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To cite this article: Mary Goldberg, Paula Rushton, R. Lee Kirby, Sara Muñera, Krithika Kandavel, Jonathan Pearlman & Amira Tawashy (2022): Wheelchair service provision content in professional rehabilitation organisations' standards documents and contemporary initiatives: a rapid review, *Disability and Rehabilitation: Assistive Technology*, DOI: [10.1080/17483107.2022.2063421](https://doi.org/10.1080/17483107.2022.2063421)

To link to this article: <https://doi.org/10.1080/17483107.2022.2063421>



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Published online: 21 Apr 2022.



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# Wheelchair service provision content in professional rehabilitation organisations' standards documents and contemporary initiatives: a rapid review

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## ABSTRACT

**Purpose:** We sought to identify opportunities, challenges, contemporary initiatives and strategies for preparing entry-level practitioners who are competent at the basic level of wheelchair service provision across four key international professional rehabilitation organisations as revealed by their educational standards, relevant guidelines and policy statements, and other publicly available information.

**Method:** A rapid review was conducted in 2021 from the International Society of Physical and Rehabilitation Medicine (ISPRM), the International Society for Prosthetics and Orthotics (ISPO), World Physiotherapy, and the World Federation of Occupational Therapists (WFOT). Additional grey-literature and grey-data searches were conducted to identify contemporary initiatives that may support competency development in wheelchair service provision.

**Results:** A total of 17 standards, guidelines, and policy statement documents were selected for detailed review. Each of the four organisations published at least one document containing language relating to wheelchair service provision. Twelve contemporary initiatives relating to wheelchair service provision were identified from the grey literature across the four organisations. Six additional initiatives were identified from the organisations' social media accounts. Themes emerged in the areas of contemporary content, opportunities, and challenges.

**Conclusion:** Global standardisation could help harmonise professional societies' approach to training wheelchair service providers.

## ARTICLE HISTORY

Received 13 September 2021

Revised 7 February 2022

Accepted 2 April 2022

## KEYWORDS

Wheelchair; wheelchair service provision; education standards; training; service standards; professional rehabilitation organisations; assistive technology; rehabilitation

## ► IMPLICATIONS FOR REHABILITATION

- There is a need to provide more descriptive content on wheelchair service provision in education and service standards and related documents to influence what is taught in professional rehabilitation programs that are accredited or approved by professional rehabilitation organisations.
- The organisations' networks are vast and may also help to promote additional continuing education in this area.

## Background

Disability is pervasive worldwide, increasing, and more prevalent among vulnerable populations, including those who live in poverty [1]. The number of persons who require mobility devices is also increasing [2]. Regrettably, only 5–15% of the approximate 100 million people who are in need, have access to an appropriate wheelchair [3]. This unmet need compromises an individual's independence, community and environmental engagement, health, safety, quality of life, vocational and educational status [3,4]. This challenge is widespread from high- to low-resourced settings, but more so in the latter [5,6].

However, there is significant international momentum to increase the availability of assistive technology products and services, including wheelchairs. For example, the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), which over 80 countries have signed, calls for maximised

community participation among people with disabilities, which entitles them to proper mobility [7]. Similarly, the UN Flagship Report on Disability and Development recommends increasing awareness among and training persons with disabilities and their families, government officials, and service providers on assistive technology [1]. In 2018, the 71st World Health Assembly (WHA) affirmed that access to assistive technology and associated services are human rights [8]. Additionally, the WHA recognised that the inclusion of assistive technology in universal health coverage is essential for achieving the Sustainable Development Goals and "leaving no one behind" [8,9]. Resolution WHA71.8 urged Member States to ensure adequate personnel for assistive technology provision at all healthcare levels [8]. Additionally, USAID's ATScale: A Global Partnership for Assistive Technology project, aims to help 500 million people get the AT they need by 2030 through service delivery and market-shaping approaches [10].

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Inadequate training of healthcare professionals who provide wheelchairs has been specifically identified as an important factor to address [11–13]. The need to build a competent workforce for provision of assistive technology is embedded within the World Health Organisation (WHO)'s Global Cooperation on Assistive Technology (GATE) [14] and it represents a priority theme in the Global Priority Research Agenda [15] and WHO Package of Rehabilitation Interventions [16]. Despite the identification of this need and the acknowledgement of its importance, the current global workforce does not have the capacity to adequately address the population's wheelchair provision needs.

### **Training challenges**

Although the problem is multi-faceted, capacity-building efforts in wheelchair service provision are still limited and significantly impact appropriate wheelchair service provision around the world [17]. Providing appropriate training is aligned with the World Health Organisation Guidelines for Wheelchair Service Provision in Less-Resourced Settings [3] (WHO Guidelines) and evidence-based resources such as wheelchair service training packages by the WHO [18] and others [19–22]. Evidence in support of the WHO 8-step process for wheelchair service delivery is accumulating [23–27].

A multidisciplinary team of stakeholders such as occupational and physical therapists, physical medicine and rehabilitation doctors, prosthetists and orthotists, and users are required for appropriate wheelchair service provision [3] and may vary across contexts [28]. Despite progress by the WHO and non-governmental organisations (NGOs), likely too few people are trained or have access to training through informal (e.g., offered by NGOs) and formal (e.g., professional rehabilitation programs at service centres and universities) training programs. A recent study [12] demonstrated that across occupational therapy, physical therapy, and prosthetics and orthotics programs, as few as 2 h of wheelchair-service-provision training were offered, with the majority of programs reporting far fewer than the 40 h recommended by WHO at the basic level of provision alone [18].

A variety of challenges that contribute to the limited wheelchair education offered in university programs were described in another recent study [13]. Principal barriers included time constraints, limited human resources from the rehabilitation program to teach the content (e.g., limited expertise, lack of training for instructors), limited physical resources (e.g., wheelchairs, space for teaching and storage, teaching materials) and difficulty with the integration process (e.g., limited faculty awareness and interest in enhancing wheelchair provision education, resistance to program changes). Limited funding is related to all barriers. Continuing education offers more opportunities for training, but again, may be limited across less-resourced settings [29]. The need for a systematic approach to training is shared globally, as evidenced by its inclusion as an important topic of discussion at the first Global Research, Innovation and Education on Assistive Technology (GREAT) Summit [6,30,31] and wheelchair sector goals and priority action items developed at the 2018 Wheelchair Stakeholders Meeting [32].

### **Open-source wheelchair service provision resources are available**

There are opportunities for increasing training in both informal and formal programs. For example, hybrid (part online, part in-person) training can reduce the number of hours required for in-

person delivery, and produce comparable results (e.g., increase in knowledge, high satisfaction levels) across lower-middle income settings as demonstrated by recent trainings in multiple languages facilitated by the International Society of Wheelchair Professionals (ISWP) [21,33]. Kirby and colleagues [19], through the Wheelchair Skills Training Program, have established evidence suggesting the amount and quality of training provided related to wheelchair skills to be impactful on service providers' competency [34–39]. A recent massive open online course (MOOC) produced by Physiopedia was found to be similarly attractive in providing foundational wheelchair service provision knowledge to a large number of trainees [22] but, as typical with MOOCs, it is unclear how many people completed the course in its entirety. The Seating and Mobility Academic Resource Toolkit (SMART) includes open-source content in four languages for instructors to use in their professional rehabilitation curricula. SMART is searchable by discipline, activity type, service provision step, language, and other relevant criteria [40]. Corresponding assessments like the ISWP Basic Wheelchair Service Provision Test establish a baseline for existing or post-training knowledge and is available in 14 languages [41]. In addition to the aforementioned guidelines and training packages, WHO has also developed training in priority assistive products (TAP), a comprehensive package that provides and supports localised training for primary healthcare and other community-level workers and includes wheelchairs [42]. In pilot testing, TAP learners were engaged, acquired practical skills, and suggested they could provide better care for their service users [42].

### **Rationale for review of standards**

This review was motivated by a meeting held alongside the 2017 Rehabilitation 2030: A Call for Action [43] event held at WHO Headquarters in Geneva, Switzerland with delegates from the International Society of Wheelchair Professionals (ISWP), the International Society of Physical and Rehabilitation Medicine (ISPRM), the International Society for Prosthetics and Orthotics (ISPO), World Physiotherapy, and the World Federation of Occupational Therapists (WFOT).

The professionals represented by these organisations, as well as other health workers, are fundamental to ensure appropriate and equitable access to health services, to achieve universal health coverage [44] and to achieve the health-related Sustainable Development Goals [9] for the general population and particularly for people with disabilities and wheelchair users.

