairments in health, function, mobility, as well as low satisfaction with the wheelchair. World-wide implementation of the WHO wheelchair service provision steps (13), including individually fitting wheelchairs, supports the feasibility of this recommendation in low- middle- and high-income settings and the ability to benefit all wheelchair users. In addition, the GDG judged that the benefits, especially the prevention of harms, warrant the cost of implementation. Thus, despite the low certainty research evidence, the recommendation was graded as "Strong."*

Preparing the wheelchair includes checking the wheelchair matches the specifications identified in the Select step. The wheelchair, wheelchair cushion, postural support devices, and any other accessories need to be inspected, to ensure they are in good repair, operate as intended and are safe for use. Preparation also includes making initial adjustments to the wheelchair ready for the first fitting. This may include adjusting the backrest, armrest or footrest heights, position of the rear wheel and rear wheel locks and programming (power wheelchairs). In some instances, this step may also include fabrication of any parts and/or modifications that need to be custom made for the user.

Fitting the wheelchair must be carried out with the wheelchair user, to ensure that the wheelchair fits as intended and provides them with the required postural support and pressure relief. Fitting also includes checking how well the wheelchair supports the wheelchair user's ability to carry out activities, interacts with other assistive technology and ensuring the wheelchair can be used at home. This may include, for example, checking that a person's communication-related assistive technology can be successfully used while they are in their wheelchair; ensuring power wheelchair users can reach the control lever, or ensuring a person who will self-propel with their arms can access the pushrims comfortably to push the wheelchair, and that the backrest allows their shoulders sufficient room to move for pushing.

Fitting requires service personnel to seek continuous feedback and guidance from the wheelchair user to identify adjustments that need to be made to achieve proper fit and optimal mobility and function. Fitting is often a cycle of adjusting and review that is repeated until proper fit and optimal mobility and function are achieved, and may take more than one appointment.

> "During my pregnancies, I needed a review of my wheelchair and refitting, so that I could continue to remain active. I found I needed a slightly wider chair and a higher backrest for more support. My centre of gravity changed with my pregnancy, and afterwards, when carrying a baby on my lap. I had larger castor wheels to give a smoother ride over obstacles in case I didn't feel safe doing a wheelie during my pregnancy. Afterwards I changed back to my previous wheelchair.
>
> ***Nina Boswell Brown, the United Kingdom***

Resources

Wheelchair preparation and fitting requires access to tools, materials and a workspace. These requirements will vary depending on the type of wheelchair and how much adjustment and/or modification is needed. Some wheelchairs need to be assembled from boxed components, whereas others are supplied fully assembled. For most wheelchairs, fitting users with intermediate or advanced mobility and support needs, will require at a minimum a workbench equipped with a range of hand tools and consumable materials such as foam, glue, upholstery fabric and straps. Ergonomic workstations assist with managing products safely and efficiently. Wheelchair service providers should familiarize themselves with the

resources required to prepare and fit each wheelchair. More than one person may be required to assist with a fitting for a wheelchair user with complex postural support needs.

Time

The time required to achieve a proper fit depends on the complexity of the wheelchair and the wheelchair user's needs. Adjustments to one part of the wheelchair may result in the need to make additional adjustments to other parts of the wheelchair to achieve the final optimal fit. Services need to allow for sufficient time for the fitting process for each wheelchair user. Wheelchair users may also need to return for further adjustments after using a new wheelchair in all environments of typical use, particularly those with intermediate or advanced seating or power mobility needs. Ensuring a correct fit is a key factor in preventing product abandonment and/or secondary injuries.

3 Service step three: Train

Recommendation 3: Training must be provided for wheelchair users and those who assist them using a wheelchair to enable maximum use including:

- **Skills to use a wheelchair** Strong recommendation, moderate certainty evidence
- **Use of wheelchair components** Strong recommendation, moderate certainty evidence
- **Guiding others with whom they interact** Strong recommendation, very low certainty evidence
- **Wheelchair maintenance and repairs** Conditional recommendation, very low certainty evidence

Training in skills including transferring in and out of the wheelchair and wheelchair mobility, how to use the components, how to guide others in assisting them, as well as wheelchair maintenance and simple repairs, will enable wheelchair users to gain maximum benefit and avoid harm.

Recommendation rationale: *The GDG discussed each skill area considering the evidence, harms, benefits and feasibility in all settings. The GDG concluded that the risk of harm associated with not providing a minimum of training in: skills to use a wheelchair, how to handle the wheelchair components, and how to guide others assisting, combined with the benefits and feasibility of providing this training using a range of low-cost strategies, warranted a "Strong" recommendation despite a mixed certainty of evidence from moderate to very low. Training for wheelchair users in maintenance and repairs was judged as providing benefits only where maintenance and repair services are not affordable, accessible, or able to be utilized in a timely manner. This, in addition to the very low certainty of evidence, resulted in a "Conditional" grading for providing training in this skill to wheelchair users.*

Like any new skill, using a wheelchair requires training to ensure the individual is using the wheelchair safely and effectively. Research has demonstrated that even experienced, long-term users can benefit from task-specific training *(93,105–115)*. For many long-term wheelchair users, training will be valuable multiple times through their life because of changes in wheelchair type, health condition, function, environment, goals and life stages. For example,

as a child becomes more independent, or as someone moves into old age, activities and environments change and therefore task specific training needs will change.

Examples of task specific training in four priority areas are given in Figure 5.

Figure 5. Examples of task-specific training

Skills to use a wheelchair

- Transfers to and from the wheelchair.
- Activities while seated in a wheelchair such as reaching and repositioning.
- Relieving pressure.
- Operating a wheelchair in and around all environments.

Use of wheelchair components

- Using components such as locking and unlocking wheel locks, and/or operating tilt and recline features.
- Attaching and reattaching components such as the wheelchair cushion, armrests and footrests, postural support devices, rear wheels and battery charger.
- Folding and unfolding a wheelchair for transport or storage.

Guiding others

- Knowing how many people might be needed to assist with a task, and the skills or abilities needed for them to assist.
- Knowing how and when to stop people from causing harm or injury to themselves or the wheelchair user when assisting.
- Being able to instruct individuals with different levels of knowledge to partially or fully carry out those tasks for which the user needs assistance.

Wheelchair maintenance and repairs

- Maintenance activities such as washing seating or support covers, cleaning the wheelchair frame, removing debris from axles, cleaning and lubricating hinges, charging batteries.
- Repair activities such as repairing or replacing the wheelchair cushion or the cushion cover, repairing or replacing a pneumatic tyre, replacing sealed wheel bearings, replacing batteries, and replacing worn or damaged parts that can be removed with commonly available tools.

Depending on the individual, wheelchair users may need assistance from others at different times and in different locations such as at home, school, their place of work, on public transport and in public spaces. Assistance may be given by family, caregivers, friends, teachers, co-workers and on occasions a member of the public. For such situations, wheelchair users benefit from having the confidence and skill to instruct people how to best assist. This can improve outcomes, as well as ensuring safety and avoiding harms. In addition to empowering wheelchair users with skills in instructing others, task-specific training specifically for those who provide regular support is often appropriate *(116)*.

Training may be delivered in different ways. Wheelchair skills, operation of the wheelchair components, and maintenance and repair training can be effectively delivered in person *(109, 111, 112,117)*, and through online methods *(107,118,119)* such as video tutorials (see Box 9 for an example). Training can occur in one day *(42,118,120–122)*, over several days *(115,123,124)*, or across several weeks *(105–107,111)*.

Box 9. Wheelchair skills programme

As part of a research series, Dalhousie University and the Nova Scotia Rehabilitation and Arthritis Centre in Canada developed a Wheelchair skills test to assess the capacity of wheelchair users to safely perform the skills they need in their everyday lives. It became clear that many wheelchair users could not perform the wheelchair skills they needed. In 2002 the Wheelchair Skills Training Program was developed, using the best available evidence on motor skills learning principles and wheelchair skill techniques. A growing number of peer-reviewed papers, including two systematic reviews *(125,126)* and meta-analyses *(126)*, have since documented the safety and effectiveness of such training.

The programme has since expanded its scope from manual wheelchairs to include powered wheelchairs and motorized mobility scooters, and to include caregivers in addition to wheelchair users. By January 2023, the programme website (www.wheelchairskillsprogram.ca) has been used by over 173 000 unique users from 200 countries and the YouTube channel (https://www.youtube.com/channel/UCxlnALbMRBCe_JDD548CQ-w) has had 269 000 views, demonstrating the importance of such information for many wheelchair users.

Task-specific training may be fulfilled by clinical or technical personnel or by dedicated trainers with the appropriate competencies. Experienced, appropriately trained wheelchair user peer trainers with the required competencies *(93,108,115,123,127–129)* have advantages over trainers who are not users, as they are able to draw on lived experience. Female peer trainers can play an especially positive role, providing women and girls who use wheelchairs with role models and success stories. Box 10 provides an example of peer training in Kenya.

