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RESEARCH ARTICLE



Training physiotherapy students in basic wheelchair provision. Experiences at two universities in Colombia

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ABSTRACT

Wheelchair provision training is essential to overcome barriers related to the lack of knowledge of health professionals on this topic. Appropriate knowledge of the service provision process may lead to higher quality service and products, and thus be more likely to help people with mobility impairments achieve the fundamental human right of personal mobility. This study aimed to describe a training intervention for two groups of future physiotherapists in Colombia, assess cohort differences in performance on a knowledge test, and explore their post-training perceptions. A quantitative retrospective study with a historical, descriptive-comparative design was conducted. 525 sixth-semester participants completed the International Society of Wheelchair Professionals Wheelchair Service Provision – Basic Test online in Spanish after curriculum modifications were implemented. The test assesses knowledge in seven domains: Assessment; Prescription; Products; Fitting; User training; Follow-up, maintenance, and repairs; and Process. The training intervention was successfully implemented with Physiotherapy students from two institutions, resulting in a 57% increase in test approval rates. Participants demonstrated increased knowledge, satisfaction with the course content, and application of learning to their current work. These results suggest implications for what pedagogical approach to employ, when curricular change may be warranted, and specific considerations for the Colombian context. Furthermore, identifying the minimal knowledge basis for undergraduate programs and facilitating its dissemination can support interprofessional education and enhance professionals' capacity to support wheelchair provision services.

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► IMPLICATIONS FOR REHABILITATION

- Developing pedagogical materials and resources should address academic needs while also being adaptable to the healthcare system and cultural and economic resources.
- Establishing minimal knowledge bases for physiotherapists and facilitating their dissemination to support interprofessional education are crucial steps.
- Sharing pedagogical experiences that improve health workforce training promotes the quality of wheelchair service provision, benefiting the functional independence and well-being of people with disabilities.
- The use of international resources such as the ISWP test in the training of the health workforce contributes to the standardization of the training process regardless of the context.

Introduction

According to the World Health Organization, between 15 and 20% of the global population has a disability, a population that needs assistive technology for functional independence and social participation [1]. Therefore, access to assistive technology is a human right, as stated in the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), through its fundamental principles of full and effective participation in society and accessibility. Similarly, access to a wheelchair and related services is a requirement and a right of people who need an appropriate

wheelchair to participate in society and prevent secondary complications. However, only between 5 and 15% have access to wheelchairs [1, 2]. Wheelchair service provision includes eight steps recommended by the World Health Organization (Referral and appointment; Studies; Prescription or selection; Financing and ordering; Product preparation; Fitting; User training; Maintenance, repair, and monitoring) and well-trained professionals in this process [3]. The recent revision of the WHO Wheelchair Service Guidelines consolidates the processes into four steps. However, the essence of the required knowledge and skills to complete a quality provision is congruent.

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Colombian context

While challenges to quality wheelchair service provision are often similar globally, it is important to consider the contextual environment, including income setting, disability prevalence, and policies, when addressing barriers. Colombia is an upper-middle-income country in South America, with a population of 50.3 million [4]. Colombia does not have an exact figure for the number of people with disabilities; however, as of 2018, 3,134,037 (7.1%) people reported having some kind of disability [5]. Of these, 3% are registered in the Registry for the Location and Characterization of Persons with Disabilities (RLCPD), a voluntary administrative registry that reports data on this population. 50% of people with disabilities reported mobility difficulties, reporting that the streets are the place where they find most barriers, followed by public vehicles, sidewalks, and parks; 22% expressed their need for technical assistance to get around [6].

Colombia ratified the Convention on the Rights of Persons with Disabilities through Law 1346 of 2009 [7, 8], recognizing the right of all people to personal mobility (article 20 of the Convention) and habilitation and rehabilitation services (article 26 of the Convention). Despite intersectoral actions that have been generated to improve the living conditions of people with disabilities, there are significant disparities, such as limited access to health services, education, and employment, among others [9]. Previous research has shown a lack of understanding or systemic thinking in Colombian legislation related to assistive technology, which may suggest insufficient implementation of policies around this issue [10].