This review describes the background, opportunities and challenges, contemporary initiatives, and strategies in international professional rehabilitation organisations for preparing entry-level occupational therapists, physical medicine and rehabilitation doctors, physical therapists, and prosthetists and orthotists who are competent at the basic level of wheelchair service provision.

### **Methods**

A rapid review method was selected as they are increasingly being used and influential in health policy and systems [45]. Such reviews are responsive, timely, sufficiently rigorous, reproducible, and credible. This topic is urgently needed because of the critical health workforce shortage experienced by multiple countries and the projected shortfall of 18 million health workers by 2030, mostly in low- and lower-middle income countries [46]. Additionally, there is a pressing need to improve the knowledge on wheelchair service provision on occupational [47], and physical

therapists [48], physical medicine and rehabilitation doctors, prosthetists and orthotists, and other rehabilitation professionals since there is often insufficient content present in the required curricula [12,13]. There is new evidence describing the negative consequences for wheelchair users due to the lack of service providers' knowledge [49].

Following rapid-review methodology, we conducted the following steps from March-May 2021: (1) needs assessment, topic selection, and topic refinement; (2) protocol development; (3) literature search; (4) screening and study selection; (5) data extraction; (6) risk-of-bias assessment; and (7) knowledge synthesis. In the first needs-assessment step, we conducted a preliminary literature search to help inform conversations among the author group to scope the review. Four international professional rehabilitation organisations were selected for review based upon identification of the primary professions (occupational therapy, physical therapy, prosthetics and orthotics, physical medicine and rehabilitation) responsible for wheelchair service provision around the world, and for their participation on the Rehabilitation 2030: A Call for Action event [43].

The primary researcher developed the protocol (step 2). The primary research questions were "What is said about wheelchair service provision in professional rehabilitation organizations' standards documents?" and "What contemporary initiatives exist related to wheelchair service provision in professional rehabilitation organizations?". Each professional rehabilitation organisation's website search engine was selected to identify the organisation's standards and guidelines for education and/or practice. Keywords included *education standards; curricula; practice standards; service standards; professional guidelines; and scope of practice*. For the contemporary initiatives search, in addition to the internal organisational search engines, a Google search was selected to identify "grey data," describing any contemporary initiatives related to wheelchair service provision or assistive technology within each organisation. We used the following keywords in the organisational search engines: *wheelchair; mobility (aid, device); assistive (device, product, technology, technologies); adaptive (device, product, technology, technologies), and service (provision, training)*. In Google, we conducted an individual search with each organisational name plus these keywords.

In May 2021, two researchers, each with more than 10 years of experience in wheelchair training and/or service, independently completed the searches (step 3). In the screening process (step 4) and in the case where multiple versions were identified for a document with the same title, the most recent version was selected. In the data extraction process (step 5), a "find" search (ctrl + f) was used within each document to identify any content relating to wheelchair service provision or assistive technology, using the same keywords as described above: *wheelchair; mobility (aid, device); assistive (device, product, technology, technologies); adaptive (device, product, technology, technologies), and service (provision, training)*. The same step was conducted for the grey literature on each of the organisational sites and Google.

We also conducted a "grey data" search, which extends the concept of grey literature to a wider range of sources, including social media [50]. This required an additional task to first identify the official social media channels across 4 platforms for each organisation: Instagram, Facebook, YouTube, and Twitter. For this process, one of the authors developed a matrix that contained the platform, relevant organisational handle, and each post containing one of the keywords.

To assess for bias (step 6), the same two researchers conferred upon the extracted text from documents and social media posts

based on the initial keyword searches through two rounds of review until agreement was reached. The same researchers manually mined the text independently to identify passages relating to continuing education and professional development expectations, and education and practice alignment to international standards and guidelines. The rationale for this additional search was that the WHO Guidelines is an international standard, designed to be profession-neutral, and can be used as a basis for capacity building in continuing education. Although the WHO Guidelines were originally developed with less-resourced settings in mind, they and the training packages subsequently developed from them have been used in several high-resourced settings for capacity building in both formal and informal settings across a variety of professions [12,13,38]. Posts that met the criteria (relating to continuing ed, professional development, and our key words) but that were not current initiatives managed by the organisation were not included in the review. The goal of this search was to answer the research question "What contemporary initiatives exist related to wheelchair service provision in professional rehabilitation organizations?". Therefore, if the post related to something occurring outside of their organisation, it was not included in the analysis.

## Results

Figure 1 provides the PRISMA flowchart of this rapid review [51]. A total of 17 standards, guidelines, or position statement documents were included across the four organisations. The grey-literature search revealed 12 contemporary wheelchair service provision initiatives across the organisations. Through the grey-data search, a total of 6 contemporary initiatives that were not previously documented were identified across the four organisations. In the next sections, we describe wheelchair- service-provision content in the standards, guidelines, position statements, grey literature and grey data.

### Standards, guidelines, and position statements

ISPO, ISPRM, World Physiotherapy, and WFOT offer forms of both educational standards and professional guidelines that are typically updated every 5–10 years, the most recent versions of which range from 2011 to 2021. The educational standards and guidelines across each of the organisations already support a form of appropriate service provision training and include content related to assistive technology. In some cases, wheelchairs are mentioned specifically (e.g., ISPO Standards, WCPT Educational Standards, ISPRM Recommended Curricula), but lack specificity to or implementation of the full wheelchair-service-provision process, including but not limited to the recognised number of steps. The following describes a sampling of content in existing standards from each of the professional rehabilitation organisations that broadly include wheelchair-service-provision training (see Appendix 1 for a full listing of documents and related content):

*ISPO Education Standards for Prosthetic/Orthotic Occupations (2018) [52], ISPO Educational Standards Handbook (2018) [53], ISPO Standards for Prosthetics and Orthotics: Part 1 Standards (2017) [54], and ISPO Standards for Prosthetics and Orthotics: Part 2 Implementation Manual (2017) [55]*: These standards encompass treatment planning and implementation of assistive products, including mobility aids. Additionally, they include recommendations for core theory and practice training on positioning/mobility devices and provision of such products. The standards emphasize that services should be provided by trained professionals, in conjunction with a multidisciplinary team, and aligned with national and international standards.

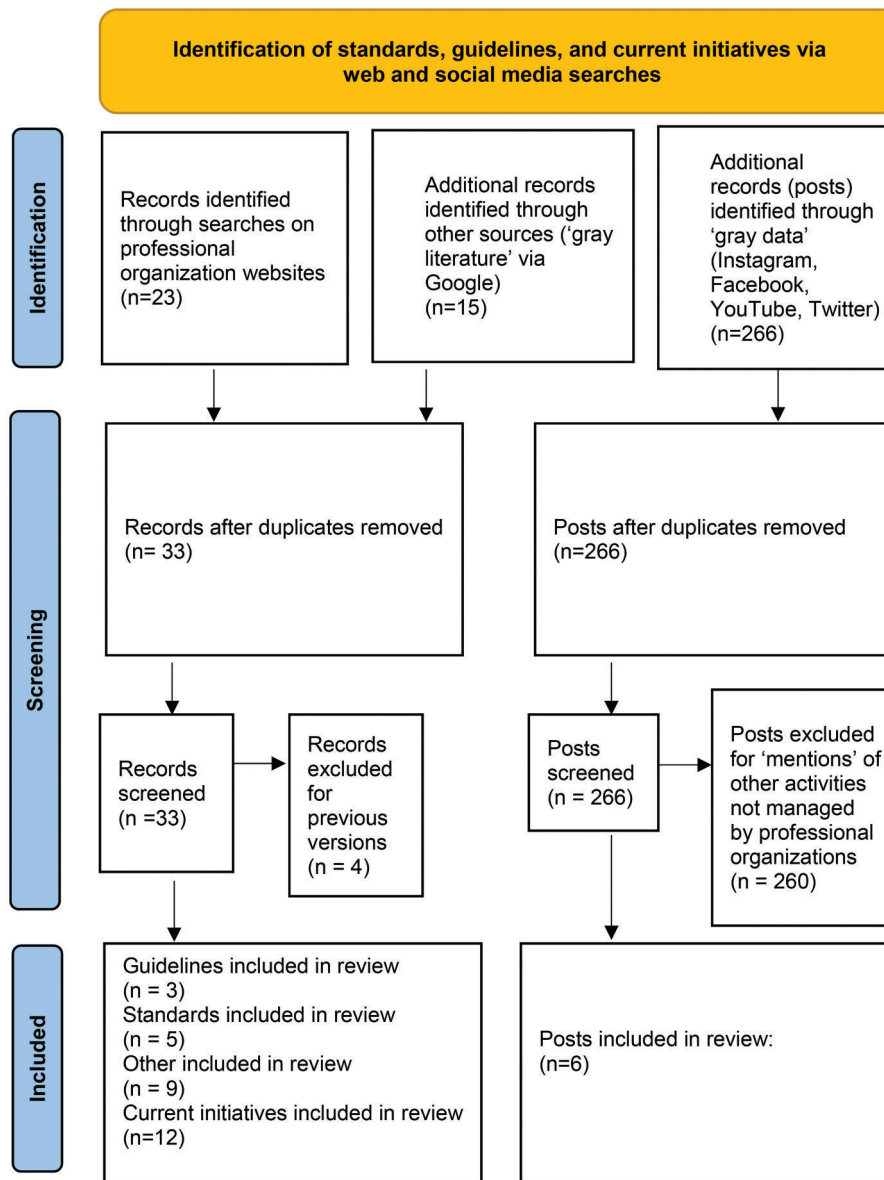


Figure 1. PRISMA flow diagram.