Box 10. Peer training in Kenya

An initiative in Kenya established through a partnership between the Motivation Charitable Trust and Kenyatta National Hospital in Nairobi, delivers task-specific training through a network of peer trainers. Peer trainers visit individuals with spinal cord injuries during their initial rehabilitation at the hospital. The peer trainers relate their own experiences as wheelchair users, and of spinal cord injury to try to address gaps that they themselves might have experienced in their own rehabilitation. Once a wheelchair has been provided, the peer trainers give training in use of the wheelchair, including mobility skills, such as transferring to and from a wheelchair and doing 'wheelies' over rough ground, as well covering health and rights issues. The trainers give further support by phone once the patient has been discharged.

The peer trainers have all personally experienced learning through peer training, and developed their skill as peer trainers through a formal training-of-trainers course and mentorship. The overall goal of the project, pioneered by wheelchair users, is for people with spinal cord injuries to improve their survival and quality of life through the sharing of knowledge and experience promoting health, mobility and independence. The programme empowers the trainers as well as participants and has positively impacted discharge rates for patients with a spinal cord injury.

Task-specific training should be tailored to the individual wheelchair user according to their needs, including the type of wheelchair, environments of use, personal goals and ability to carry out tasks independently or with the assistance of a support person. Table 2 provides some examples of how training may be tailored to individual people and their specific situation.

Table 2. Tailoring training to people and their situation

People and their situation	Examples of training considerations for different people and their situation
People receiving a new wheelchair for the first time	New wheelchair users need more training than experienced, long-term wheelchair users. When receiving a new type of wheelchair, all wheelchair users may benefit from task-specific training. For example, a different seat height, or change in the wheelchair cushion may require a different transfer method.
Children	Developmentally appropriate training for children should be provided *(130)* beginning as soon as a child would normally begin exploring their environment. Children should receive additional training as they develop their abilities and/or move into different environments or levels of understanding. Group training for children can be particularly motivating.
People whose needs are changing	Wheelchair users with progressive conditions may need frequent training inputs as their condition changes, potentially requiring different ways to carry out tasks. Older adults experiencing a gradual loss of function may need additional training as their function and reliance on the wheelchair changes. Long-term users who are used to doing things one way, and whose needs begin to change, for example with ageing or changes in health, may need assistance in changing how they perform tasks or to improve their ability to instruct others.
People who are at risk	People at risk of complications such as pressure injury or postural problems will need training to ensure they know how to reduce the risk of these complications occurring.
People with cognitive impairments	People who use wheelchairs who also experience cognitive impairments may need adjustments to their training. For example, deliver training in the environments where the wheelchair will be used, offer shorter, more frequent training over a longer period, and involve others the person is familiar with to support.
People living in different environments	Training, particularly in mobility, needs to be relevant to the environment in which a person uses their wheelchair. Ideally carry out mobility skills training as a priority in environments that mirror the environment a wheelchair user lives within. Training mobility skills in different environments, enables wheelchair users to be as mobile as possible in a range of environments.
People with different accessibility needs	People who have cognitive impairments will need training tailored to their understanding. This may include having shorter training sessions, breaking down skills, engaging family and caregivers to assist and reinforce training with frequent practice, and/or providing easy-read information. People with vision, hearing and/or communication impairments will also need accessible information and training methods.

Resources

Special facilities to provide task-specific training are not essential, as many existing spaces can be used or dual purposed as a training area. However, a dedicated area has the advantage of increasing the focus on this step. This may include an indoor or outdoor area with different surfaces and obstacles for wheelchair mobility training, and a space that simulates home and/or work environments. Wheelchair users can be supported to practice manoeuvring their wheelchair and carrying out typical tasks such as transferring in and out of the wheelchair to different surfaces, reaching, and working at a desk or kitchen bench.

Time

The content, duration and frequency of training varies depending on the skills required to meet the wheelchair user's goals, and how readily the wheelchair user is able to achieve competency.

4 Service step four: Follow up

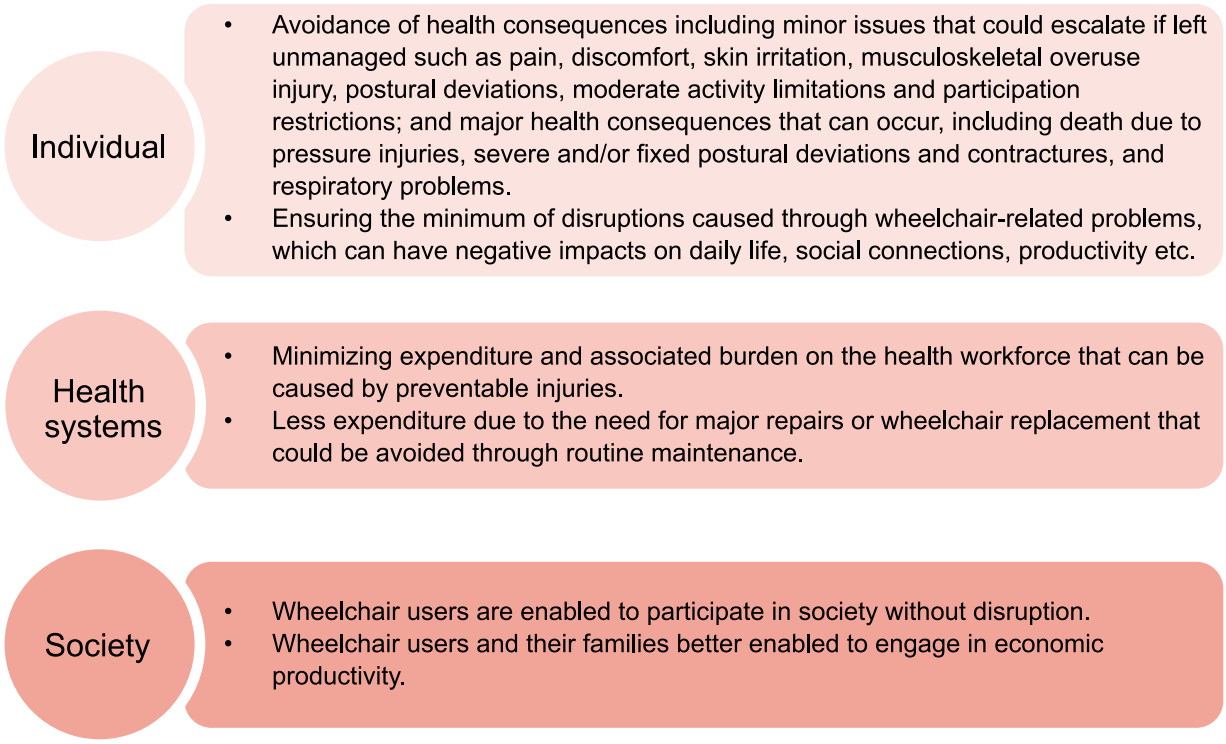
Recommendation 4: Ongoing follow up is an integral part of wheelchair service delivery and should be offered and available to all wheelchair users for as long as they require a wheelchair Conditional recommendation, very low certainty evidence

Follow up has two components: review and remediation. Review involves collaboration between a wheelchair user and service provider to identify how well the wheelchair continues to meet the wheelchair user's needs. Remediation involves addressing and resolving any identified problems.

Recommendation rationale: *The GDG determined that follow-up is critical in all contexts to identify and correct problems or potential problems to prevent potential severe harm to wheelchair users and/or their wheelchair. Follow-up was judged to be feasible in low and high resourced settings. However, the frequency of follow-up required to optimize health and mobility and the methods to optimize cost effectiveness and clinical efficacy is unknown. This, in addition to the very low certainty research evidence resulted in grading the recommendation as "Conditional."*

Follow up is a necessary preventative care that has important benefits for the wheelchair user, as well as for health systems, and society in general *(131–133)*. Some key benefits are summarised in Figure 6.

Figure 6. Benefits of follow up for wheelchair users, health systems and society



Review involves the wheelchair user and appropriately trained personnel working together to understand how well the wheelchair continues to meet the wheelchair user's needs and if they are using it well, and with no harm. This includes: checking the condition (state of repair) of the wheelchair, wheelchair cushion and postural support devices; discussing any changes in the user's situation such as their health, support, transportation and environments of use; assessing fit for correct functional posture and pressure management; assessing user capacity to drive a power wheelchair; assessing the user's ability to perform needed and desired tasks/activities (including all skill domains in the Train section) and any challenges they may be facing; and confirming the wheelchair user's overall satisfaction with the wheelchair performance.

Remediation involves addressing and resolving any problems identified in the review. Remediation actions may include: adjustment of the wheelchair or drive controls, wheelchair cushion and/or postural support devices; additional information and/or training for the wheelchair user and anyone assisting them; and completing wheelchair maintenance or repairs. This step may also require immediate or planning for future provision of a new similar or different wheelchair, wheelchair cushion, or postural support devices. In this case it would be necessary to return to the Select step for a full assessment.

Problems should be addressed in a timely manner and the timeline, cost and steps should be clearly communicated to the wheelchair user and as appropriate those who assist them. Extended delays in remediation can result in a worsening of the problem and result in health and financial consequences to the wheelchair user, health system and society. Unclear communication between the professional and wheelchair user can result in frustration and evolve into mistrust of the provider and health care system. Follow up is not complete until the wheelchair user and personnel are satisfied with the solution(s).