Government guidelines for the supply of wheelchairs can improve the quality of this service, including training of professionals serving people with disabilities. Assistive technology users in the country perceive a lack of information on assistive devices and related policies, professionals informed on the subject, and user-centered services for their provision. Additionally, in the Colombian health system, the funding for these products is excluded, resulting in legal acts to ensure the supply of wheelchairs [10].

Training as a facilitator of quality wheelchair service provision

Training in the provision of wheelchairs is associated with good practice in the provision of health services. However, this wheelchair service provision training is neither homogeneous nor mandatory in many health professional training programs [11]. Previous research in Colombia supports the users' experience concerning the little knowledge professionals have in the provision of wheelchairs [10, 12]. Universities interested in contributing to training in the provision of wheelchairs in undergraduate Physiotherapy (PT) [13] and Occupational Therapy (OT) [14] have reported opportunities for improvement in the curriculum to promote access to assistive technology. Some Colombian universities explored the knowledge of final-year PT and OT students, but none passed the International Society of Wheelchair Professionals (ISWP) basic test on wheelchair service provision. The ISWP is an international society that seeks to serve as a global resource to advance wheelchair standards and service provision through advocacy, education, evidence-based practice, innovation, and being a platform for information exchange. Thus, it is necessary to prioritize the academic programs' efforts to work with international associations to improve the integration of wheelchair-related content into the training of professionals in rehabilitation, improving services to users who require wheelchairs [15].

Methods

A quantitative study employing a historical, descriptive-comparative design was conducted to compare changes in ISWP test performance and students' post-training perception across two cohorts. The students were enrolled in mandatory courses on wheelchair provision, and the academic program was physiotherapy. Data were collected from all students who completed the mandatory questionnaire in each cohort representing the entire population rather than a sample.

Motivated by students' test performance, two private Colombian universities implemented curriculum modifications to improve the knowledge of physiotherapy students. The study was conducted in two cities in Colombia. Curriculum modifications were informed by the content of the Wheelchair Service Training Package - Basic level developed by the World Health Organization (WHO). The universities used resources and teaching materials such as the virtual course developed by the International Society of wheelchair professionals (ISWP) and employed adult and active learning pedagogies [3, 16, 17].

The curriculum modifications implemented by the universities, in terms of theoretical framework, content, strategies, resources, and evaluation, are described below.

Theoretical framework

To develop the curricular modifications and create a cohesive and effective experience for physiotherapy students, principles from andragogy [18] and active learning/constructivism [19] were employed. These models foster a dynamic and engaging learning environment that enables students to synthesize, integrate, and apply what they have learned in the course.

Andragogy is an adult learning theory that assumes adults have unique characteristics and needs as learners that are different from children, and these differences should guide the design and delivery of adult-focused training [20]. The principles of andragogy guided the curriculum modifications for wheelchair training: need-to-know (knowing the relevance of the material), self-concept (directing one's learning process), experience (life experiences can be used as a foundation for learning), readiness to learn (being ready to learn when there is a problem to be solved), learning orientation (having learning tasks that can be applied to real-life situations), and motivation (being motivated to learn when learning is relevant, useful, and immediately applicable).

The active/constructivist learning model also emphasizes active participation and engagement in the learning process, similar to andragogy. This model recognizes that students construct their understanding by engaging in realistic and complex problems, co-creating meaning with others, and examining problems from multiple perspectives [19]. To implement the wheelchair training program in the curriculum, hands-on learning experiences, group discussions, and problem-solving activities were incorporated. Table 1 summarizes the information.

Student outcomes

Data from 2017 and 2021 were analyzed to determine changes in knowledge of wheelchair service provision among students and professionals who graduated from these programs. Outcome measures included: 1. A web-based survey administered to students and graduates after completing wheelchair service provision training at University A and University B (see attached); 2. The International Society of Wheelchairs Professionals' (ISWP) basic

Table 1. Curricular changes.