*ISPRM Curricula for Undergraduate Education in Physical and Rehabilitation Medicine (2012)* [56], and *ISPRM Core Curriculum & Competencies for the Professional Practice of Physical and Rehabilitation Medicine (2017)* [57]: Both the undergraduate and postgraduate curricula include assistive technology interventions as a part of rehabilitation management. The postgraduate curricula include skills specifically related to the prescription of wheelchairs.

*World Physiotherapy Physiotherapist Education Framework (2021)* [58], and *Guideline for Physical Therapist Professional Entry Level Education* [59]: Both documents reference applications of assistive or adaptive devices. The Guideline references wheelchairs specifically in a few instances: “therapeutic exercise interventions that may involve wheelchair propulsion programs”, “gait and locomotor training that may involve wheelchair training”, and the “prescription and application of devices and equipment that may include wheelchairs”. Other relevant documents found on World Physiotherapy website search were: *Policy Statement: Description of physical therapy*, *Guideline: Qualifications of faculty for physical therapist professional entry level education programmes (2011)* [60], *Guideline: Standard evaluation process for accreditation/recognition of physical therapist professional entry level education programmes (2011)* [61], *Policy Statement: Education (2019)* [62]. Although the Policy Statement for Description of physical therapy mentions “... prescription, application, and, as appropriate, fabrication

of devices and equipment (assistive, adaptive, orthotic, protective, supportive and prosthetic)”, the Policy Statement for Education does not include any of our designated keywords.

*WFOT Minimum Standards for Education of Occupational Therapists (2016)* [63]: These standards emphasize that occupational therapy graduates are expected to have essential knowledge, skills, and attitudes for competent practice in several domains, including the person-occupation-environment relationships. The specific content to be included in occupational therapy curricula is dependent upon local health needs. Under the person-occupation-environment domain, in the occupation section, it is specified that graduates must have skills in ‘analyzing, adapting and grading occupation in the area of assistive-technology scope and usage’. Other documents found on the WFOT website were: *Position Statement: Occupational Therapy and Assistive Technology (2019)* [64], *Position Statement: Educational Research in Occupational Therapy (2021)* [65], and *Occupational Therapy Human Resources (2021)* [66]. The first explicitly suggests “that assistive technology provision is a core competency within occupational therapy practice for optimizing the fit between a person’s abilities and desire to engage in occupations”. Despite the fact that the latter two documents did not mention any of the key words, the authors recognized the “rapidly changing landscape of occupational therapy demands that we [WFOT] reflect on existing and new educational practices, participate in

knowledge generation and exchange, and design educational programs and professional development resources" and that "a concerted international effort is required to advance educational research in response to opportunities and challenges facing occupational therapy education globally", including technological innovations. The position statements also state that "with ageing populations and the increasing prevalence of non-communicable health conditions, the need for occupational therapy services is growing. Meeting population health needs and reducing the growing burden of chronic conditions and disabilities are prioritised as global concerns by the World Health Organization. Action is needed to ensure access to occupational therapy that enables engagement in occupations to promote health and well-being" and recognize the need for "workforce policies, planning, and research activities (...) to reduce disparities and improve access to occupational therapy (...) to address the diversity, availability and distribution of occupational therapists and ensure compliance with education and competency standards to fulfil professional role obligations" that involve wheelchair service provision based on the population needs.

### Grey-literature and grey-data sources

The grey literature search revealed 12 contemporary wheelchair-service-provision initiatives since 2006 across the organisations. Significant mentions and novel findings identified included the WHO Joint Position Paper on the Provision of Mobility Devices in Less Resourced Settings [17] that was developed in consultation with ISPO, WFOT, and World Physiotherapy, the WHO GATE Consensus Conference to identify priority assistive technologies [67] and the subsequent WHO Global Report on AT Consultation [68] with the same organisations contributing. Each of the individual organisation's contemporary initiatives are described in the following paragraphs.

ISPO was part of the Report of a Consensus Conference on Wheelchairs for Developing Countries in 2006 [69], which led to the development of the Guidelines on Provision of Wheelchairs in less resourced settings [3], and to resources related to wheelchair service provision on their website [70]. This led to a commitment to continued promotion of wheelchair service provision through the "ISPOWER" campaign in 2016 to support ISPO's mission to raise awareness and increase access to Prosthetics & Orthotics and assistive health technologies for people with disabilities. The campaign promotes the development of awareness raising events with different orthotic devices including wheelchairs [71]. Additionally, ISPO developed the Wheelchair Advisory Group (WAG) in 2017 with the aim to "guide ISPO in the promotion of access to appropriate wheelchair services worldwide" [72], is currently involved in the development of wheelchair standards with USAID [73], and has worked with Cochrane and ISPRM to foster collaboration in the field of assistive technology, including mobility devices [74].

Each of the other three professional rehabilitation organisations revealed at least one initiative related to wheelchair service provision. ISPRM has content related to wheelchair service provision in their conferences [75]. *World Physiotherapy* engaged in a project to "Strengthen the physiotherapy associations, use the standards set by World Physiotherapy, develop a paper on physiotherapy assistants' role, and augment wheelchair training" in Mali, Niger, and Senegal in 2016 [76]. WFOT has worked with ISWP and WHO in wheelchair related projects [77], and also has content regarding wheelchair service provision on their conferences [78].

The grey-data search across social media platforms revealed that each of the professional rehabilitation organisations posted content related to wheelchair service provision on Facebook and Twitter. ISPRM, WFOT, and World Physiotherapy also posted on Instagram and YouTube. Table 1 shows the number of posts

Table 1. Shows the number of posts related to wheelchair service provision by each organisation since the initiation of that particular social media account.

	Facebook	Twitter	Instagram	YouTube
ISPO	52	26	NA	NA
ISPRM	26	12	8	6
WFOT	21	24	3	5
World Physiotherapy	21	23	8	31

related to wheelchair service provision by each organisation since the initiation of that particular social media account. The list of all the posts can be found on ISWP's website [79].

From these posts, we identified six that contained the organisations' contemporary initiatives not identified in the grey-literature search: (1) *ISPO India held a 2 day continuing education program on wheelchair management for spinal cord injury patient*; (2) *The #ISPOWER campaign was launched in 2015 with key partners in five countries to raise policymakers' awareness of the importance of Prosthetics and Orthotic in Assistive Health Technology services to empower people with impaired mobility*; (3) *ISPO GPEx, a forum discussing common challenges in the field of rehabilitation and assistive technology*; (4) *Global indicators of assistive technology use amongst occupational therapists- Report of WFOT's Global Surveys – Poster (Link) and Report (Link)*; (5) *WFOT Development Paper – Results from the Assistive Technology Surveys 2017 (Link)*; and (6) *Statement that presents WFOT's position on Occupational Therapy and Assistive Technology (Link)*.

The majority of posts were mentions of content already identified in the grey literature, event highlights (e.g., conference sessions), notifications of relevant research, or re-posts from other organisations.

### Discussion

This review is relevant to educators, monitoring and regulatory bodies, practitioners, researchers, students, administrators, health and education authorities, government policy makers, and wheelchair users. This review affirms the notion that occupational therapists, physical medicine and rehabilitation doctors, physical therapists, and prosthetists and orthotists who provide wheelchair service provision must possess the required knowledge and skills, in accordance with the WHO Guidelines [3]. This statement is reaffirmed by the organisations' documents which include recommendations for training on positioning/mobility devices and provision (ISPO); curricula to include assistive technology (ISPRM) and therapeutic exercise interventions (*World Physiotherapy*); skills in analysing, adapting and grading occupation in the area of assistive technology (WFOT); and the recognition of the increasing number of people with disabilities and the importance of fulfilling their rehabilitation needs (WFOT).