One of the most common remediation actions is maintenance and repair. Timely maintenance and repair are critical to ensure the safety, health and mobility of the wheelchair user and to maximize the longevity of the wheelchair, wheelchair cushion and postural supports. Maintenance and repair are a responsibility shared between the wheelchair user and wheelchair service. Wheelchair users and those who assist wheelchair users can care for the wheelchair and carry out basic repairs, reaching out to services for maintenance and repair that exceeds their abilities and resources.

There are different ways to carry out follow up. Depending on the context, follow up could begin with a phone call, messaging application, or other telehealth method. Where needs cannot be met remotely, an in-person review can then be scheduled. Outpatient visits to any health provider could also be used to initiate follow up, particularly within a health workforce that has been sensitized to screen for wheelchair needs and are aware of indicators for follow up. Resources to support wheelchair users, those that assist them, and individuals performing the role of maintenance and repair can be made available in formats that are most easily accessed by these groups. In areas with reliable internet access and coverage, the use of telehealth methods may be most appropriate. Box 11 provides an example of follow up in Argentina carried out by local health workers with the support of remote advisors using telehealth to bridge distance.

Box 11. Using telehealth methods to support follow up in Argentina

Asistiva, an Argentinian nongovernmental organization that carries out wheelchair provision, partnered with the regional Ministry for Health and Social Development in a remote part of Argentina to initiate a programme of wheelchair follow up. The programme was initiated to achieve better outcomes for wheelchair users and reduce the number of abandoned wheelchairs. It uses telehealth to bridge the distance between local health workers and Asistiva wheelchair provision personnel who are based over 1800km away, and are able to visit the area only once annually.

Health and social workers carry out home visits to wheelchair users in their area, and have integrated follow up as part of their visit. To enable them to fulfil this role, Asistiva provided training in wheelchair provision, focusing on follow-up competencies. Now, during health and social worker home visits, these personnel talk with wheelchair users about their wheelchair, including whether they are still using it and if they have any problems or concerns. With the wheelchair user's informed consent, health and social workers also photograph or film the person using their wheelchair and send the images to Asistiva clinical advisors. These personnel remotely review the wheelchair user's seating position, highlight any missing information and provide guidance on simple remediation actions. The programme has additionally trained two local people local in simple maintenance and repair techniques. The clinical advisors follow up more complex cases during their annual visit to the area.

This alliance between a wheelchair service and local health and social services enables wheelchair users to receive follow up at 1800km distance from specialist providers, and has reduced unnecessary abandonment of wheelchairs.

Timing

Follow up may be routinely scheduled, or initiated as needed by the wheelchair user or a service provider when a problem that requires attention is identified. Wheelchair users need to know how to access both routine and emergency follow up. In addition, processes to identify when a wheelchair user may benefit from follow up should be implemented broadly in health systems and educational, vocational or social welfare sectors as appropriate. All health providers who are involved in the care of wheelchair users should be able to identify a potential need for follow up and be able to refer the wheelchair user to a wheelchair service. Examples of indicators for initiating follow up include a change in health and or functional condition, such as pain, weakness or stiffness, recent falls, new or persistent pressure injuries, difficulty carrying out daily activities, changes in the ability to propel the wheelchair and the wheelchair being in need of repair.

Frequency

The frequency of scheduled follow up should be tailored to the wheelchair user and their situation and reflect needs such as growth (children), progression of condition and pressure injury risk. An optimal interval between follow up appointments has not yet been defined for any population. However, as a guide, all new, first-time wheelchair users and users with stable health conditions should be followed up at least annually and as the need arises. Children, older persons and those with rapidly changing/unstable health conditions should be followed up at least bi-annually and as the need arises. This guidance should be tailored to specific contexts and user groups.

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System level recommendations

3.2 Competent workforce

The previous section outlined the minimum service level steps involved in wheelchair service delivery. This section provides an overall recommendation and suggested strategies towards ensuring wheelchair personnel have the appropriate training and competency to fulfil their roles. This extends to those who support services such as managers, and personnel within referral network services.

5 Competent workforce

Recommendation 5: Wheelchair provision roles must be performed by people who have role-specific competencies Strong recommendation, moderate certainty evidence

Competency is the ability to integrate skills, knowledge, attitudes and behaviours to successfully achieve a desired result. Fulfilling the different wheelchair provision roles, including identification and referral, service delivery (clinical and technical) and management, requires the availability of appropriately trained personnel with the competencies required to perform their role.

Recommendation rationale: *The GDG judged that in low- middle- and high-income countries, performance of wheelchair service provision roles by individuals who lacked necessary training and competency can result in serious harm to wheelchair users. The systematic review indicated that role specific training improved the ability of service providers to carry out services. World-wide implementation of the WHO Wheelchair Service Training Packages supports feasibility of training in low- middle- and high-income member states. Licensing and certification requirements for provision of wheelchairs are common world-wide, further supporting feasibility. The certainty of the research evidence was moderate. Therefore, this recommendation was graded as "Strong."*

Wheelchair service roles can be broadly classified as shown in Table 3.[14] For clinical, technical and training roles, the degree of competency required of personnel increases with the complexity of the wheelchair user's needs.

[14] Adapted from *Guidelines on the provision of wheelchairs in less resourced settings (2008).*

Table 3. Different roles involved in wheelchair provision within health systems

Role	Description of Role
Identification and referral	Health care personnel at community, primary, secondary and tertiary levels, as well as those in other sectors such as education and social care, play a role in identifying people who may benefit from a wheelchair and referring those in need to the closest service.
Clinical	Clinical personnel work directly with wheelchair users throughout the select, fit, use and follow up steps. Ideally, clinical personnel work closely with technical personnel, particularly during the select and fitting steps.
Technical	Technical personnel specialize in the assembly, adjustment, modification, maintenance and repair of wheelchairs. Technical personnel may also assist with selection due to their extensive knowledge of available products. They ensure the wheelchair is correctly prepared for fitting, assist with adjustments and modifications, and carry out maintenance and repairs. Where a wheelchair user's mobility and postural support needs are complex, technical personnel should ideally be directly involved in their assessment, fitting and follow up.
Training	Task-specific training designed to assist wheelchair users to use and care for their wheelchair may be fulfilled by clinical and technical personnel, or by dedicated trainers, including peer trainers who can draw on and share their own experiences.
Management	Managers ensure the wheelchair service has the required resources and systems to deliver appropriate cost effective, efficient, services. Managers also play a key role in promoting wheelchair services. Managers require a good understanding of wheelchair provision in addition to general management skills. The role may be fulfilled by a dedicated manager, someone managing a number of services or by someone who also functions in other roles within the service.

Building a competent workforce with sufficient personnel to fulfil the roles of wheelchair provision requires a workforce plan and training strategy. Workforce planning must be context-specific, reflecting the current workforce, training opportunities and resources, and cannot simply be adapted from one country to another *(134)*. Evidence-based workforce planning can enable Member States to identify the scope of needed wheelchair services, develop innovative models to deliver wheelchair services, the types and number of clinical, technical, training and management personnel required, and where and how to deploy them to make the best use of their competencies. Box 12 describes systematic strengthening of wheelchair provision in Bhutan, which has focused on building the workforce capacity.

Box 12. Building a national wheelchair service in Bhutan

WHO training packages, together with ISWP skills tests, have been used to help build Bhutan's national wheelchair service. From an initial position of having no structured wheelchair services in the country, a successful model of delivery has been developed, which provides 200 wheelchairs annually. Furthermore, wheelchair service training has been embedded in the Bhutan national Physiotherapy Technician (PTT)[15] course curriculum, indicating commitment and a recognition of the importance of wheelchair services within the health system.

In 2016, 16 physiotherapist and physio-technicians undertook the full WHO training packages, with clinical, technical and management personnel training delivered in Bhutan, and ISWP tests to check knowledge. Wheelchair user involvement in the delivery of the course, and a subsequent wheelchair maintenance training allowed for task-shifting with more people available to work within the service. Inclusion of wheelchair user ideas and feedback has been seen as crucial for developing appropriate services that meet needs, and also in fostering trust and utilization of the services among the wheelchair user community.

The Bhutanese Government's commitment to improving the situation has been pivotal, and their presence at a stakeholders' meeting resulted in the commitment of the Ministry of Health to ongoing procurement of appropriate wheelchairs. The current focus is: developing services through the delivery of training; strengthening the central service and health services throughout the country; and also linking wheelchair services with other assistive technology services. Appropriate wheelchair provision in Bhutan has resulted in growing empowerment of wheelchair users and their families and a new focus on inclusion and accessibility.

Tools such as the WHO Workload indicators of staffing need (WSIN) *(135)* can be used to gather data needed for wheelchair service workforce planning. Monitoring and evaluation of wheelchair services can help to determine if wheelchair users and personnel are being correctly matched and to determine if there are enough personnel with basic, intermediate and advanced competencies to meet the needs of wheelchair users.