University A	University B
Content:	Content:
- Compulsory course with two components: - ICF wheelchair prescription in the context of activities, participation and environmental factors. - Wheelchairs, appropriation of WHO guidelines with greater emphasis on step 7 (user training).	- Mandatory ongoing course on assistive technology. - The time dedicated to face-to-face work and independent work was extended (from 1 session to 3 sessions) for a total of 18 h. - Use of WHO guidelines for the Provision of Manual Wheelchairs in less resourced settings.
This content is viewed in 6th semester.	This content is viewed in 7th semester.
Pedagogical strategies and resources for teaching:	Pedagogical strategies and teaching resources:
- Virtual classroom to support face-to-face and practical activities. - Working guides with new strategies and inclusion of all WHO steps. - Use of the ISWP web platform. - Interprofessional work with 3rd year medical students.	- Flipped classroom with work prior to the face-to-face meeting. - Case study with knowledge integration. - Use of the ISWP web platform.
Evaluation:	Evaluation:
- Guidelines and rubrics based on WHO and ICF content were developed. - Discussion spaces with teachers and classmates as evaluation activities.	Basic ISWP exam as pre- and post-assessment to the wheelchair provision module.

test on wheelchair service provision. The test is based on the WHO Guidelines for the Provision of Manual Wheelchairs at the basic level and is available on the ISWP platform <https://wheelchairnetwork.org/courses/iswp-basic-knowledge-test/>

Outcome measures

Outcome measure 1: The survey focused on the impact of wheelchair service provision knowledge on participants' current professional practice. The survey was developed by a professor from the Faculty of Physiotherapy at University A and validated by two professors, one from the Faculty of Medicine who participated in the interprofessional work component and another from the Faculty of Physiotherapy at University B. This survey was not pilot-tested since it was part of the course evaluation process. The survey included 12 Likert-style questions focused on students' current jobs and application of wheelchair service provision knowledge within the context of the WHO 8 steps. The last two questions of the survey asked about the contributions of the course to the student's process and suggestions for improvement.

Outcome measure 2: The exam comprised 75 questions randomly selected by the platform. It included seven wheelchair supply domains weighted as follows: user assessment (user needs), 25%; Wheelchair and cushion prescription (product specifications, features, and modifications), 16%; Preparation of wheelchairs and cushions before delivery (assembly and security), 7%; Adaptation (ensuring that the wheelchair adapts to the needs of the user), 13%; User training (mobility skills, transfers, etc.), 20%; Follow-up (maintenance, repair, and follow-up procedure), 5% and Process (derivation, evaluation, financing and order), 13%. A 70% or higher score was required to pass the test (53/75).

The personal information that could be extracted from the database was kept confidential to avoid exposing the participants' personal data. Variables of interest were grouped into sociodemographic characteristics, university affiliation, and test performance (total score on the ISWP Basic Knowledge test, and score for each domain). A descriptive analysis of the variables was made

Table 2. Total and domain scores for the entire sample.

Item	Q1	Median	Q3
Total score	60.00	73.33	89.33
Assessment	68.42	84.21	94.74
Prescription	58.33	75.00	91.67
Production (product preparation)	40.00	80.00	100.00
Fitting	40.00	50.00	80.00
User training	53.33	73.33	86.67
Maintenance, repair, and follow up	50.00	75.00	100.00
Process	70.00	90.00	100.00

Table 3. Total and domain scores by group.

Item	University A			University B		
	Q1	Median	Q3	Q1	Median	Q3
Total score	74.67	82.67	92.00	54.67	64.67	81.33
Assessment	81.58	89.47	100.00	63.16	73.68	89.47
Prescription	75.00	83.33	91.67	50.00	66.67	83.33
Production (product preparation)	60.00	80.00	100.00	40.00	60.00	80.00
Fitting	50.00	70.00	90.00	30.00	50.00	70.00
User training	73.33	80.00	93.33	53.33	66.67	80.00
Maintenance, repair, and follow up	75.00	100.00	100.00	50.00	75.00	100.00
Process	80.00	90.00	100.00	60.00	80.00	90.00

for both the exam and the survey, reported in frequencies and percentages. For the examination, a comparison of the old cohort with the most recent cohort, Mann-Whitney U, was conducted according to the distribution of the data to the total test and the scores by domain.

Ethical considerations

The project was approved by the University A research ethics committee. Informed consent was included in the survey's header.