Training should be available within the curricula of accredited education programs (i.e., a process to validate a training program against education standards as in the case of ISPO) or approved (i.e., a process to provide assurance that the program adheres to education standards as in the case of the WFOT) by international professional rehabilitation organisations to graduate entry-level practitioners that are competent in this area of practice.

The standards, although varied in their content and specificity, provide opportunities to enhance wheelchair-service-provision education, but also present challenges to full integration in their current form. Each professional organisation also describes contemporary initiatives to support wheelchair service provision capacity building. These opportunities, challenges, and contemporary

initiatives are described below according to both the education standards themselves, and the alignment of curricula with education standards.

### **Education standards**

#### **Opportunity**

International education standards for ISPO, ISPRM, WFOT, and World Physiotherapy offer the opportunity to recommend or stipulate that wheelchair education is offered within approved or accredited university programs globally. The reach is wide given that WFOT approves 1042 programs and ISPO accredits 33 programs resulting in over 30,000 trained rehabilitation professionals per year from low- to high-resourced settings. Further, the 383 member organisations and societies, and national societies of this collective group have the potential to influence a large geographic distribution worldwide. Across the 4 societies, there are over 850,000 providers represented [80–83].

#### **Challenges**

The scope of practice of each profession and the need to be relevant to all contexts, challenges the level of wheelchair-specific detail that may be included in these standards. To date, wheelchair provision is integrated into the ISPO Education Standards for Prosthetic/Orthotic Occupations [52], ISPRM Core Curriculum & Competencies for the Professional Practice of Physical and Rehabilitation Medicine [57] and World Physiotherapy Physiotherapist education framework [58] but is not referenced specifically in the Minimum Standards for the Education of Occupational Therapists [63]. All standards and guidelines lack specificity to the WHO Guidelines which has been identified as a critical factor impacting users' community participation [24,25,27]. Several considerations – such as already overcrowded curricula, disparate awareness of the Guidelines, specialised wheelchair knowledge, competing capacity-building priorities and time lapses between standards reviews – may contribute to this void [13]. Additionally, the WHO Guidelines were developed in 2008 and are thus overdue for revision.

#### **Contemporary initiatives**

WHO, ISPO, and ISWP are in the process of developing Wheelchair Service Standards, sponsored by USAID [13]. The effort was launched on the 2020 International Day of Persons with Disabilities and was cited as being potentially instrumental in advancing the quality of services that wheelchair users receive around the world. The Wheelchair Service Standards are scheduled to be published by WHO in 2022 [84]. They will include the latest evidence on service provision, in addition to guidance on policy and products. These Standards should be useful as a benchmark for what should be taught in education programs and may influence future education-standards revisions.

#### **Recommendations**

Educational standards updates are understandably onerous for international organisations as it is a challenge to keep up with advances in evidence. Other challenges include difficulties in achieving consensus and costly translations. Nevertheless, an educator delivering an annual course is expected to keep content current by monitoring the literature and engaging in professional development. The Wheelchair Skills Program provides an example of how educational materials can remain “living” and are under continuous evolution. Its website provides its users with instantaneous “dynamic links” (<https://wheelchairskillsprogram.ca/en/>

) to customised searches regarding the assessment and training of wheelchair skills. The ISWP training modules [85] and upcoming Wheelchair Educators Package will also be living resources.

International organisations may assist by developing and maintaining a process of continuous improvement. For example, addition of more explicit and specific wheelchair-service-provision content to education standards as core knowledge and skills, may help to promote adequate education that would ideally ensure competency across the professions. Example text that could be added to education standards might be: *Knowledge and skills related to the appropriate wheelchair service provision including but not limited to the referral, assessment, prescription, funding and ordering, product preparation, fitting and adjusting, user training, and maintenance, follow-up, and repair of the device.* (Adapted from the World Health Organisation Guidelines for Wheelchair Service Provision in Less-Resourced Settings [3]). The Wheelchair Service Standards, once published, may include updated language and evidence to be incorporated into education standards.

Evaluation of competency is a key component to ensure that there is an adequate workforce of healthcare professionals who provide wheelchair services. In addition to graduating from a university healthcare professional program in occupational therapy, physical medicine and rehabilitation, physical therapy, prosthetics/orthotics, a wheelchair-provision-specific evaluation is available that may provide added value. Specifically, ISWP has developed and is currently updating a Basic Wheelchair Service Provision Test [41] that is available in 14 languages. Indeed, this measure may also be used to advocate for improved wheelchair education within university curricula [47,48]. Additionally, ISWP has also developed a Basic Wheelchair Service Provider certification that may serve to advance capacity building beyond the training offered within university curricula and an additional globally-accepted standard [86]. ISPO, ISPRM, World Physiotherapy and WFOT could share the test and certification in their newsletter.

### **Alignment of curricula with education standards**

#### **Opportunity**

Healthcare professional education programs are ideally situated to provide training to those students who may provide wheelchair services as part of their clinical practice. The accumulating evidence [11] of and support [32] for the need to build capacity among healthcare professionals who provide wheelchair services provide leverage to modify education standards and healthcare professional programs to meet this need.

#### **Challenges**

Current education provided within university curricula for these healthcare professionals varies considerably in terms of the hours of training dedicated specifically to wheelchair-service-provision training (i.e., as low as 2h), the coverage of the WHO 8-step wheelchair-service-provision process and the manner in which the competency level is evaluated [12]. This variability leaves many entry-level clinicians inadequately prepared to practice in this domain. Barriers for adding or modifying wheelchair-specific content into existing curricula are numerous and include: time constraints, limited human resources with the expertise to teach the content, limited physical resources (e.g., wheelchairs, space for teaching and storing equipment, teaching materials) and difficulty with the integration process (e.g., limited faculty awareness and interest in enhancing wheelchair-provision education, resistance to change) [13].

**Contemporary initiatives**

ISPRM, ISPO, WFOT, World Physiotherapy, and ISWP are advancing or planning to advance university program curricula and other training programs worldwide through various strategies as described below. ISPO and ISWP have specific groups or committees dedicated to improving wheelchair education at the university level and beyond, including the Wheelchair Advisory Group (ISPO) [72], the Integration Sub-Committee (ISWP) [87], and Professional Standards Board (ISWP) [88]. ISPO’s WAG conducted an international survey among prosthetics and orthotics training institutions to collect data regarding knowledge of the WHO WSTPs, integration of wheelchair content (WHO materials or others) into curricula and plans to integration wheelchair content into curricula. ISWP has collected quantitative cross-sectional data using a survey [12] regarding the current state of wheelchair education across occupational therapy, physical therapy and prosthetics and orthotics and qualitative data using interviews to develop a more comprehensive understanding of the integration of wheelchair content into these healthcare professional programs [13]. These data will be used to inform ongoing wheelchair education efforts. WFOT lists ISWP and WHO as partners on their website that support their work on wheelchair service provision. Even though World Physiotherapy does not have a specific subgroup working on wheelchair education, some of their congresses include wheelchair-service-provision topics.

The development of a model that suggests that barriers to integration can vary by context (Fung, 2020), Perpetuating and

Attenuating Factors (Figure 2; green bars include factors that are addressed by SMART [40]) and Stages of Wheelchair Integration (Table 2) into university curricula and training programs by the ISWP’s Integration Sub-Committee can provide uniform terminology and guidance for enhancing wheelchair content.

ISWP is expanding SMART to a Wheelchair Educators’ Package through a participatory-action-research approach with more than 30 volunteers worldwide [40]. The Wheelchair Educators’ Package will be released in 2022 and include resources for advocating for more wheelchair training in the curriculum, planning and teaching, and evaluating. A scoping-review protocol has been published to outline the plan for review and synthesis of the global literature on wheelchair-service-provision education for healthcare professional students, healthcare personnel and educators offered by universities, organisations, and industry [89]. This scoping review, that is nearing completion, will provide immediate guidance to advocate to different organisations on the importance of integrating wheelchair content into universities and regional training center’s curricula, to improve evidence-based content and effective methods for training students on wheelchair service provision, and to evaluate a program including its clinical impact and sustainability.

**Recommendations**

Supplementing university curricula with additional wheelchair services training materials may serve to increase the competency of healthcare professionals who provide wheelchair services.