Potential strategies to assist Member States in strengthening their workforce to meet the need for wheelchair provision include:

- **Task-shifting:** In most countries there are not enough rehabilitation personnel for the delivery of wheelchair services to be limited to these personnel only *(136)*. To reach adequate personnel capacity at all levels (primary, secondary and tertiary), task-shifting strategies are required. For example, nurses and technicians at primary health level may be trained to carry out wheelchair service steps for people with basic needs, referring only those with more complex needs. Such training should consider gender balance to ensure equitable access *(137,138)*.
- **Defining competencies:** The knowledge, skills, attitudes and other competencies required for roles within different levels of wheelchair services should be defined. The development of a core set of competencies, followed by specialization and advanced training competencies may help to address the needs of wheelchair users with increasing complexity, and provide avenues for continuing education of personnel, and the application of best practice provision evidence *(81)*. Knowledge, skills, attitude and behaviours identified should include awareness of broader disability and gender issues among service providers, and referral networks. Existing wheelchair services and relevant professional organizations

[15] Role specific to Bhutan

can support in defining competencies and the development of training programmes that harmonize with the development of services and roles.

- **Integration of wheelchair training into curricula:** In addition to training provided to personnel already within the workforce, integrating wheelchair provision training into health personnel curricular *(139, 140)* will help strengthen referral networks and increase the available workforce to carry out wheelchair service steps. Professional organizations can support the integration of wheelchair provision training into current professional training programmes and also support continuing educational training and professional development *(100)*. Box 13 outlines one initiative to support integration of wheelchair content into curricula.
- **Introducing national accreditation:** Member States should consider requiring wheelchair service personnel to have a basic certification as proof of competency in the wheelchair service steps. Defined competencies can be used in planning and certifying training and education standards *(81)*. Evidence of competency may be assessed and documented by a certified wheelchair service provider, academic institutions, national accreditation bodies, or professional organizations. Current certification models may serve as a grounding framework or opportunity for collaboration.
- **Utilize a range of training approaches,** adopting those most suited to the national context, resources and existing programmes. Options include:
  - *In-person training:* Face to face training may be delivered through standalone courses, or as an element of a broader training programme for relevant professions such as physiotherapy or occupational therapy *(141–145)*.
  - *Hybrid training (part remote, part in-person):* Online training for part of the course can reduce the number of hours required for in-person training, and in the right settings can produce comparable results *(146)*.
  - *Apprenticeship training programmes:* The guidance of experienced mentors can help support maturation of knowledge and skills through practise *(146)*.
  - *Mentorship and learning:* Mentorship from professionals with established advanced competencies and learning from wheelchair users' experience and is necessary to transfer knowledge within wheelchair services *(99)*.

Box 13. The Wheelchair educators' package (WEP)

The Wheelchair educators' package (WEP) *(147)* is an online resource designed to support the integration of wheelchair service training into university and other workforce preparation courses. The package was developed by a taskforce of wheelchair provision experts form 21 countries and launched in 2022. It contains guidance for educators on how to plan and teach wheelchair service content for manual wheelchair provision. It also provides guidance on how to evaluate developed courses, and advocate for sustained inclusion of wheelchair service content in curricula.

3.3 Wheelchair service systems

Wheelchair services function within health and other systems, involving and networking with other services and stakeholders to meet wheelchair users' needs for individualized wheelchair provision. To be effective and efficient, ensuring positive outcomes for wheelchair users, wheelchair services need to be well coordinated within the broader systems in which they function, as well as networked externally. Established processes for monitoring, evaluating and using lessons learned will ensure continuous improvement in building the quality, equity and sustainability of wheelchair services.

6 Seamless referral and access

Recommendation 6: Wheelchair provision including identification of need, referral and service delivery should be seamless and integrated across all levels of health systems and other relevant sectors Strong recommendation, very low certainty evidence

Seamless wheelchair provision is characterized by consistency, continuity and coordination of identification, referral and service steps in a timely manner with minimal barriers and delays. Integrated means that wheelchair provision is part of a comprehensive health service at all levels (i.e. primary, secondary, tertiary), and as appropriate, part of other relevant sectors such as social, vocational or welfare.

Recommendation rationale: *The GDG noted that fragmented/ad hoc systems cause significant harm to wheelchair users by delaying or denying access to a wheelchair and all service steps (select, fit, train, and follow-up). Harms were noted as including negative impacts on health as well as social and economic inclusion. The systematic review reported that seamless systems can reduce costs, whilst an ad hoc/fragmented system increased financial burden on wheelchair users and results in service delivery delays. Seamless systems were determined to be feasible in low- middle- and high-income countries and could provide benefit in all contexts. Thus, despite the very low certainty evidence, the recommendation was graded as "Strong."*

Seamless referral and access to each of the service steps is characterized by:

- Services organized around the individual to provide person-centred care.
- Consistency of care between different providers, health service levels, and each step.
- Continuity of care with clear signposts for wheelchair users and their families or caregivers so that they know when, where and how to access each step.
- Coordination and communication among service providers throughout referral and service steps.
- Timely referral and completion of each step with minimum delays.[16]
- Minimal barriers to access and use of each step.

[16] Timeliness in health care is defined by WHO as: "Reducing waiting times and sometimes harmful delays for both those who receive care and those who give care" *(153).*

A seamless service can be achieved by a single service provider or multiple service providers coordinated and arranged in different ways. Importantly, it is the experience of the wheelchair user, and those that assist them, which determines if their wheelchair provision is seamless.

Seamless referral and access to each of the service steps can be supported at the system level by *(148)*:

- **Systematic identification of need for wheelchairs and established referral pathways:** As noted previously, access to wheelchair services begins with identification of need for wheelchairs and referral. Including routine screening for mobility needs in primary care, as well as having established referral systems (including self-referral) across health and other sectors, are essential to facilitate timely access. The success of referral can be enhanced by ensuring support systems are in place for those who may need assistance in accessing a service (for example due to distance, cost or transport needs).
- **Making wheelchair services available as close as possible to where people live:** Wheelchair services for people whose mobility, postural support and other wheelchair-related needs are simple and can be successfully provided at primary health level, reducing the distance to service for many. Analysis of data gathered from 27 countries[17] as a part of the rATA survey *(63)* indicates that 34.4% of participants using a wheelchair travelled 26km or more to get it. For people with more complex needs, who may require referral to secondary or tertiary level services, some service steps, such as follow up, may still be provided at primary health care level.
- **Building workforce capacity:** Adequate workforce is key to developing seamless wheelchair provision. As noted in section 3.2 (Competent workforce), workforce planning needs to include the whole wheelchair provision ecosystem. This should be built into the education and training of health care personnel, reflect the need for a broad referral network, and tailored to the number of personnel with the required role specific training needed across the health system.
- **Established funding mechanisms:** Funding mechanisms that determine how the wheelchair service and product costs will be met and by whom, must be in place to avoid delays caused by uncertainty in funding. Funding mechanisms should be adjusted to achieve equality in outcomes, be portable across sectors (e.g. educational, vocational and social welfare), support in-person, telehealth, and hybrid service delivery, and recognize that more than one wheelchair per person may be appropriate to accommodate different environments and uses. (See section 3.4 on Policy and finance issues).

Wheelchair services can also support seamless services through a number of strategies, for example:

- **Establishing and maintaining waiting lists:** Waiting lists can help manage high demand for a wheelchair service, limited funding and product resources. A waiting list should prioritize people whose needs may change rapidly or who are at highest risk for developing secondary health complications.

[17] rATA survey results reported in these guidelines are based on the data from 22 national samples (Azerbaijan, Bhutan, Burkina Faso, Djibouti, Dominican Republic, Georgia, Indonesia, Iran (Islamic Republic of), Iraq, Italy, Jordan, Kenya, Liberia, Maldives, Mongolia, Myanmar, Nepal, Poland, Rwanda, Senegal, Togo, Ukraine,) and five sub-national samples (China, Guatemala, India, Malawi, Tajikistan). Results reported are unadjusted for potential confounder such as age, gender, and country income.

- **Utilizing telehealth methods:** Digital technology provides an opportunity to enhance seamless wheelchair provision by removing barriers of time, distance, capacity and provider scarcities in underserved communities, making service delivery more efficient and cost-effective *(74)*. Telehealth can be used to assist with service steps, workforce training, procurement and data collection *(42, 70, 116, 133)*. Telehealth can also be used to facilitate communication between a range of stakeholders. For example, a service provider seeking support from a more experienced provider, consultation between the wheelchair user and service provider, or a user accessing information through a device, for example wheelchair maintenance instructions *(141)*.
- **Being aware of key barriers and working to remove them:** Meeting with stakeholders and receiving feedback from wheelchair service user can help wheelchair services understand access barriers people may be facing, which is the first step in addressing them.
- **Usual health care provider:** A consistent and trusted source for medical needs, including referral for wheelchair provision can support better outcomes and lower costs *(42)*

An example of a seamless service in operation is highlighted in Box 14.

Box 14. Seamless wheelchair provision in Canada

Assistive products in Ontario, Canada are provided through a system that utilizes a community referral system with two key elements that facilitate a smooth flow of the system: A system navigator supports the client to move through the service steps; and a centralized funding system helps to reduce paperwork delays. The service provision steps are carried out by various stakeholders, including private clinicians, suppliers and vendors. However, the navigator enables the client to move through the Select, Fit, Train and Follow up steps seamlessly, with accreditation of providers ensuring quality among all stakeholders.