Results

Wheelchair knowledge test

The results of the wheelchair provision knowledge test among 525 sixth-semester students from University A and a seventh-semester from University B in the period between 2017 and 2021 ($n=205$ University A and $n=320$ University B) were analyzed. Among the participants, 74.4% were female, with a median age of 24 years (Q1: 23; Q3:25).

Global and domain performance

Both total score and domain scores exhibited non-normal distribution ($p<0.05$). Table 2 shows the score distribution for all participants.

The median score for all students was 73.33, with 57% (300 students) passing the exam. The domain with the highest scores was "Process," and the domain with the lowest was "Fitting."

When analyzing the results by university, University A demonstrated better overall and domain-specific performance compared to University B. See Table 3.

The domain in which University A obtained the highest results was "Maintenance, repair, and follow up," while the domain with the highest performance in University B was "Process." The domain with the lowest result for the two Universities was "Fitting."

Comparison between cohorts

When comparing the old cohort (as reported in the article "Undergraduate physiotherapy students' basic wheelchair provision knowledge: a pilot study in two universities in Colombia") and the current cohort, the total score showed a non-parametric distribution in both groups, with extreme values affecting its distribution in the most recent cohort. However, when the variable is categorized as Approved or Not approved, a significant 57% increase in approval of the questionnaire was observed. Due to the data's behavior, estimating the strength of association is impossible since no students in the first cohort managed to pass, making the outcome a constant (Not approved).

When comparing the cohorts, according to the university, it was found that at University A, better performance was obtained for all domains and in the total score with respect to the previous cohort ($p\text{-value} > 0.05$). The domain that improved the most was "Production." The item with the smallest magnitude of change in the score was "Fitting."

At University B, better performance was found for all domains and the total score ($p\text{ value} > 0.05$), except "Fitting" ($p=0.062$). The item that improved the most was "Production: and the one that changed the least was "Maintenance, repair, and follow up".

Student survey: implementation of the knowledge acquired by students and graduates

Among respondents ($n=220$), 58 were graduates and 162 were students. Among the graduates of both universities, 2.9% ($n=5$) mentioned that their current job is related to providing wheelchairs, and 74.1% ($n=43$) claimed to have used the knowledge acquired in the wheelchair supply course at some point in their work activities. Regarding the students, 54% ($n=88$) mentioned

having applied the knowledge acquired in the course in their practices.

In the context of academic practices and work activities, both students and graduates mentioned having participated in some of the 8 steps of wheelchair provision.

It is important to mention that among the suggestions made by the respondents for improvement in wheelchair training, they highlight the need to increase the number of hours of instruction on the subject and to include a practical component in wheelchair training.

Below are the results for each of the steps and their frequency of participation (Figure 1):

Taking into account that user training, assessment, and prescription were the steps in which the greatest participation was reported, it was also possible to establish its frequency (Figure 2).

Similarly, they mention that the steps in which their participation is minimal and sometimes non-existent are the financing and ordering step and the product preparation step.

Discussion

Physiotherapy students positively evaluated the training they received: it increased their knowledge and they continued to use the content in their current work. These results suggest implications for when curricular change may be necessary, suitable pedagogical approaches, and specific considerations for the Colombian context.

Curricular changes according to the needs of the academic context

Understanding the academic and professional context in which students and graduates of physiotherapy programs operate is crucial for adjusting study plans, particularly in the area of wheelchair provision, where academia plays a vital role in addressing unresolved needs in this field. The curricular modifications made in the programs of both universities might have influenced the improvement in the exam results. Although the