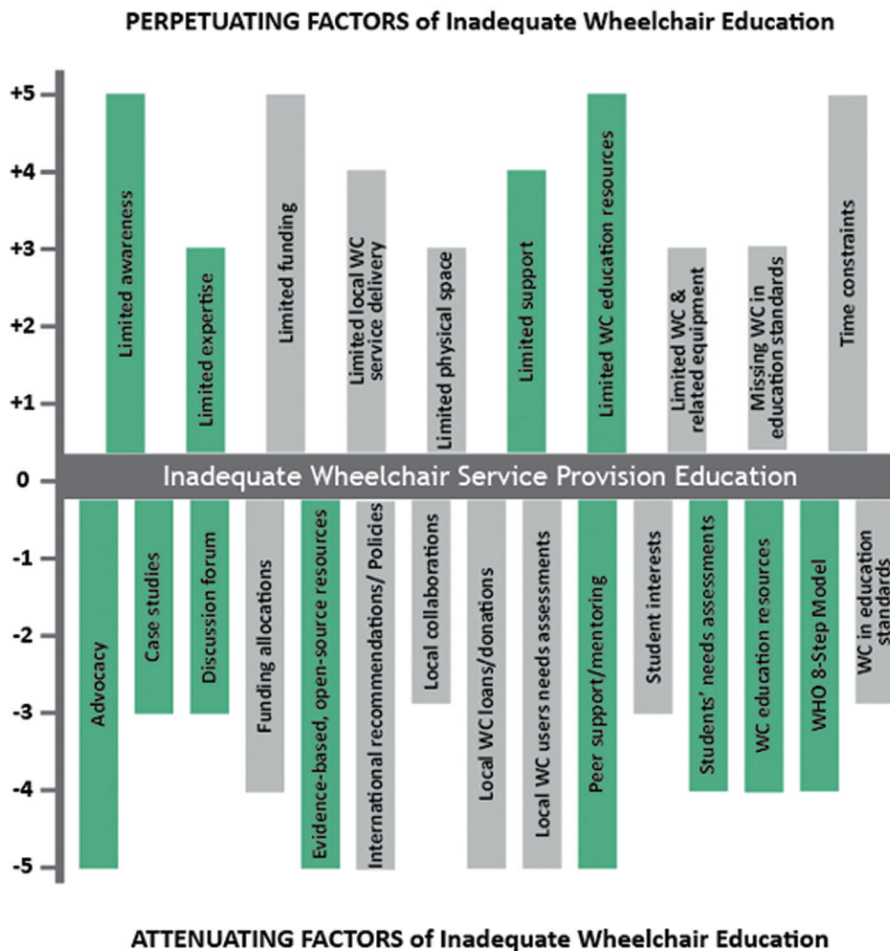


Figure 2. Perpetuating and attenuating factors related to inadequate wheelchair education.



Table 2. States of wheelchair integration into University Curricula.

State of integration	Description
Advocacy	Raising awareness of the need for wheelchair service provision education into the professional rehabilitation curricula for approval of wheelchair-specific course
Planning	Identifying resources and strategies to manage requirements and constraints in the integration process
Course development and delivery	Assembling components of the wheelchair-specific course based on the plan, ensuring the context-specificity of course content and delivery for approval of wheelchair-specific course
First-time implementation	Offering the newly integrated wheelchair service provision course as planned to the students. Evaluating (1) the students' academic performance, (2) the efficacy of the course's pedagogic approaches and (3) course evaluations whether by the students in a formal process or by the collaborators and the instructors giving informal feedback.
Improvement	Improvement of the wheelchair service provision course based on to the feedback and to the student performance

Recent and existing initiatives include a newly updated ISWP Hybrid Course (part online, part in-person) [21], WHO WSTP Train the Trainer [90] courses, a Wheelchair MOOC produced by Physiopedia [22], Wheelchair Maintenance Training Program [91], Wheelchair Skills Program [19] and Wheelchair Skills Train the Trainer Courses [92]. Additional opportunities (beyond those offered at regular conferences) may be created by ISPRM, ISPO (e.g., Short Course Programs), World Physiotherapy, and WFOT. These packages and programs are being or may be promoted through the organisational communication channels already described *via* feature articles and/or banner advertisements. Organisations may also choose to use logos to endorse quality education materials.

Additionally, online forums may provide a useful venue for discussion and information exchange regarding wheelchair education. Several existing forums may be used for this purpose, including ISPO Community Platform, ISPRM Groups & Forums, World Physiotherapy DOVE, WFOT's Occupational Therapy International Online Network (OTION) and ISWP's Wheelchair International Network.

### Limitations

The rapid-review method was used to ensure that the most relevant documents were included and that the interpretation of the findings was valid. However, as there is no universally accepted definition of a "rapid-review," the search may not be as comprehensive and rigorous as other review types. In this case, some relevant documents may have been missed and misinterpretations may have occurred. The use of a defined methodology and two reviewers who are content matter experts may assist in addressing this and limiting biases. In addition to the professional organisations' websites and social media platforms, only one search engine (Google) was used and each search was only conducted in English. Also, because the authors are not members of all the professional rehabilitation organisations, some content may also be in a members-only section of the site and not publicly available.

### Conclusion

This paper serves as a review of standards, guidelines, and policy-statement documents relating to wheelchair service provision from ISPRM, ISPO, WFOT, and World Physiotherapy as well as identifying contemporary initiatives. This review should influence updates to educational standards and enhanced university curricula, but also encourage multiple training pathways, such as providing or directing to training resources for continued professional development. Likewise, this paper serves as a call to action to the general rehabilitation community to support existing initiatives and new strategies such as the development of

Wheelchair Service Standards and a Wheelchair Educators' Package which may provide useful language and resources to support updated standards content and development of new initiatives in professional rehabilitation organisations. The collective efforts of ISPO, ISPRM, World Physiotherapy, WFOT, and ISWP, in conjunction with the rehabilitation community at large, has the potential to significantly impact the quality and quantity of healthcare professional capacity building efforts related to wheelchair service provision worldwide in order to provide appropriate wheelchairs for those in need to fulfil all human rights.

### Disclosure statement

No potential conflict of interest was reported by the author(s).

### Funding

This work was supported by the United States Agency for International Development [AID-OAA-A-17-00002, AID-OAA-A-12-00047, APC-GM -0068 and APC-GM-0107].

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### References

- [1] UN Flagship Report on Disability and Development. United Nations New York; 2018.
- [2] Gell NM, Wallace RB, LaCroix AZ, et al. Mobility device use in older adults and incidence of falls and worry about falling: findings from the 2011–2012 national health and aging trends study. *J Am Geriatr Soc.* 2015;63(5):853–859.
- [3] World Health Organization (WHO). Guidelines on the provision of manual wheelchairs in less resourced settings. Geneva (Switzerland): World Health Organization; 2008.
- [4] Smith EM, Sakakibara BM, Miller WC. A review of factors influencing participation in social and community activities for wheelchair users. *Disabil Rehabil Assist Technol.* 2016; 11(5):361–374.
- [5] Matter R, Harniss M, Oderud T, et al. Assistive technology in resource-limited environments: a scoping review. *Disabil Rehabil Assist Technol.* 2017;12(2):105–114.
- [6] de Witte L, Steel E, Gupta S, et al. Assistive technology provision: towards an international framework for assuring availability and accessibility of affordable high-quality assistive technology. *Disabil Rehabil Assist Technol.* 2018; 13(5):467–472.