7 Systematic evaluation

Recommendation 7: Processes to measure and evaluate the performance of wheelchair provision should be implemented to inform ongoing strengthening of people-centred, equitable access to appropriate wheelchairs Conditional recommendation, very low certainty evidence

Measurement includes the routine collection of information about service users, personnel, provision, and/or products provided. Evaluation involves reviewing information collected and other methods to determine whether wheelchair provision is meeting, exceeding or falling short of desired targets. Strengthening means making changes to wheelchair provision when evaluation indicates a weakness.

Recommendation rationale: *Processes to measure and evaluate are commonly used in health care to improve outcomes. Research evidence supporting their use in wheelchair provision is very limited, with very low certainty research evidence. Despite the lack of information specific to wheelchair service provision, the GDG judged that introduction of simple processes that measure and evaluate wheelchair provision services are feasible, and of benefit in strengthening the sector. The GDG also noted that widespread use and value of systematic evaluation in industries*

and other health care sectors was sufficient to support a "Conditional" recommendation in favor of systematic evaluation as a mechanism to strengthen wheelchair service provision.

Development of wheelchair service systems that ensure the best outcomes for wheelchair users and health systems, requires a continuous cycle of monitoring and measuring progress against targets defined for that system, carrying out regular evaluations, and taking action to address identified areas of need. Potential methods that wheelchair services may use to establish monitoring and measuring of progress *(89)* are described below.

- **Identify priority areas and activities of the service to be routinely monitored:** Examples are: rate of referrals; waiting times for appointments and between prescription and fitting; the number of people receiving wheelchairs and their demographics; the types of wheelchairs, wheelchair cushions and postural support devices provided; data regarding wheelchair skills (performance and confidence levels, frequency of use); the number of follow ups; and user satisfaction.
- **Set performance targets for these areas and activities:** A performance target is a measurable statement (indicator) of how well the service would like to perform in that area. Performance targets should be realistic, taking into account available resources, and align with broader health system priorities and targets. For example:
  - The service will be accessed equally by people of all gender.
  - Time between referral and first appointment for people 'at risk' to be less than one week.
  - The number of people receiving follow up in a timely manner increased from (baseline) to (target).
  - The incidence of secondary complications reduced from (baseline) to (target).
  - Available resources (human and/or physical resources) increased to a defined target.

Box 15 provides an example of a proposed set of indicators to support monitoring of rehabilitation services, and includes indicators related to provision of assistive products.

- **Identify what information will be collected:** To measure each performance target, specific data will be needed *(92)*. For example, to measure service equity, information about the people accessing the service (e.g. gender, distance from service, socioeconomic status etc.) will be needed.
- **Plan for how information will be collected:** The method of collection will depend on each service as well as health management information systems that may already be established in the country *(4)*. Ideally, gathering information should be part of the service's normal record-keeping, should be integrated with national health information systems, and should require minimal additional work by service personnel. In addition to routine data collection, services are encouraged to ensure the gathering of feedback from wheelchair users. This may be through asking a few routine questions after appointments, longer wheelchair user surveys, focus groups and/or interviews.
- **Plan for how information will be stored and retrieved:** Information collected should be stored in accordance with national data regulations and ideally electronically. Modernizing data systems for robust data/evidence collection, and research is important. An ideal situation is for wheelchair services to be able to use established national electronic health information systems *(149–151)*. A regular analysis of information by service personnel

can be used to identify problems, and act quickly to resolve them. For example, if fewer referrals than expected are being received, a service may choose to contact referral sources to remind them about the service or offer additional training. If there is limited funding to meet needs, a specific waiting list for these wheelchairs and long-term budget strategies can be developed to meet the need.

Box 15: Standard indicators for rehabilitation

WHO has developed a rehabilitation module within overall guidance to Member States on the analysis and use of routine health information systems *(152)*. The rehabilitation module sets forth a series of standard indicators that may be included within national health information systems, in order to monitor and strengthen rehabilitation. The indicators are designed to integrate with routine reporting through health facilities from both individual and service records. They may be used for defining rehabilitation targets and outcomes, clinical decision-making, estimates of service utilization, and quality management. Examples of core indicators related to assistive technology include uptake of assistive products (from the WHO Priority assistive products list *(104)*) and waiting times for provision.

Evaluation is an opportunity to review and reflect on the information collected through routine monitoring and measuring, with a particular focus on the service's targeted performance areas. Evaluation may also include additional activities such as an overall review of a service, more detailed interviews with service personnel and service users. A thorough evaluation should cover the whole system including identification, referral and each service step, and include the perspectives of all relevant stakeholders. Inclusion of evaluation of the impact of the service for individuals and their families is important to understand gaps and benefits for service users *(153, 154)*. Box 16 contains an example of tools with people-centred measures of wheelchair users' outcomes before and after wheelchair provision.

Box 16. Evaluation tool – Measuring outcomes for wheelchair users

The Wheelchair outcomes assessment tools (known as WATCh tools) *(154)* are people-centred outcome measures for children and adults developed by the Centre for Health Economics and Medicines Evaluation (CHEME), Bangor University and the Shropshire Wheelchair and Posture Service, the United Kingdom. The tools were designed to allow wheelchair users, clinicians and therapists to identify, score and monitor individual users' outcomes before and after wheelchair provision. The tools allow wheelchair users to select outcomes important to them and outline what they hope to achieve for each.

Based on the findings of surveys and interviews, and in consultation with the service providers and users, the WATCh tool comprises 16 outcome options. Service users select the five most important to them to be monitored, describe what they want to achieve, and rate their current satisfaction with each outcome. A follow-up tool has been developed to allow monitoring of outcomes after wheelchair provision.

The WATCh tool is currently being implemented by the NHS North Wales Posture and Mobility Service as part of routine practice, with the intention to use resulting data to evaluate service effectiveness from the perspective of the service users.

Previous evaluation reports can be used as a basis for subsequent evaluations. Service evaluations may be carried out internally or externally, and are intended to highlight the

service's strengths and weaknesses, in order to take action towards improvement. Lessons learned are used to build on success and inform further strengthening of wheelchair provision and, where appropriate, other areas of health and/or other care sectors. Evaluation can, and should, lead to service and system level recommendations, as well as valuable information that can be fed into national reporting on progress towards realization of commitments such as the SDGs, universal health coverage, and the Convention on the Rights of Persons with Disabilities. Evaluation reports will ideally identify those responsible for responding to recommendations.

3.4 Policy and finance issues

Implementing the recommendations presented in these guidelines will require a favourable policy environment, as well as established financing mechanisms. This section provides an overview of some of the considerations in strengthening policy and financing, as well as examples of actions taken to address specific issues within policy and funding.

Policy environment

National policy frameworks to support equitable access to wheelchairs will ideally be designed to ensure users receive wheelchairs, wheelchair cushions, postural support devices and accessories that meet their individual needs and minimum requirements for safety, performance and reliability. A policy framework that addresses wheelchair provision may include an overarching policy on wheelchairs or a policy on the provision of assistive technology that includes wheelchairs. In addition, policies, regulations and guidelines for cross-cutting issues that impact wheelchair provision need to be considered in coordination with relevant sectors. For example, health workforce guidelines on roles and responsibilities may impact the ability to share wheelchair service delivery tasks *(156)*, and health financing policies may impact the selection of wheelchair products *(157)*. Box 17 provides an example of a law that addresses wheelchair repair, as a specific aspect of wheelchair provision. Box 18 provides an example of a policy on recycling of assistive technology that reduces costs for the government and waiting times for service users.

Given the need to address cross-cutting areas, multi-stakeholder consultation and engagement is important to ensure a holistic framework. Government and ministries play a leadership role in the formulation of policies, coordinating different government and nongovernment sectors including wheelchair user representative bodies, service providers and researchers *(158)* to ensure policies are fit for purpose *(157, 159)*. Parallel to policy development, processes to enforce and ensure implementation of policy should be developed, as well as funding to support these processes *(160)*.

Box 17. Colorado 'Right to Repair' law for power wheelchair users

In January 2023, Colorado became the first state in the United States to enact a 'Right to Repair' law for power wheelchairs *(161)*. Prior to this law, owners of powered wheelchairs had to seek diagnostic, maintenance and repair services from the manufacturer, which, when combined with insurance and regulatory obstacles, frustrated wheelchair users seeking timely repairs to their wheelchair.

The new law aims to facilitate reduced delays for wheelchair users' by easing access to wheelchair parts and services. A simple missing bolt can make the difference between independence and bed rest, yet complications with insurance, parts supply, approved repair services, and under-funding of repair services can result in uncomplicated but critical repairs taking days, or weeks to resolve.

The Right to Repair law allows wheelchair users and independent vendors access to parts, software and manuals held by manufacturers in order to reduce barriers to repair. Under the law, power wheelchair manufacturers could be cited for an unfair trade practice if they refuse to allow access to parts and manuals.

Box 18. Norwegian AT centres: repair and reuse of wheelchairs

The Norwegian system for assistive technology places high importance on the repair and re-use of products, including wheelchairs, aiming to extend the life of devices as much as possible, while continuing to meet quality and service standards. The AT system is based on individual rights and is covered by the Act on Social Security in Norway. It comprises multidisciplinary assistive technology (AT) centres in each province, with the Ministry of Labour and Welfare Administration responsible for organizing funding, procurement and capacity building. Product procurement agreements are made at the national level, evaluating products for quality and price, and requiring product suppliers to guarantee product servicing, and availability of spare parts.