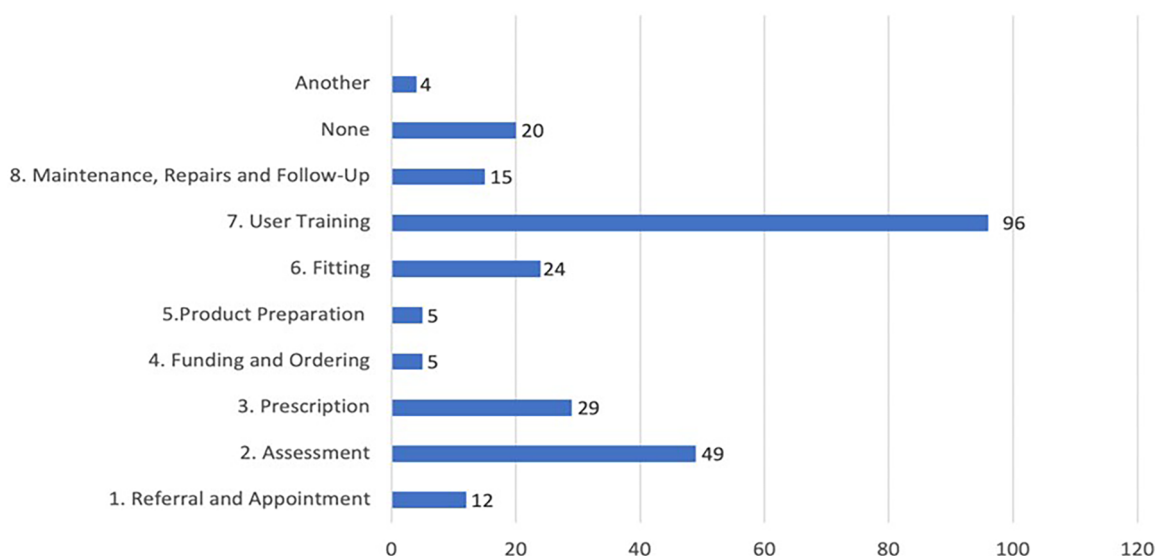


Figure 1. 8-step participation in academic practices and work activities.

A horizontal bar chart showing the frequency of student participation in the 8 steps of wheelchair provision. Step 7 "User training" has the highest level of participation, followed by step 2 "Assessment" and step 3 "Prescription".

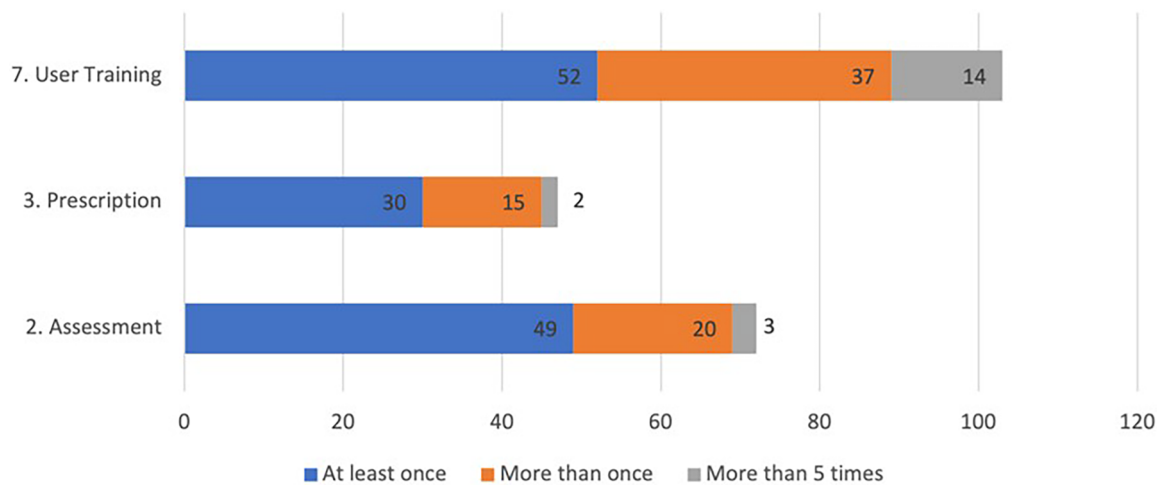


Figure 2. 8-step frequency of participation.

A horizontal bar chart displaying the frequency of participation in the steps where participation was most reported. Most students participated at least once in the steps, while very few students participated more than 5 times in the steps.

students find the content useful and the knowledge is applicable (survey), there are still some challenges articulating the curriculum adjustments to the health system context. A similar study was conducted in 2021 by Bosques, G. et al. [21]. A survey of medical students about to graduate revealed that 33% of the participants stated that they had insufficient experience in caring for the population with disabilities and their rehabilitation. Based on this information, curricular changes were generated in the course: increased instructional hours, changes in content (identification of barriers to attention), and implementation of new pedagogical strategies (videos, reflections based on media publications, practical activities with wheelchairs). The results, which were obtained from a post-training test, were quite satisfactory. The students not only showed that they had more knowledge but also that they had more tools to care for people with disabilities.