- [7] Convention on the Rights of Persons with Disabilities (CRPD) | United Nations Enable; 2008. Available from: <https://www.un.org/development/desa/disabilities/convention-on-the-rights-of-persons-with-disabilities.html>.
- [8] World Health Organization. Improving access to assistive technology in Agenda item 12.5. 3. Geneva (Switzerland): World Health Organization; 2018.
- [9] United Nations. 2016. Sustainable development goals report. New York.
- [10] ATScale Homepage 2022. Available from: <https://atscale2030.org>.
- [11] McSweeney E, Gowran RJ. Wheelchair service provision education and training in low and lower Middle income countries: a scoping review. *Disabil Rehabil Assist Technol*. 2019;14(1):33–45.
- [12] Fung KH, Rushton PW, Gartz R, et al. Wheelchair service provision education in academia. *Afr J Disabil*. 2017;6:340.
- [13] Fung K, Miller T, Rushton PW, et al. Integration of wheelchair service provision education: current situation, facilitators and barriers for academic rehabilitation programs worldwide. *Disabil Rehabil Assist Technol*. 2020;15(5):553–562.
- [14] WHO GATE. World Health Organization Global Cooperation on Assistive Technology (GATE); 2021. Available from: [https://www.who.int/news-room/feature-stories/detail/global-cooperation-on-assistive-technology-.\(gate\)](https://www.who.int/news-room/feature-stories/detail/global-cooperation-on-assistive-technology-.(gate)).
- [15] World Health Organization. Global priority research agenda for improving access to high-quality affordable assistive technology. Geneva (Switzerland): World Health Organization; 2017. Available from: <https://apps.who.int/iris/handle/10665/254660>. License: CC BY-NC-SA 3.0 IGO.
- [16] WHO Package of Rehabilitation Interventions Information Sheet. 2021. Available from: <https://www.who.int/rehabilitation/Package-of-rehab-interventions-info-sheet.pdf>.
- [17] Joint Position Paper on the Provision of Mobility Devices in Less-resourced Settings: a Step Towards Implementation of the Convention on the Rights of Persons with Disabilities (CRPD) Related to Personal Mobility. Geneva (Switzerland): World Health Organization; 2011.
- [18] World Health Organization. Wheelchair service training package basic. 2012. Available from: <https://www.who.int/publications/i/item/9789241503471>.
- [19] Kirby RL, Rushton PW, Smith C, et al. The wheelchair skills program manual. Halifax (Canada): Published electronically at Dalhousie University; 2019. [www.wheelchairskillsprogram.ca/eng/manual.php](http://www.wheelchairskillsprogram.ca/eng/manual.php).
- [20] Toro ML, Bird E, Oyster M, et al. Development of a wheelchair maintenance training programme and questionnaire for clinicians and wheelchair users. *Disabil Rehabil Assist Technol*. 2017;12(8):843–851.
- [21] Burrola-Mendez Y, Goldberg M, Gartz R, et al. Development of a hybrid course on wheelchair service provision for clinicians in international contexts. *PLoS One*. 2018;13(6):e0199251.
- [22] Wheelchair Service Provision Course. Physiopedia. Available from: [https://www.physio-pedia.com/Wheelchair\\_Service\\_Provision\\_Course](https://www.physio-pedia.com/Wheelchair_Service_Provision_Course).
- [23] Kirby RL, Doucette SP. Relationships between wheelchair services received and wheelchair user outcomes in less-resourced settings: a cross-sectional survey in Kenya and the Philippines. *Arch Phys Med Rehabil*. 2019;100(9):1648–1654.e9.
- [24] Borg J, Larsson S, Östergren PO, et al. User involvement in service delivery predicts outcomes of assistive technology use: a cross-sectional study in Bangladesh. *BMC Health Serv Res*. 2012;12(1):330.
- [25] Toro ML, Eke C, Pearlman J. The impact of the World Health Organization 8-steps in wheelchair service provision in wheelchair users in a less resourced setting: a cohort study in Indonesia. *BMC Health Serv Res*. 2015;16(1):26.
- [26] Visagie S, Mlambo T, van der Veen J, et al. Impact of structured wheelchair services on satisfaction and function of wheelchair users in Zimbabwe. *Afr J Disabil*. 2016;5(1):222.
- [27] Shore S. The long-term impact of wheelchair delivery on the lives of people with disabilities in three countries of the world. *Afr J Disabil*. 2017;6:344.
- [28] Greer N, Brasure M, Wilt TJ. Wheelchair mobility (wheelchair) service delivery: scope of the evidence. *Ann Intern Med*. 2012;156(2):141–146.
- [29] Geissbuhler A, Bagayoko CO, Ly O. The RAFT network: 5 years of distance continuing medical education and teleconsultations over the internet in French-speaking Africa. *Int J Med Inform*. 2007;76(5–6):351–356.
- [30] Scherer MJ, MacLachlan M, Khasnabis C. Introduction to the special issue on the first Global Research, Innovation, and Education on Assistive Technology (GREAT) Summit and invitation to contribute to and continue the discussions. *Disabil Rehabil Assist Technol*. 2018;13(5):435–436.
- [31] Smith EM, Gowran RJ, Mannan H, et al. Enabling appropriate personnel skill-mix for progressive realization of equitable access to assistive technology. *Disabil Rehabil Assist Technol*. 2018;13(5):445–453.
- [32] World Learning. Wheelchair stakeholders' meeting: meeting report. 2018. <https://wheelchairnetwork.org/wp-content/uploads/2019/08/01a-WL-Wheelchair-Two-Pager-FINAL.pdf>.
- [33] Burrola-Mendez Y, Toro-Hernández ML, Goldberg M, et al. Implementation of the hybrid course on basic wheelchair service provision for Colombian wheelchair service providers. *PLoS ONE*. 2018;13(10):e0204769.
- [34] Best KL, Routhier F, Miller WC. A description of manual wheelchair skills training: current practices in Canadian rehabilitation centers. *Disabil Rehabil Assist Technol*. 2015;10(5):393–400.
- [35] Kirby RL, Crawford KA, Smith C, et al. A wheelchair workshop for medical students improves knowledge and skills. *Am J Phys Med Rehabil*. 2011;90(3):197–206.
- [36] Coolen AL, Kirby RL, Landry J, et al. Wheelchair skills training program for clinicians: a randomized controlled trial with occupational therapy students. *Arch Phys Med Rehabil*. 2004;85(7):1160–1167.
- [37] Giesbrecht EM, Wilson N, Schneider A, et al. Preliminary evidence to support a “boot camp” approach to wheelchair skills training for clinicians. *Arch Phys Med Rehabil*. 2015;96(6):1158–1161.
- [38] Rushton PW, Daoust G. Wheelchair skills training for occupational therapy students: comparison of university-course versus “boot-camp” approaches. *Disabil Rehabil Assist Technol*. 2019;14(6):595–601.
- [39] Keeler L, Kirby RL, Parker K, et al. Effectiveness of the Wheelchair Skills Training Program: a systematic review and meta-analysis. *Disabil Rehabil Assist Technol*. 2019;14(4):391–409.
- [40] Goldberg M, Rushton P. Launch of the Seating and Mobility Academic Resource Toolkit (SMART). Proceedings