Products are loaned to users without charge. The user can use the product for as long as it meets their needs, however it remains the property of the government. A nationwide system collects products once they have been used. The products are then cleaned, repaired and refurbished to a high standard before being placed back into stock alongside new equipment, for re-issuing to another user. Staff have been trained extensively in assistive technology repair and reuse, and a national system maintains an overview of all stock and devices shipped between AT centres to facilitate the use of refurbished devices where they are needed.

The repair and re-use system is especially important to meet the needs of children whose needs change rapidly as they grow as it enables children to be provided with a well fitted wheelchair at frequent intervals, with minimal delays, and at a low cost. The system increases the number of people served while also controlling costs. In 2021 the system reported 24% of all the products issued by AT centres (valued at EUR68.6 million) were refurbished.

Financing wheelchair provision

In accordance with the principles of universal health coverage, national policies should accommodate the right to an appropriate wheelchair *(1)*, without the individual facing financial hardship as a result of the cost of accessing wheelchair services and/or an appropriate wheelchair *(4)*. This requires planning for the costs of provision including the cost of product(s) and access to the four service delivery steps by those in need.

Different sources of funding for wheelchair provision in various contexts are described below.

- **Government funding:** Government funding is usually the most reliable funding source where the government is committed to wheelchair services. However in some countries where health services are well established, out-dated funding models may restrict wheelchair users' options through limited tender lists and lack of flexibility *(88)*. Where wheelchair services are being established outside of government services (e.g. by nongovernmental organizations), the relevant government departments should be consulted on long-term planning to determine when, how and to what extent the government is able to assume overall responsibility for the service, including financial contributions *(162)*. Government funding can be made available through different models. Where resources are limited, partnerships between the public, private, and international nongovernmental organizations can lead to sustainable solutions *(163–165)*. Box 19 describes a person-centred funding model for wheelchair provision introduced by the United Kingdom National Health Service in England.

Box 19. Personal wheelchair budgets

Personal wheelchair budgets (PWBs) have been in use through the National Health Service in England, United Kingdom, since 2019 *(166)* to increase wheelchair user's choice and control over the wheelchair provided. The scheme is designed with the principles of person-centred services, and to better support wheelchair users' health and well-being outcomes.

PWBs support a thorough assessment of each wheelchair user's individual needs and goals. This includes a broad focus, considering wheelchair users' education, work, social and family priorities, and selection of the most appropriate wheelchair is made with these goals in mind.

Funding is provided by the National Health Service to meet the assessed needs. These funds can be combined with other funds from a range of health, social care and education services, access to work grants and funding from local authorities. People may also choose to top up the funds themselves or contribute funding that may be available via charitable organizations. The combined funding increases wheelchair options. For example, combining funds may enable payment for accessories for a powered wheelchair to enable the wheelchair user to transfer independently, instead of being used to fund an assistant. The total funding may be spent through the National Health Service, or a third-party supplier, and may be topped up by the wheelchair user.

The system gives wheelchair users the opportunity to look at their needs as a whole, and access equipment that will improve their quality of life without separating equipment by home and school or work. Wheelchair users are able to use PWBs when their wheelchair is due to be changed, either every five years, or less if their health needs change.

- **Insurance premiums:** Insurance premiums involve the advance payment of contributions or taxes into a common fund to pay for all or part of health services. Health insurance may provide for full or partial payment of the costs of wheelchair services. Insurance plans do not always lead to UHC as they often prioritize people who are formally employed, and exclude the poorest and most marginalized who cannot afford to pay premiums, especially women *(167)*. Policy caps or limits, as well as product or supplier restrictions, can result in wheelchair users not being able to access an appropriate wheelchair *(168)*.
- **Donor funding:** In many contexts, the initiation of a wheelchair service may depend on funding from national and international donors. Owing to its usually short-term nature,

donor funding should be complemented by advocacy for government and other more sustainable sources of funding *(169)*. Wheelchair users can have a greater voice and choice in the wheelchair purchasing process if funding is distributed through a model that focuses on enabling choice and accommodating individual needs *(170)*.

Funding for wheelchair provision may be distributed in different ways. For example, funds may be distributed through purchase programmes under health insurance, voucher systems that enable wheelchair users to make their own purchasing decisions within agreed requirements, or through loans that enable the cost of a wheelchair to be spread over time. Funding may be distributed directly to the wheelchair user, or through wheelchair services. Funding may be cost-shared, means-tested, or fully covered.

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Next steps

This section outlines next steps for the sector, including: mapping and strengthening relevant policies; strengthening guidance for manufacturers on minimum quality standards and design; creation of blueprint wheelchair service step protocols tailored to the main groups of wheelchair users, to support increased access through health and other care services; and development of a model competency framework covering the different wheelchair service system roles.

4.1 Dissemination

WHO will ensure that these guidelines are disseminated through webinars, conferences, regional and country workshops and other events, to a broad network of stakeholders, including ministries of health and other relevant ministries of WHO Member States, WHO regional and country offices, other UN agencies, nongovernmental and international organizations, professional associations and research networks, donor agencies, disabled people's organizations, and older persons representative bodies. WHO will further use the WHO-GATE community to support wide-spread disemmination as well as working with partners, collaborating centres and key network agencies to ensure the guidelines reach the widest possible audience.

4.2 Next steps towards implementation

The seven recommendations presented in the guidelines are intended to guide Member States in the development of strategies that will strengthen national wheelchair services, thereby contributing to improving access to high-quality, affordable wheelchair services globally. This is a decisive step towards strengthening UHC and making sure that 'no one is left behind' *(2)*.

The following outlines actions that WHO, Member States and other stakeholders can take to create a more favourable environment for the implementation of wheelchair provision, considering the need for supportive policy, availability of appropriate wheelchairs, models of service delivery and trained personnel. All actions should involve consultation and active engagement of the stakeholders outlined in section 2.7, ensuring in particular that diverse groups of wheelchair users and their representative bodies are actively engaged in planning, implementation and evaluation.

Policy

- **Policy mapping:** Develop or modify a new or existing framework for the mapping of policies, inclusive of legislation, regulation, guidelines and/or standards, that impact wheelchair provision, in order to identify policy gaps, barriers and opportunities.
- **Policy strengthening:** Use the results to prioritize policy development and/or strengthening to facilitate effective, seamless and sustainable wheelchair provision.
- **Data:** Develop a unified framework for wheelchair provision data collection, including quality and sustainability indicators, to inform evaluation of progress and provision strengthening.

Products

- **Feedback:** Strengthen and make systematic feedback loops between wheelchair users and their service providers, industry (e.g. wheelchair designers), manufacturers, suppliers and donors. Feedback loops are important to continue improving the quality and suitability of available wheelchair products. Feedback loops should include opportunities to report on product failure and/or other performance issues. They may be integrated into the Follow up wheelchair service step, or facilitated through the use of digital technology.
- **Make information about products more readily available:** Develop clear information for service providers and wheelchair users about wheelchairs and their features, to facilitate selection discussion and choices. Suppliers can be requested to provide product specific information. Further training for wheelchair service personnel on products and features can be integrated into wheelchair service delivery training.
- **Minimum product range:** Member States may build on the WHO *Priority assistive product list* to identify a minimum range of wheelchairs to be made available as a part of UHC, and include these within overall national priority assistive product lists.
- **Standards:** Where possible, Member States are encouraged to develop quality and safety standards for wheelchairs, assisting in procurement and signalling to industry requirements that must be met. Such standards can be developed collaboratively with government regulators, equipment manufacturers, and clinicians using existing international standards

(see Box 8) and the WHO *Assistive products specifications and how to use them (101)* as a guide, adapted to national contexts. Members States should ensure processes for certification of products against these standards are accessible, achievable and affordable.

Provision

- **Share best practice examples:** As Member States work to implement cost-effective wheelchair provision solutions, the identification and sharing of lessons learned from existing models of wheelchair services can help to inform national planning. These could be examples from different contexts, supported by evidence including research and/or best practice experience, made available through a central portal. WHO and other stakeholders can facilitate dissemination of solutions between countries.
- **Wheelchair service protocols:** The development of protocols and clinical practice guidelines that are tailored to the main groups of wheelchair users, can enhance decision-making and efficiency within health and other service systems. Such tools provide clear guidance to personnel across the health and other service systems on, for example, identification of need, when to refer, risk factors and special requirements for particular groups of people.
- **Prepare roles and resources across the provision network:** At an early stage of developing national wheelchair provision systems, Member States may benefit from further guidance on the role of personnel at different levels of the health and other systems, and the resources required for them to fulfil these roles.

Personnel

- **Competency framework for wheelchair provision roles:** Develop a model competency framework covering the different wheelchair service system roles required to ensure seamless wheelchair provision. Such a framework helps to: inform country-specific wheelchair provision workforce planning; support the development of training curricula and/or integration of wheelchair content into existing curricula; and facilitate recognition of training programmes and accreditation of individuals.

People

- Actively work with wheelchair service user groups to support their efforts in increasing awareness and demand for access to appropriate wheelchairs through services. This includes ensuring that wheelchair user representative groups are actively engaged in decision-making, and the provision of information and where requested training in the relevant issues.

