

# Factors Influencing Prescription and Validation of Upper Limb Actuated Assistive Devices: A Cross-Sectional Survey of Allied Health Professionals

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## Aim and Objectives

This study explores the barriers and limitations of current actuated assistive devices, focusing on design factors, prescription methods, and outcome measurement tools.

By defining these barriers, steps to improve the design, decision-making support and validation of these devices can be addressed.

## Background

Actuated devices can assist individuals with upper limb motor impairments by providing additional strength and prehension. These motorised and powered assistive technologies can aid in activities of daily living, therefore enhancing the independence and quality of life of the user.

According to current literature, the use of actuated assistive devices has shown promise in the occupational sector, yet there has been less uptake in clinical sectors for upper limb use. Global guidelines and councils such as **NICE** [1] and the **Assistive Technology Report** [2] have yet to medically recommend actuated devices such as exoskeletons and electronic stimulators.

Studies have identified barriers to accessing assistive devices: which include factors of cost, weight, validation, and poor market. Although, actuated devices have not been the primary focus of these discussions.

## Method

The cross-sectional survey was conducted between October 2023 and January 2024. The survey was designed on Qualtrics and included 26 items grouped into:

- **Demographic features:** occupation, work experience, and place of work
- **Trends in Assistive devices** from a list curated from previous literature
- **Importance of Design factors** of actuated devices
- **Opinions on validation methods** for persons requiring assistive devices.

The study was ethically approved by the University of Strathclyde Departmental Ethical Committee. The study was piloted and disseminated via their mailing lists, e-posters and newsletters by the American Society of Hand Therapists (**ASHT**), the British Association of Hand Therapists (**BAHT**), the British Association of Prosthetics and Orthotics (**BAPO**), and the International Society of Prosthetics and Orthotics (**ISPO**).

The results were statistically analysed using Microsoft Excel functions, and open-ended questions were subjected to thematic analysis using **Braun and Clarke's method** [3].

## Results

87 responses to the survey were collected with a 69% completion rate. Of the 60 participants who completed the online questionnaire, their occupations (**Figure 1**), country of work (**Table 1**) and patient populations they support (**Figure 2**) were recorded:

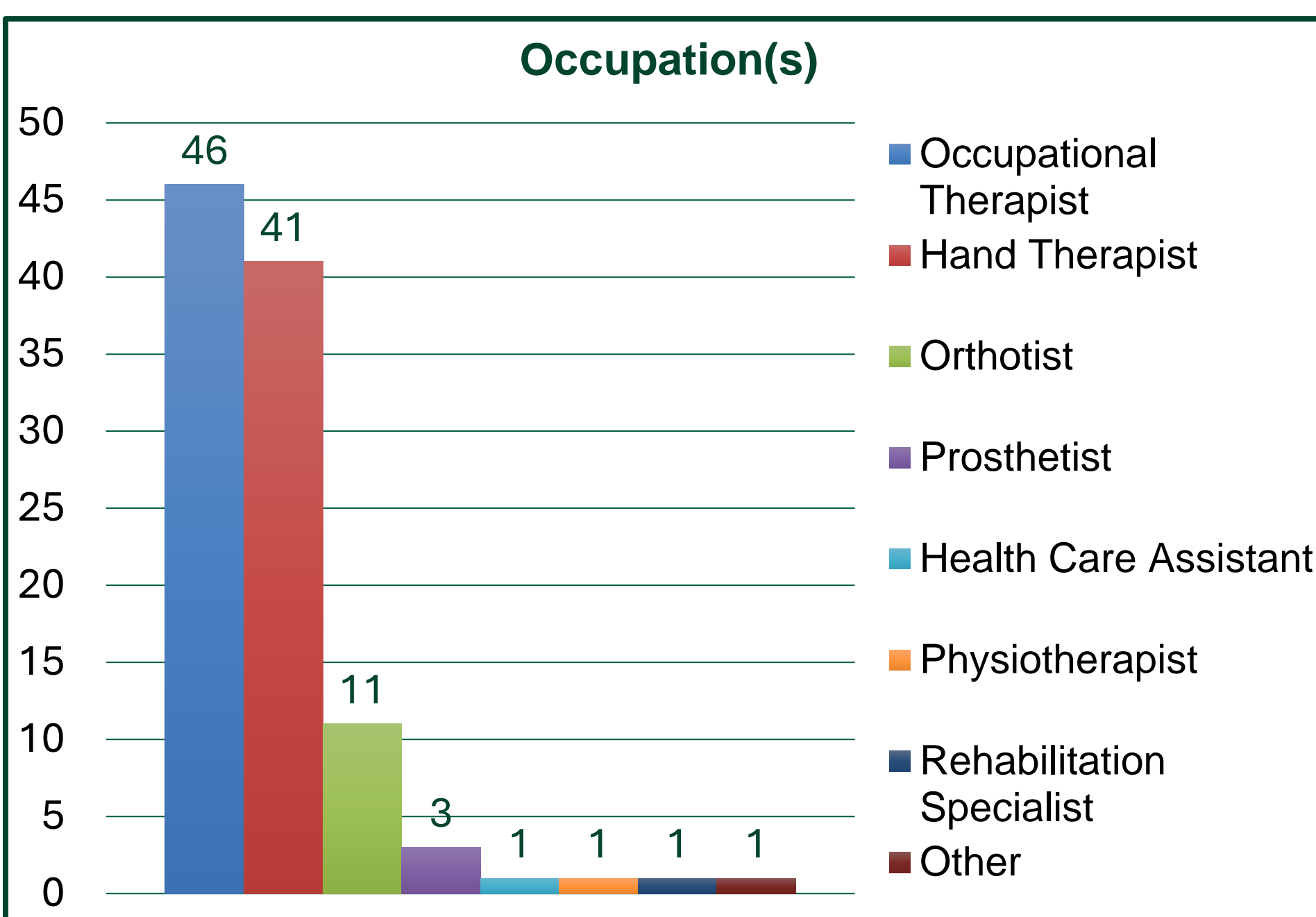


Figure 1. The occupation(s) of participants

Table 1. County of employment

List of Countries	Count
USA	43
UK	11
Switzerland	1
South Africa	1
Nigeria	1
Ireland	1