- of the World Federation of Occupational Therapy World Congress 2018; Cape Town, South Africa; May 2018.
- [41] Gartz R, Goldberg M, Miles A, et al. Development of a contextually appropriate, reliable and valid basic Wheelchair Service Provision Test. *Disabil Rehabil Assist Technol.* 2017; 12(4):333–340.
- [42] World Health Organization 2018. Training in priority assistive products: report from the first pilot. Available from: [https://www.who.int/docs/default-source/assistive-technology-2/tap/tap1stpilot-report-accessible.pdf?sfvrsn=fc4ecd4\\_2](https://www.who.int/docs/default-source/assistive-technology-2/tap/tap1stpilot-report-accessible.pdf?sfvrsn=fc4ecd4_2).
- [43] World Health Organization 2017. Rehabilitation 2030: a call for action. Available from: [https://www.who.int/disabilities/care/Rehab2030MeetingReport\\_plain\\_text\\_version.pdf](https://www.who.int/disabilities/care/Rehab2030MeetingReport_plain_text_version.pdf).
- [44] Al-Shorbaji N, Atun R, Car J, et al. 2015. eLearning for undergraduate health professional education: a systematic review informing a radical transformation of health workforce development. Available from: <https://www.who.int/hrh/documents/14126-eLearningReport.pdf>.
- [45] Tricco AC, Langlois EV, Straus SE, editors. Rapid reviews to strengthen health policy and systems: a practical guide. Geneva: World Health Organization; 2017. Licence: CC BY-NC-SA 3.0 IGO. <http://apps.who.int/iris/bitstream/handle/10665/258698/9789241512763-eng.pdf;jsessionid=73EA5D18A7502CC7A3F2B4C8D02D2C4B?sequence=1>.
- [46] World Health Organization. 2021. Health workforce. Available from: [https://www.who.int/health-topics/health-workforce#tab=tab\\_1](https://www.who.int/health-topics/health-workforce#tab=tab_1).
- [47] Toro-Hernández ML, Alvarez L, Vargas-Chaparro MC, et al. Final year students' knowledge on basic manual wheelchair provision: the state of occupational therapy programs in Colombia. *Occup Ther Int.* 2020;2020:3025456.
- [48] Toro-Hernández ML, Mondragón-Barrera MA, Torres-Narváez MR, et al. Undergraduate physiotherapy students' basic wheelchair provision knowledge: a pilot study in two universities in Colombia. *Disabil Rehabil Assist Technol.* 2020;15(3):336–341.
- [49] Ott J, Henderson T, Wilson-Jene H, et al. A high prevalence of manual wheelchair rear-wheel misalignment could be leading to increased risk of repetitive strain injuries. *Disabil Rehabil Assist Technol.* 2021.
- [50] Adams J, Hillier-Brown FC, Moore HJ, et al. Searching and synthesising 'grey literature' and 'grey information' in public health: critical reflections on three case studies. *Syst Rev.* 2016;5(1):1–11.
- [51] Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ.* 2021:n71.
- [52] International Society of Prosthetics and Orthotics. ISPO education standards for prosthetic/orthotic occupations. 2018. Available from: [https://cdn.ymaws.com/www.ispoint.org/resource/resmgr/3\\_learn/ispo\\_standards\\_nov2018\\_sprea.pdf](https://cdn.ymaws.com/www.ispoint.org/resource/resmgr/3_learn/ispo_standards_nov2018_sprea.pdf).
- [53] International Society of Prosthetics and Orthotics. ISPO education standards handbook. 2018. Available from: [https://cdn.ymaws.com/www.ispoint.org/resource/resmgr/3\\_learn/accreditation/ispo-handbook\\_2018\\_09\\_18\\_spr.pdf](https://cdn.ymaws.com/www.ispoint.org/resource/resmgr/3_learn/accreditation/ispo-handbook_2018_09_18_spr.pdf).
- [54] International Society of Prosthetics and Orthotics. Standards for prosthetics and orthotics. 2017. Available from: <http://apps.who.int/iris/bitstream/handle/10665/259209/9789241512480-part1-eng.pdf?sequence=1>.
- [55] International Society of Prosthetics and Orthotics. Standards for prosthetics and orthotics. Part 2: implementation manual. 2017. Available from: <http://apps.who.int/iris/bitstream/handle/10665/259209/9789241512480-part2-eng.pdf?sequence=2>.
- [56] International Society of Physical and Rehabilitation Medicine. Curricula for undergraduate education in physical and rehabilitation medicine. 2012. Available from: [https://www.isprm.org/wp-content/uploads/2012/09/UNDERGRADUATE\\_Curriculum.pdf](https://www.isprm.org/wp-content/uploads/2012/09/UNDERGRADUATE_Curriculum.pdf).
- [57] International Society of Physical and Rehabilitation Medicine. Core curriculum & competencies for the professional practice of physical and rehabilitation medicine. 2017. Available from: [https://www.isprm.org/wp-content/uploads/2019/06/DRAFT-PRM-Core-curriculum-Competency-Final-28.06\\_.pdf](https://www.isprm.org/wp-content/uploads/2019/06/DRAFT-PRM-Core-curriculum-Competency-Final-28.06_.pdf).
- [58] World Physiotherapy. Physiotherapist education framework. 2021. Available from: <https://world.physio/sites/default/files/2021-07/Physiotherapist-education-framework-FINAL.pdf>.
- [59] World Physiotherapy. Guideline for physical therapist professional entry level education. 2011. Available from: <https://world.physio/sites/default/files/2020-07/G-2011-Entry-level-education.pdf>.
- [60] World Physiotherapy. Qualifications of faculty for physical therapist professional entry level education programmes. 2011. Available from: <https://world.physio/sites/default/files/2020-07/G-2011-Faculty-qualifications.pdf>.
- [61] World Physiotherapy. Standard evaluation process for accreditation/recognition of physical therapist professional entry level education programmes. 2011. Available from: <https://world.physio/sites/default/files/2020-07/G-2011-Faculty-qualifications.pdf>.
- [62] World Physiotherapy. Policy statement: education. 2019. Available from: <https://world.physio/policy/ps-education>.
- [63] World Federation of Occupational Therapy. WFOT minimum standards for education of occupational therapists. 2016. Available from: <https://www.wfot.org/resources/new-minimum-standards-for-the-education-of-occupational-therapists-2016-e-copy>.
- [64] World Federation of Occupational Therapy. Policy statement: occupational therapy and assistive technology. 2019. Available from: <https://www.wfot.org/resources/occupational-therapy-and-assistive-technology>.
- [65] World Federation of Occupational Therapy. Position statement. Educational research in occupational therapy. 2021. Available from: <https://wfot.org/resources/educational-research-in-occupational-therapy>.
- [66] World Federation of Occupational Therapy. Occupational therapy human resources. 2021. Available from: <https://wfot.org/resources/occupational-therapy-human-resources-project-2020-alphabetical>.
- [67] Khasnabis C, Mirza Z, MacLachlan M. Opening the GATE to inclusion for people with disabilities. *Lancet.* 2015; 386(10010):2229–2230.
- [68] World Health Organization. Global report on AT consultation. 2019. Available from: <https://www.who.int/news-room/events/detail/2019/08/22/default-calendar/great-consultation-2019>.
- [69] Sheldon S. Report of a consensus conference on wheelchairs for developing countries. 2006. Available from: [https://www.who.int/disabilities/technology/Wheelchair%20Consensus%20Conference%20Report\\_Jan08.pdf?ua=1](https://www.who.int/disabilities/technology/Wheelchair%20Consensus%20Conference%20Report_Jan08.pdf?ua=1).
- [70] International Society of Prosthetics and Orthotics. Useful resources. 2021. Available from: <https://www.ispoint.org/page/UsefulResources>.

- [71] International Society of Prosthetics and Orthotics. ISPOWER. 2016. Available from: <https://www.ispoint.org/page/ISPOWER>.
- [72] International Society of Prosthetics and Orthotics. Wheelchair Advisory Group. 2017. Available from: <https://www.ispoint.org/news/372123/Launch-of-ISPO-Wheelchair-Advisory-Group.htm>.
- [73] International Society of Prosthetics and Orthotics. Development of wheelchair standards. 2020. Available from: <https://www.ispoint.org/news/523880/Development-of-Wheelchair-Standards--Negotiations-with-USAID.htm>.
- [74] International Society of Prosthetics and Orthotics. ISPO and ISPRM Collaboration. 2019. Available from: <https://www.ispoint.org/news/460451/ISPO-fosters-its-collaboration-with-ISPRM-and-Cochrane-Rehabilitation.htm>.
- [75] International Society of Physical and Rehabilitation Medicine. Poster session. 2020. Available from: <https://www.eventscribe.com/2020/ISPRM/fsPopup.asp?efp=RUUpFWIBSWEI5NTY0&PosterID=259652&rnd=0.8512402&mode=posterinfo>.
- [76] World Physiotherapy. SUDA project. 2016. Available from: <https://world.physio/what-we-do/projects/suda>.
- [77] World Federation of Occupational Therapy. WFOT Partners. 2021. Available from: <https://wfot.org/about/partners>.
- [78] World Federation of Occupational Therapy. WFOT Congress. 2018. Available from: <https://congress2018.wfot.org/exhibitor-workshops.php>.
- [79] International Society of Wheelchair Professionals. Social media search for professional rehabilitation organizations. 2021. Available from: <https://wheelchairnetwork.org/wp-content/uploads/2021/07/Social-Media-Search.pdf>.
- [80] World Federation of Occupational Therapy. WFOT official countries representing practitioners internationally. 2021. Available from: [https://www.aota.org/Practice/Manage/Intl/WFOT.aspx#:~:text=The%20World%20Federation%20of%20Occupational%20Therapists%20\(WFOT\)%20is%20the%20official,countries%20representing%20350%2C000%20practitioners%20internationally](https://www.aota.org/Practice/Manage/Intl/WFOT.aspx#:~:text=The%20World%20Federation%20of%20Occupational%20Therapists%20(WFOT)%20is%20the%20official,countries%20representing%20350%2C000%20practitioners%20internationally).
- [81] World Physiotherapy. Global report. 2019. Available from: <http://www.aefi.net/Portals/1/WCPT/2019-GlobalReport.pdf>.
- [82] International Society of Physical and Rehabilitation Medicine. National societies. 2021. Available from: <https://ispo372224799.wordpress.com/ispo-international/#:~:text=ISPO%20presently%20has%20approximately%203000,Societies%20established%20in%2051%20countries>.
- [83] International Society of Prosthetics and Orthotics. ISPO International. 2021. Available from: <https://ispo372224799.wordpress.com/ispo-international/#:~:text=ISPO%20presently%20has%20approximately%203000,Societies%20established%20in%2051%20countries>.
- [84] World Health Organization. WHO global launch: WHO service standards. 2021. Available from: [https://who.zoom.us/rec/play/-k7sNnbhPMNinPIGHBPweemleyc3-gfuryzqvhYZxrV8iNayJg6rqj0f0-9pwpKcolyEzJc5W70LO8q.mhS87AVlrRLWslYW?continueMode=true&\\_x\\_zm\\_rtaid=JiBOI4-HSbe950N\\_qxWFhg.1614783002138.16365ea5f86c0756db749ecef23c3223&\\_x\\_zm\\_rhtaid=141](https://who.zoom.us/rec/play/-k7sNnbhPMNinPIGHBPweemleyc3-gfuryzqvhYZxrV8iNayJg6rqj0f0-9pwpKcolyEzJc5W70LO8q.mhS87AVlrRLWslYW?continueMode=true&_x_zm_rtaid=JiBOI4-HSbe950N_qxWFhg.1614783002138.16365ea5f86c0756db749ecef23c3223&_x_zm_rhtaid=141).
- [85] Goldberg M, Pearlman J, Rushton P, et al. The International Society of Wheelchair Professionals (ISWP): a resource aiming to improve wheelchair services worldwide. *British Journal of Occupational Therapy*. 2018;81(12):671–672.
- [86] Goldberg M. 2018. Accreditation and certification for the wheelchair sector. USAID Wheelchair Stakeholders' Meeting. Bangalore, India.
- [87] International Society of Wheelchair Professionals. About Integration Sub-Committee. 2021. <http://smart.wheelchair-network.org/about/integration-subcommittee/>.
- [88] International Society of Wheelchair Professionals. About Professional Standards Board. 2021. <https://wheelchairnetwork.org/professional-standards-board/>.
- [89] Kamalakannan S, Rushton PW, Giesbrecht E, et al. Wheelchair service provision education for healthcare professional students, healthcare personnel and educators across low- to high-resourced settings: a scoping review protocol. *Disabil Rehabil Assist Technol*. 2020;1–7.
- [90] Munera S, Goldberg M, Kandavel K, et al. Development and evaluation of a wheelchair service provision training of trainers programme. *Afr J Disabil*. 2017;6(1):1–13.
- [91] Pearlman J, Munera S. We describe the development and validation of an online wheelchair maintenance training program (WMTP) for clinicians that is freely available for use. *Ann Phys Rehabil Med*. 2018;61:e236–e237.
- [92] Worobey LA, Kirby RL, Cowan RE, et al. Efficacy of a remote train-the-trainer model for wheelchair skills training administered by clinicians: a cohort study with pre- vs. post-training comparisons. *Arch Phys Med Rehabil*. 2021;103(4):798–806.