4.3 Research gaps and priorities

Publication of the Guidelines on the provision of manual wheelchairs in less resourced settings in 2008 *(13)* prompted an exponential growth in research on wheelchair provision. 72% of the publications that met the criteria for inclusion in the systematic review commissioned for the current guidelines were published after 2008. However, despite this surge in research between 2008 and 2022, extensive gaps remain. Further research is needed for the sector to provide better data, including evidence of what works, which will enable increasingly specific and authoritative guidance to policy-makers and all other stakeholders, in support of their efforts towards increasing access to appropriate wheelchairs.

Table 4 highlights research gaps and opportunities that were identified as a priority during the preparation of these guidelines. Researchers and funding agencies who seek to address these gaps are strongly encouraged to target and prioritize outcomes identified as critical to forming the recommendations (see *Wheelchair provision guidelines web annex A: Summary of evidence*). These outcomes are used in an evidence–to–decision process for determining if the overall balance of health benefits or harms favours the intervention.

All of the research gaps and priorities identified in Table 4 need to be addressed in low- and high-resource contexts, urban and rural settings, and among diverse wheelchair users in relation to age, type of wheelchair used, degree of postural support required, degree of cognitive capacity or impairment, and any other factors that identify a unique sub-group of individuals at risk for inequitable outcomes in harms or benefits. The terms ‘benefit(s)’ and ‘harm(s)’ used in the gaps and priorities identified below refer to the harms and benefits identified as critical or important for each PICO question.

In conducting research, researchers and funding agencies are reminded to pay attention to the quality and rigor of research approaches. The quality of evidence found during the current systematic review was generally low to very low, resulting in ‘discordant’ recommendations where the recommendation strength is strong but the quality of evidence is low. For example, recommendations 1, 2 and 3 (aligning with service steps Select, Fit, and Train) and 5 (seamless services) are currently discordant due to the gap between practice-based evidence and science-based evidence.

> “When I was born, doctors told my parents I would never walk. They were right! And my life has been amazing. My wheelchair has allowed me to achieve everything I have wanted to.
>
> ***Shane Burcaw, United States of America***

Table 4. Research gaps and priorities

Filling gaps in service level research	
Service delivery steps	Among wheelchair users, those who assist them, service providers, and health systems: • Degree to which clinical implementation of the four steps (alone or in combination) achieve short- and long-term (>1 year) reduction in harms and gains in benefits. • Degree to which training wheelchair users and those who assist them in repair and maintenance reduce harms and improves benefits. • Determining follow up frequency and methods needed to reduce harm and improve benefits across diverse contexts and groups. • Development of guidelines and frameworks for reporting the outcomes of the four steps, alone or in combination, including, but not limited to: domains assessed; needs identified; wheelchair features that meet identified needs; products considered; product selected and rationale for selection. These guidelines will facilitate better scientific evaluation of the interventions.
Policy and funding	Among wheelchair users, those who assist them, service providers and health systems: the impact of policy and funding on the availability and provision of appropriate wheelchairs and on the availability, access and utilization of the four steps of service delivery.
Equity	Methods that reduce inequity in availability, access, and utilization of the four service steps and reduce inequity in harms and benefits.
Filling gaps in system level research	
Need and unmet need	Population level estimates of met and unmet need for wheelchairs, and population level estimates of availability, access and utilization of wheelchair services.
Identification and referral	Health system level interventions that improve the ability of all health care providers to identify need for a wheelchair among individuals who do not have a wheelchair or need for follow up among current wheelchair users and increase referral to and utilization of wheelchair services.
Timely service delivery	Determining what wheelchair users consider as 'timely' delivery of wheelchair services from referral through follow up, and how timeliness is related to harms and benefits. These definitions will provide performance benchmarks for Member States.
Cost	Comprehensive financial and economic evaluation of the four service level recommendations, including programme cost, cost of illness, cost-effectiveness and cost-benefit *(171)*.
Monitoring and evaluation	Examples and methods of monitoring, evaluation and performance improvement that reduce harms and improve benefits for wheelchair users, those who assist them, service providers and health systems. Financial and economic evaluation of these methods should be reported.

Workforce	Impact of role-specific competencies on harms and benefits to wheelchair users, those who assist them, service providers, and health systems for the roles of: • Identification and referral of people who use wheelchairs to a wheelchair service. • Assessment of wheelchair user's needs, identification of wheelchair features that meet user needs and selection from available products. • Wheelchair preparation including assembly, modification, and/or adjustment, followed by fitting. • Training wheelchair users and others, such as caregivers, in how to use, maintain and repair their wheelchair/s. • Follow up of wheelchair users. • Maintenance and/or repair of wheelchairs. • Management of wheelchair services. • Any other role identified as relevant in a given context or service delivery model. Development of a competency and outcomes framework that bridges education and employment for all wheelchair service roles to inform in-service and pre-service education programmes; provision of benchmarks for performance of people performing these roles; and guide needs for in-service skills development and capacity building *(85)*

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Annex 1: Contributors to the Guidelines

WHO Steering Group

A WHO Steering Group provided high-level oversight throughout the guidelines development process, and included members from WHO headquarters, six regional offices and two country offices.

Name	WHO Regional or Country Office	Focal area
Alarcos Cieza	Headquarters, Geneva	Disability and rehabilitation
Ameel Mohammad	Regional Office for South-East Asia	Disability and injury, including assistive technology and rehabilitation
Antony Duttine	Regional Office for the Americas	Disability and rehabilitation
Bianca Hemmingsen	Headquarters, Geneva	Noncommunicable diseases
Edith Andrews Annan	Regional Office for Africa	Medicines and health products
Emma Tebbutt*	Headquarters, Geneva	Assistive technology
Hala Sakr Ali	Regional Office for the Eastern Mediterranean	Injury and violence prevention, incl. assistive technology, disability and rehabilitation
Hyobum Jang	Headquarters, Geneva	Ageing
Kylie Shae*	Headquarters, Geneva	Assistive technology
Mohammed Bappirambharath	India Country Office	Disability and injury, including assistive technology and rehabilitation
Priscilla Nad	Papua New Guinea Country Office	Noncommunicable diseases
Tifenn Lucile Marie Humbert	Regional Office for Europe	Medicines and health products
Satish Mishra	Regional Office for Europe	Rehabilitation and assistive technology

**Responsible technical officers*

Guidelines Development Group

The Guidelines Development Group provided input into the scope of the Guideline; assisted in developing the key questions in PICO format; chose and rated outcomes that guided the evidence reviews and focused the recommendations; interpreted the evidence, with explicit consideration of the overall balance of benefit and harm; contributed to content development; and reviewed and approved the final guidelines. Membership included representation across age, gender, settings, as well as experience of accessing services, health and/or wheelchair service delivery and policy development.

Name	Affiliation	Region	Expertise
Almah Kuambu	National Orthotics and Prosthetics Service, Department of Health, Papua New Guinea	Western Pacific Region	Wheelchair service provider, manager, lived experience
Apinchapat Kongkerd	Sirindhorn National Medical Rehabilitation Institute, Thailand	South-East Asia Region	Wheelchair service provider, manager, trainer
Cheryl Ann Xavier	Independent, Philippines	Western Pacific Region	Technical, international development
David Constantine*	Independent, United Kingdom	European Region	Technical, international development, lived experience
Elsje Scheffler	Stellenbosch University, South Africa	African Region	Wheelchair service provider (adults and children), trainer, international development
Emma Smith	Maynooth University, Ireland	European Region	Wheelchair service provider, power wheelchairs, research
Jane Miano	Global Alliance for the Rights of Older Persons (GAROP), Kenya	African Region	Older persons, lived experience
Lamia Al Faleh	Sultan Bin Abdulaziz Humanitarian City, Saudi Arabia	Eastern Mediterranean Region	Rehabilitation and wheelchair service provider, neurological conditions, manager
Lisa Chaffey	Independent, Australia	Western Pacific Region	Wheelchair service provider, lived experience, sports

Name	Affiliation	Region	Expertise
Maria Toro Hernandez	Momentum Wheels for Humanity, Netherlands (Kingdom of the)	European Region	Technical, international development
Nancy Mbugua	Independent, Kenya	African Region	Wheelchair service provider, trainer
Sam Wu	Lewis Katz School of Medicine at Temple University, United States of America	Region of the Americas	Health, rehabilitation and wheelchair service provider, manager, lived experience, trainer
Satendra Singh	University College of Medical Sciences, India	South-East Asia Region	Health service provider, lived experience, human rights
Shivani Gupta	Independent, India	South-East Asia Region	Human rights, lived experience
Silvana Contepomi	Independent, Argentina	Region of the Americas	Wheelchair service provider, trainer
Vennila Palanivelu	Mobility India, India	South-East Asia Region	Wheelchair service provider, trainer, manager

**Chair*

External Review Group

The External Review Group provided review to identify any errors or missing data and to comment on clarity, context specific issues and implications for implementation. Members included people who may use or implement the guidelines, as well as people who may be impacted by them.