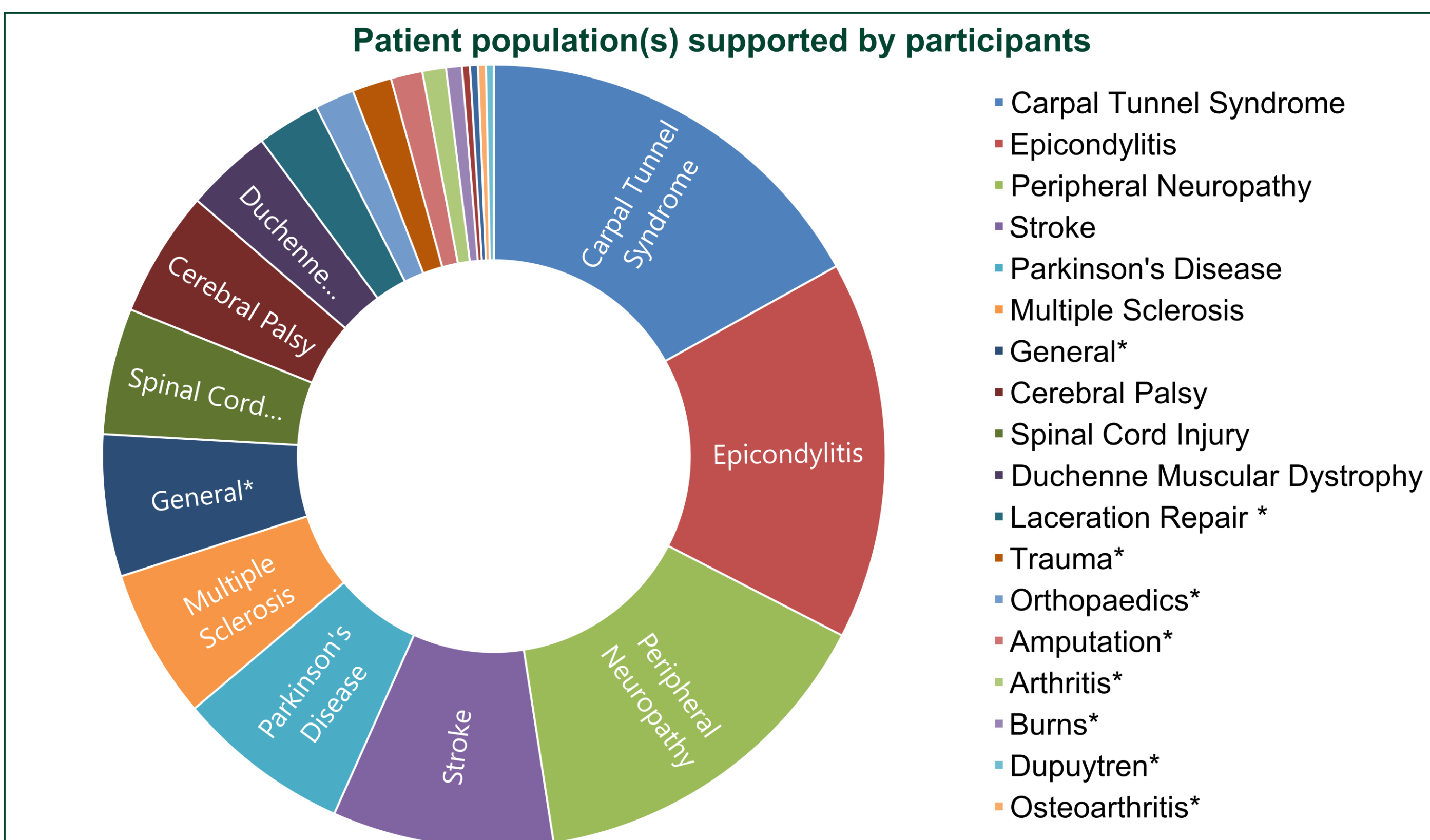


Figure 2. The distribution of patient conditions supported by the respondents

## Key findings

- ✓ Participants had experience using electrical stimulation devices (70%, 42/60) but lacked knowledge of other actuated devices.
- ✓ 66% of respondents (n=40) reported insufficient access to all assistive devices.
- ✓ Barriers to prescribing assistive devices included lack of awareness, experience, and prescription methods (**Table 2**).
- ✓ Respondents favoured multifunctional devices and considered weight, portability, and mechanical power less important (**Figure 3**).
- ✓ 72% of participants found outcome measures and tools useful, though 58% agreed they could be improved with more objective functional ADLs :
  - ✓ Range of motion tests, self-reported pain, DASH, 9-hole peg test and Purdue Pegboard test were most popular.
- ✓ Barriers to conducting outcome measures included lack of time, equipment and training (**Table 3**).

Table 2. Breakdown of themes from thematic analysis of AHPs' perspective on assistive devices for hands and wrists

Main theme	Sub-theme	Defining Statement (occupation, experience in years, country)
Device Design	Function	"Multifunctional use, patients won't use it if it helps with only 1[activity]" (HT/OT, 33, USA)
	Comfort	"In my experience, if an AD is not extremely comfortable and easy to use, they usually end up not being used." (HT/OT, 6, USA)
	Durability	"ability of the patient to obtain a replacement or extra items" (HT/OT, 50, USA)
Awareness	Weight	"if they do not have proximal strength to be able to lift and manipulate the device, what good is it?" (HT/OT, 32, USA)
	Lack of experience	"Very limited experience unfortunately - I could have used more information/experience to treat patients" (HT/OT, 1, USA)
Prescription	Lack of knowledge	"I am not familiar with the list of adaptive equipment in your international list." (HT/OT, 43, USA)
	Unclear methods	"Need for clearly defined way to assess if patient is appropriate for the assistive device" (HT/OT, 40, USA)
User	Adaption	"Patients are very quick to adapt their movements after an injury, and if they can use the opposite hand, they figure out how to quickly without the need of adapted equipment to assist." (HT/OT, 6, USA)
Cost	Cost efficient alternatives	"many times just putting a wrist and hand in a more functional position through static custom splint fabrication can be a low-cost and effective way to address many ADL goals." (HT/OT, 32, USA)