## Appendix 1

Document (year published)	Section and/or page #	Extracted text
ISPO Education Standards for Prosthetic/Orthotic Occupations (2018)	-p 12	-In addition to treatment planning and the implementation for custom prosthetic/orthotic interventions, professionals may also be responsible for modular or prefabricated devices, soft goods, mobility aids, postural supports, wheelchairs and other assistive products related to prosthetic/orthotic services.
	-p 38	-Core Prosthetic/Orthotic Theory and Practice ... IV. Positioning/mobility devices; i. Seating systems; ii. Wheelchairs; iii. Standing frames
ISPO Standards for Prosthetics and Orthotics: Part 1 Standards (2017)	-p 17	-Prosthetics and orthotics services (including wheelchairs) should be provided by competent, adequately trained professionals. -Complicated prosthetics and orthotics treatment and care of complex cases should be provided by a multidisciplinary team of professionals with complementary skills.
	-p 18	-Training in prosthetics and orthotics should be aligned with national and international educational standards.
	-p 19	-Training in prosthetics and orthotics should be available at various levels to fully meet national needs. -Healthcare professionals, especially rehabilitation professionals, who provide treatment relevant to prosthetics and orthotics services should have adequate knowledge about prosthetics and orthotics. -Continuing professional development should be compulsory in prosthetics and orthotics professional practice.
	-p 50	-Prosthetics and orthotics courses should also provide fundamental knowledge of ... provision of other mobility assistive products, such as wheelchairs and crutches, which are often prescribed with prostheses and orthoses
ISPO Standards for Prosthetics and Orthotics: Part 2 Implementation Manual (2017)	N/A	None identified
Educational Standards Workbook (2018)	N/A	None identified
ISPO Education standards for P&O Occupations (2018)	-p 22	-Prosthetic/orthotic occupations are a spectrum of specialised health care disciplines that combines a unique blend of clinical and technical competencies to provide assistive products for people with physical impairments. In addition to treatment planning and the implementation for custom prosthetic/orthotic interventions, professionals may also be responsible for modular or prefabricated devices, soft goods, mobility aids, postural supports, wheelchairs and other assistive products related to prosthetic/orthotic services. It is therefore imperative that an appropriate occupational structure is established and maintained to ensure that service recipients receive care from qualified professionals
	-p 10	-Goals and objectives for long term programs (the Hannover model): longer formal exposure to Physical Medicine and Rehabilitation (at least 2 weeks) ... C. Interventions ... k. Assistive technology, technical supports and aids (e.g., mobility aids, communication aids)
ISPRM Curricula for Undergraduate Education in Physical and Rehabilitation Medicine (2012)	-p 2	-Rehabilitation prescription writing 1 (exercise, orthotics, prosthetics, wheelchairs, assistive devices for ambulation, and other durable medical equipment or assistive devices)
	-p 3	-Interventions: ... Assistive technology/augmentative communication
ISPRM Core Curriculum & Competencies for the Professional Practice of Physical and Rehabilitation Medicine (2019)	-p 16	prescription, application, and, as appropriate, fabrication of devices and equipment (assistive, adaptive, orthotic, protective, supportive, and prosthetic)
	-p 53	assistive technologies and adaptive devices - devices and equipment, components, remediation of impairments, functional limitation, disabilities, safety
	-p 53	ergonomics and body mechanics - dexterity and coordination during work, functional capacity during work, safety during work, specifics of work conditions, work tools, devices, equipment, body mechanics during self-care, home management, work, community and leisure (with and without assistive, adaptive, orthotic, prosthetic, protective, and supportive devices and equipment)
	-p 8	-Tests and measures may include, but are not limited to, those that assess ... assistive technology and adaptive devices; orthotic, protective and assistive technologies, including Activities to Daily Living (ADL)
World Physiotherapy Physiotherapist education framework (2021)	-p 22	-Assistive technologies and adaptive devices may include assessment of: devices and equipment, components, remediation of impairments, functional limitation, disabilities, safety
	-p 23	-Ergonomics and body mechanics may include assessment of ... body mechanics during self-care, home management, work, community and leisure (with and without assistive, adaptive, orthotic, prosthetic, protective and supportive devices and equipment)
	-p 25	-Therapeutic exercise may include: aerobic capacity/endurance ... wheelchair propulsion programmes -Gait and locomotion training ... wheelchair training
	-p 27	-Device and equipment use and training ... assistive technologies and adaptive devices or equipment training during activities of daily living (ADL) and instrumental activities of daily living (IADL)
	-p 29	-Prescription, application and, as appropriate, fabrication of devices and equipment may include: ... assistive devices ... wheelchairs
	-p 8	-Tests and measures may include, but are not limited to, those that assess ... assistive technology and adaptive devices; orthotic, protective and assistive technologies, including Activities to Daily Living (ADL)
	-p 22	-Assistive technologies and adaptive devices may include assessment of: devices and equipment, components, remediation of impairments, functional limitation, disabilities, safety
World Physiotherapy Physical therapist entry level education guideline (2011)	-p 23	-Ergonomics and body mechanics may include assessment of ... body mechanics during self-care, home management, work, community and leisure (with and without assistive, adaptive, orthotic, prosthetic, protective and supportive devices and equipment)
	-p 25	-Therapeutic exercise may include: aerobic capacity/endurance ... wheelchair propulsion programmes -Gait and locomotion training ... wheelchair training
World Physiotherapy Policy statement: Description of physical therapy (2019)	-p 27	-Device and equipment use and training ... assistive technologies and adaptive devices or equipment training during activities of daily living (ADL) and instrumental activities of daily living (IADL)
	-p 29	-Prescription, application and, as appropriate, fabrication of devices and equipment may include: ... assistive devices ... wheelchairs
World Physiotherapy Policy statement: Description of physical therapy (2019)	Appendix 1	-Intervention/treatment is implemented and modified in order to reach agreed goals and may include: ... prescription, application, and, as appropriate, fabrication of devices and equipment (assistive, adaptive, orthotic, protective, supportive and prosthetic)
Guideline: Qualifications of faculty for physical therapist professional entry level education programmes (2011)	N/A	None identified
Guideline: Standard evaluation process for accreditation/recognition of physical therapist professional entry level education programmes (2011)	N/A	None identified
Policy statement: Education (2019)	N/A	None identified
WFOT Minimum Standards for the Education of Occupational Therapists (2016)	-p 34	-Analysing, adapting and grading occupation ... assistive technology scope and usage
Position Statement: Occupational Therapy and Assistive Technology (2019)	-p 1	-WFOT advocates that assistive technology provision is a core competency within occupational therapy practice for optimising the fit between a person's abilities and desire to engage in occupations ...
	-p 1	-Occupational therapists deploy a broad range of assistive products, which affords them an important role in enacting the WHO's vision for universal sustainable access to appropriate assistive technology
Position Statement. Educational Research in Occupational Therapy (2021)	N/A	None identified
Occupational Therapy Human Resources (2021)	N/A	None identified