Name	Affiliation	Region	Expertise
Alex Manaila	Motivation Romania, Romania	European Region	Wheelchair service provider
Amah Adama	Ecole National des Auxilliaries Medicaux, Togo	African Region	Wheelchair service provider, trainer
Bärbel Rückriem	Swiss Children's Rehab, Childrens Hospital Zurich, Switzerland	European Region	Rehabilitation and wheelchair provider, paediatrics, paediatrics

Name	Affiliation	Region	Expertise
Dan Mills	American Physical Therapy Association World Physiotherapy, United States of America	Region of the Americas	Wheelchair service provider
Dietlind Gretschel	Independent, South Africa	African Region	Wheelchair service provider, trainer
Eric Wunderlich	The Church of Jesus Christ of Latter-day Saints, United States of America	Region of the Americas	International development, procurement, training coordination
Ferdiliza Dandah Garcia	Independent, Philippines	Western Pacific Region	Representative of wheelchair service providers
Heli de Oliveira Rodrigues	Cavenaghi Special Equipment, Brazil	Region of the Americas	Wheelchair service provider, trainer, researcher
Jamie Noon	Independent, United States of America	Region of the Americas	Service provider, trainer, product developer
Koly Kamrunnaher	Centre for the Rehabilitation of the Paralysed (CRP), Bangladesh	South-East Asia Region	Wheelchair service provider, spinal injury rehabilitation, trainer
Kristel Faye Roderos	Philippine Academy of Occupational Therapists, Philippines	Western Pacific Region	Wheelchair service provider, community-based rehabilitation
Laura Cohen	World Confederation of Physical Therapy; Rehabilitation & Technology Consultants, LLC, United States of America	Region of the Americas	Policy, standards implementation, technology transfer/ commercialization, wheelchair service provider, clinical research
Lori Rosenberg	The Hebrew University of Jerusalem, Israel	Eastern Mediterranean Region	Wheelchair service provider, trainer
Marie Barhouche Abou Saab	SESOBEL, Lebanon	Eastern Mediterranean Region	Wheelchair service provider, trainer
Mary Goldberg	University of Pittsburg, United States of America	Region of the Americas	Researcher

Name	Affiliation	Region	Expertise
Nicky Seymour	Independent, South Africa	African Region	International development, Wheelchair service provider, trainer
Paula Rushton	Dalhousie University, Canada	Region of the Americas	Wheelchair service provider, Researcher, trainer
Peter Mbuguah	Motivation Charitable Trust, Kenya	African Region	Wheelchair service provider, manager
R. Lee Kirby	Dalhousie University, Canada	Region of the Americas	Wheelchair service provider, trainer, mobility skills, researcher
Rachel Brown	Enable New Zealand Limited, New Zealand	Western Pacific Region	Wheelchair service provider, community services, outreach
Rory Cooper	University of Pittsburgh and US Department of Veterans Affairs, United States of America	Region of the Americas	Product designer, researcher, lived experience
Rosemary (Rosie) Joan Gowran	Discipline Occupational Therapy School of Allied Health, University of Limerick, Ireland	European Region	Sustainable Wheelchair Provision Educator, Researcher, Policy Development Consultant
Rusudan Lortkipanidze	Center of Child Neurology and Neurorehabilitation, Georgia	European Region	Wheelchair service provider, trainer
Sara Munera	International Society of Wheelchair Professionals, Colombia	Region of the Americas	Wheelchair service provider, trainer
Sheila Buck	TherapyNOW, Canada	Region of the Americas	Wheelchair service provider
Shona Mcdonald	Shonaquip Social Enterprise, South Africa	African Region	Wheelchair service provider, pediatric product design and production, trainer, community services, standards, lived experiences.

Name	Affiliation	Region	Expertise
Simonetta Rossi	Independent, Italy	European Region	Wheelchair service provider, neurological rehabilitation, trainer
Takenobu Inoue	National Rehabilitation Center for Persons with Disabilities, Japan	Western Pacific Region	Product standards
Tamara Lee Kittelson	Posture 24–7, Peru/United States of America	Region of the Americas	Wheelchair service provider, manager, paediatrics
Tone Oderud	SINTEF, Norway	European Region	Researcher
Yeti Raj Niraula	Humanity & Inclusion, Nepal	South-East Asia Region	Wheelchair service provider, trainer
Yohali Burrola-Mendez	University of Montreal, Canada CHU Sainte-Justine Research Center, Canada	Region of the Americas	Researcher, Wheelchair service provider, trainer

Systematic review team

A systematic review team was commissioned to inform the Guidelines. The team was selected through WHO's regular procurement processes, ensuring the necessary expertise in the use of GRADE to conduct evidence assessments and no financial conflicts of interests.

Names	Affiliation
Steve Milanese, Janine Dizon, Brad Stenner, Kobie Boshoff, Narasimman Swaminathan	iCAHE Review Team, International Centre for Allied Health Evidence, University of South Australia, Australia

External partners and observers

The following non-governmental organizations and professional associations with a role in wheelchair provision and related activities attended remote briefings and an in person technical meeting of the GDG, during the development process.

Name	Affiliation
Alexander Kamadu	International Society of Wheelchair Professionals
Barbara Goede	ATScale, Global Partnership on AT

Name	Affiliation
Claude Tardif	International Society for Prosthetics and Orthotics
Claudia von Zweck	World Federation of Occupational Therapists
David Rusaw	International Society for Prosthetics and Orthotics
Dennis Soendergaard	UNICEF
Edward Winter	World Vision
Emily Wootton	ATScale
Francois Friedel	International Committee of the Red Cross
Friedbert Kohler	International Society for Prosthetics and Orthotics
Firoz Alizada	Anti-personnel Mine Ban Convention
Jamie Danemayer	Global Disability Innovation Hub
Jon Pearlman	University of Pittsburgh, International Society of Wheelchair Professionals
Ritchard Ledgerd	World Federation of Occupational Therapists
Steven Williams	Kyaninga Child Development Centre
Tracy Bury	World Physiotherapy
Vanessa Mendoza	Free Wheelchair Mission

Annex 2: Managing declarations of interest and conflicts of interest

WHO Compliance, Risk Management and Ethics (CRE) policy was followed to ensure effective management of conflicts of interest. Members of the GDG, ERG, external partners and observers, authors and methodologist were asked to complete the WHO Declaration of Interests (DOI) form as part of their engagement with the Guidelines process. These forms were individually reviewed by the WHO Secretariat. The WHO DOI form requires individuals to declare interests related to the guideline topic in the area of employment, consultation, research, investment, intellectual property, public statements or other. As the work drew on many individuals with knowledge and expertise in the sector, a number declared interests, which have been shared in the table below. In each instance, the nature of these interests were assessed by the WHO Secretariat to identify whether they represented a conflict of interest that would be considered to affect, or be perceived to affect, the individual's judgement when assessing evidence or formulating recommendations. There was no instance where a declaration of interest was considered to represent a conflict of interest that would either preclude the person from participating, or other management.

Name	Declaration of interest
David Constantine	Held an office representing interests or defending a position related to the subject of the meeting
Emma Smith	Carried out consultancies and received research funding in areas related to the subject of the meeting
Lamia Al Faleh	Has provided expert opinion, manages rehabilitation service including wheelchair provision
Silvana Contepomi	Has provided consultancy and advisory services to other organizations involved in wheelchair provision
Mary Goldberg	Employed, engaged in related research
Jon Pearlman	Employed, engaged in related research, co-inventor of wheelchairs, patents owned by employer (University).
Bärbel Rückriem	Engaged in wheelchair provision.
Eric Wunderlich	Is employed by a charity working in wheelchair provision and provides consultancy services.

Name	Declaration of interest
Ferdiliza Dandah Garcia	Has provided independent consultancy services to organisations training in wheelchair provision. Has acted as a representative of wheelchair provision stakeholder groups in a leadership and advocacy role.
Jamie Noon	Has provided consultancy services to a range of organizations on wheelchair provision and training.
Koly Kamrunnaher	Has provided research support to academic institutions
Laura Cohen	Has been employed, and consulted for national bodies and undertaken research as recipient of a grant
Lori Rosenberg	Member of representative body as a trainer. Has received grants as part of doctoral research. Is employed at a academic institution.
Mary Goldberg	Is employed at an academic institution and provides research support to a major funder in wheelchair development. Sits on Boards in the wheelchair sector.
Nicky Seymour	Is employed in an organisation that supports wheelchair provision
Paula Ruston	Has received research grants from major funders in wheelchair research and leads wheelchair education activities
Rory Cooper	Has applied for patents for wheelchairs
Rosemary Joan Gowran	Is a consultant and advisor for other projects related to wheelchair provision internationally
Sara Munera	Is employed at a company working in assistive product education and is a consultant and advisor
Sheila Buck	Works as an educator with various wheelchair organizations
Shona McDonald	Runs a social enterprise that provides wheelchairs
Yohali Burrola	Has received funding for research and employment with a leading wheelchair agency

Name	Declaration of interest
External partners and observers	
David Rusaw	Research support, participation (in technical meeting) funded by an entity other than WHO
Jon Pearlman	Research support, patents and speaker honorariums
Authors	
Rachel Cowan	Has provided consultancy and advisory services in the area of research and academia with relation to wheelchair services. Has received recent grants for academic institution.
Sarah Sheldon	Has provided consultancy and advisory services with relation to wheelchair provision.

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