Teaching strategies and content

The step with the highest performance was "Process," encompassing referral, assessment, financing, and ordering. The step where there was lower performance was "Fitting." It is important to evaluate the teaching strategies implemented. Perhaps the "fitting" step requires a more comprehensive approach and additional practical time. The manner in which each of these steps is taught significantly impacts meaningful learning.

In 2015, Best, K.L., et al. [22] showed that some teaching methods, such as manual instruction, can be very effective for steps requiring some manual dexterity, either by the user or the physiotherapist.

Despite the above, within the modifications to the course content, more emphasis should be placed on specific steps based on survey results (greater participation of students and graduates in steps such as user training, prescription, and evaluation) and the resources available to carry out the course.

A semester-long program of 20h like the one at University A or 18h like the one at University B, benefits from this type of adjustment. These measures favor the prioritization of content in terms of available time. In 2022 Giesbrecht, E. M., et al. [23] evaluated wheelchair-related content in occupational therapy programs in Canada. They found that all the programs covered at least four of the WHO steps, but only five programs covered all

the steps. Steps 1 (referral and appointment), 4 (Funding and ordering), 6 (fitting), and 7 (user training) were covered in most programs while steps 2 (assessment) and 3 (prescriptions) were addressed in all programs.

The pedagogical approach, the amount of time spent on wheelchair-related content, and the type of assessment used, varied widely between programs. This supports the fact that curricular modifications depend on multiple factors such as current knowledge, the needs of the context, and the resources available for training [24].

Thus, it seems that the improved performance obtained in the current cohort may be attributed to interprofessional experience, increased practice time, and the use of support resources in virtual classrooms.

The provision of wheelchairs, professional development, and work context of physiotherapists

In Colombia, the wheelchair provision process is undergoing a legal transition with several policies proposed after the ratification of the UNCRPD. Perhaps for this reason, the survey showed that 2.9% ($n=5$) of physiotherapists currently work in wheelchair supply, and 74.1% ($n=43$) state that they have used the knowledge acquired in the course of wheelchair provision at any time in their work activity. The visibility of this area requires professionals to be competent in this task, driving a growing demand for training. While several training resources are available, it can be difficult to adapt them to the educational programs in a particular context [25]. Burrola-Mendez, Y., et al. [15] were able to demonstrate the topics and contents addressed in courses. The most common model was that of the WHO 8 steps. However, they showed a lack of information about how these themes were implemented within professional rehabilitation programs.

Participation in university and internship activities primarily focuses on user training, user evaluation, and wheelchair prescription. Based on this, different training activities that emphasize these supply steps could be proposed, for example, holding a "camp" on wheelchair skills training. This intensive activity allows students to gain greater skills in assessing, training, detecting, and documenting users' manual and power wheelchair skills [26].

Regarding university internships, where 54% ($n=88$) of respondents mentioned applying the acquired knowledge, enhancing internship opportunities for students could involve strengthening wheelchair supply processes.

As with any study, this study has its limitations. There was no standardization of training in curriculum; the participants were graduates and students with different experiences and background related to wheelchair provision services. Each university used a diverse pedagogical approach, and the amount of time spent on wheelchair-related content and the type of assessment used varied. The students' pre-wheelchair service provision knowledge and related wheelchair experience were not captured for any cohort. Therefore, the post-knowledge and application gains and comparisons must be interpreted cautiously.

Conclusions

Modifying pedagogy and course content in physiotherapy degree programs might potentially improve the quality of wheelchair service provision for wheelchair users in Colombia.

Recommendations for future research include employing a systematic wheelchair service provision training program and evaluation strategy across all Colombian universities. Moreover, it is imperative to investigate and correlate the regulations and the social and cultural context that impacts the integrality of the wheelchair service provision process, in which training is a fundamental element to achieve the social participation of people with disabilities.

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