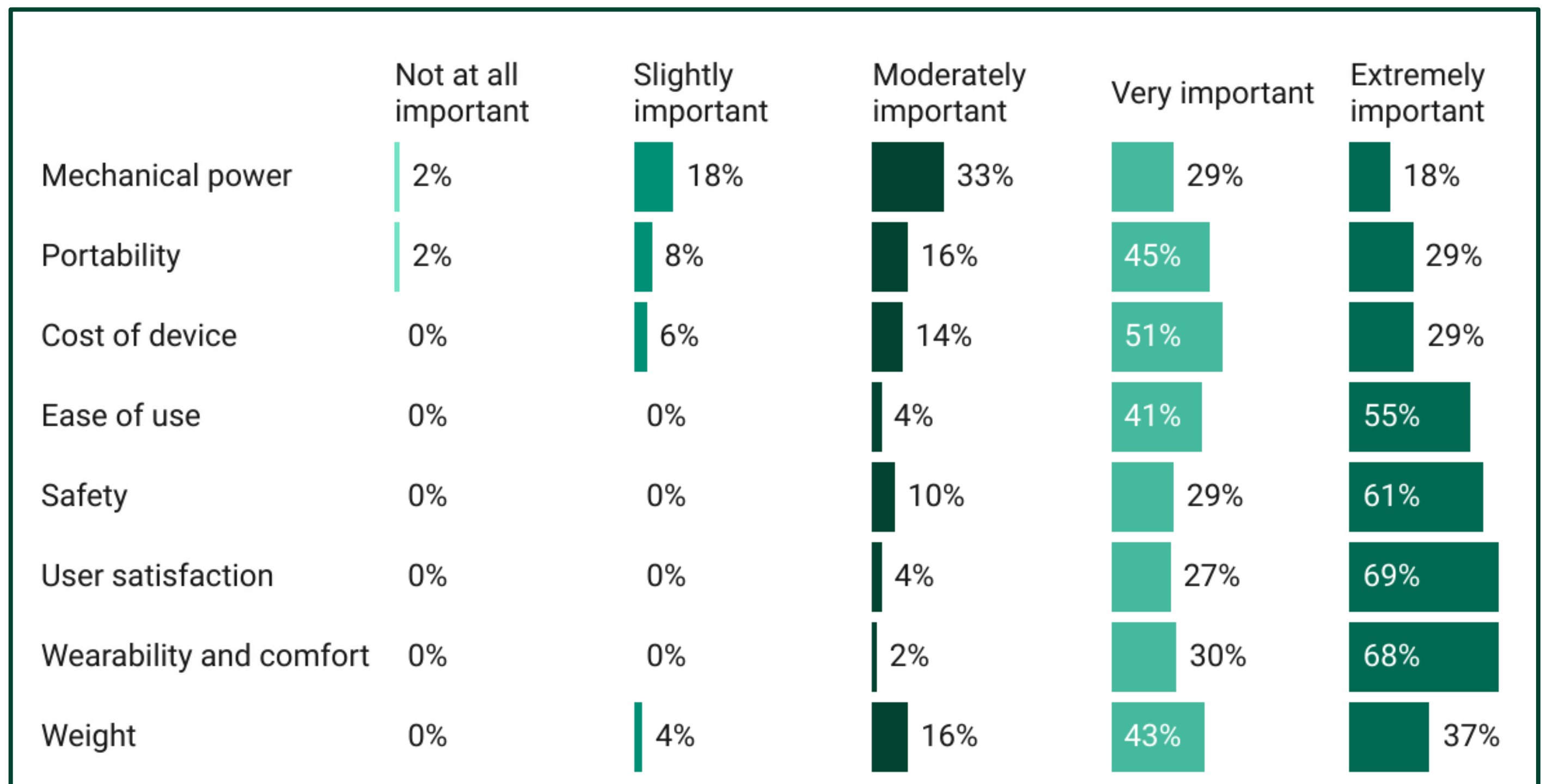


Figure 3. The level of importance of design features using a modified Quebec User Evaluation of Satisfaction with Assistive Technology (QUEST 2.0) [4]

Table 3. Main factors limiting AHPs from assessing outcomes for patients requiring hand and wrist assistive devices.

Limiting factors	Mentions (n)	Respondents affected (%)
Time with patients	37	63
Lack of equipment	27	45
Lack of skills or training	21	35
None*	3	5
Cost*	2	3
Hygiene protocols*	1	2
Inappropriate use*	1	2

Note: \*Factors abstracted from text response

## Conclusions

Prescribers and assessors of assistive devices lack the access, knowledge, and clinical methods needed to effectively assess and prescribe actuated devices. The mechanical requirements for developing actuated devices do not align with prescribers' priorities for user needs, such as comfort, satisfaction, and ease of use. In addition, outcome measures should define the functionality of the user in an objective manner using a larger bank of ADLs to track user progress.

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## References

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