Measuring Wheelchair Intervention Outcomes: Development of the Wheelchair Outcome Measure

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Abstract

Purpose—Provision of a wheelchair has immediate intuitive benefits; however, it can be difficult to evaluate which wheelchair and seating components best meet an individual's needs. As well, funding agencies now prefer evidence of outcomes; and therefore measurement upon prescription of a wheelchair or its components is essential to demonstrate the efficacy of intervention. As no existing tool can provide individualized goal-oriented measure of outcome after wheelchair prescription, a research project was undertaken to create the Wheelchair Outcome Measure (WhOM).

Method—A mixed method research design was employed to develop the instrument, which used in-depth interviews of prescribers, individuals who use wheelchairs and their associates, supplemented by additional questions in which participant preferences in key areas of the measure were quantified.

Results—The WhOM is a client-specific wheelchair intervention measurement tool that is based on the World Health Organization's International Classification of Function, Disability, and Health. It identifies desired outcomes at a participation level and also acknowledges concerns about body structure and function.

Conclusion—The new outcome instrument will allow clients to identify and evaluate the outcomes they wish to achieve with their wheelchairs and seating and provide clinicians a way to quantify outcomes of their interventions in a way that is meaningful to the client and potential funding sources.

According to Statistics Canada,¹ approximately 152,000 Canadian adults rely on wheelchairs for mobility. Given the expected increase over the next 20 years in the number

of older adults, by far the proportionately largest age group to use wheelchairs, the number of individuals who use wheelchairs will likely grow as well. In fact, Clarke and Colantonio² estimated that, based on 1995/96 data, 88,300 community-dwelling older adults used wheelchairs, which represents roughly half of all individuals who use wheelchairs in Canada. Wheelchairs, as a means of transportation and independent mobility, have a large influence on quality of life.^{3,4} Power wheelchairs, for example, have been noted to enhance quality of life by enabling occupation, facilitating social interaction, and improving self-esteem and comfort.^{5–9} Similar benefits have been attributed to manual wheelchairs.^{10–14} As suggested by the Matching Person to Technology model¹⁵ successful prescription of assistive technology generally and wheelchairs specifically involves measurement and consideration of person-related factors, such as cognitive and physical function, and of environmental factors, such as structural barriers. These factors are then weighed within the context of the wheelchair product parameters and personal preferences of the individual, and a suitable system is prescribed. A basic wheelchair system consists of the frame and the seating components (back and seat cushion).¹⁶ More complex systems often may include a variety of other components, such as special switches to operate the chair.¹⁷

Costs for a basic manual propulsion wheelchair system range have been estimated to range from \$1414–\$2828 US,¹⁸ while power wheelchair systems can cost well over \$10,000 US.¹⁹ Many agencies fund a wheelchair and/or seating system with a subsequent ineligibility period, when further financial support for purchase of such equipment will not be provided. Provision of the right system therefore is essential to reduce not only the monetary cost but also the person-related cost, such as pressure sores, excessive fatigue and lack of mobility, that are associated with a poorly fitting wheelchair.^{20–22} There is also the common problem of abandonment of assistive technology devices, with estimates ranging from 18–82% depending on the population and type of device.^{23–27} More recently, Garber and colleagues²⁸ reported that 31% of their sample discontinued using their wheelchairs, primarily because the devices no longer met their needs. Kittel et al. indicated that failure to recognize and consider important individual lifestyle issues was identified as a primary factor leading to manual wheelchair abandonment among individuals with a spinal cord injury.²⁹

The International Classification of Functioning, Disability and Health (ICF)³⁰ is the World Health Organisation's revised system to describe health states. The ICF model indicates that functioning occurs as a result of a dynamic interaction amongst health conditions, and personal and environmental factors. Although based on the previous International Classification of Impairment, Disability and Handicap, the ICF uses neutral terms to identify function at the Body Function, Activity and Participation levels, rather than impairment, disability and handicap so that both health and disability are encompassed. The ICF defines the 3 primary domains that are classified from body, individual and societal perspectives: 1) body function as physiological function of body systems, which includes psychological functioning, 2) activity as the execution of a task or action by an individual and 3) participation as involvement in a life situation. The ICF describes function using two qualifiers: performance describes what an individual does and capacity describes what an individual is capable of doing. For the purpose of this paper, the domains of learning and applying knowledge, general task and demands, communication and mobility and will be

considered activities and the domains of self care, domestic life, interpersonal interactions and relationships, major life areas and community, social and civic life are considered participation.

Using the ICF as a framework,³⁰ the majority of available seating and outcome measures target outcomes at the Body Function level. Such diverse outcomes include pulmonary function, swallowing, motor control, body positioning, psychological impact after assistive device provision,³¹ and satisfaction with assistive device provision.³² At the Activity level, there have been developments of tools that evaluate manual wheelchair skills^{33, 34} as well as basic and instrumental activities of daily living,³⁵ but most of these focus on measuring capacity.

Recently the Functional Evaluation in a Wheelchair (FEW)³⁶ was designed as a tool to measure basic wheelchair use, including such items as ability to reach from the wheelchair and to transfer into and out of the chair. While this test has excellent potential, the FEW items appear to be directed at 1) individuals who use wheelchairs who are less disabled and 2) measuring activity (in terms of mobility) rather than participation. For instance, items such as reaching and transferring (which are considered part of mobility in the ICF), are not globally applicable to individuals with high-level quadriplegia or with some progressive conditions.

Typical of many rehabilitation measures, most wheelchair-related body function and activity outcome tools reflect clinicians' concerns,³⁷ rather than determining whether the goals of the individual are being met. Wright et al.³⁸ suggested that the most effective means of determining consumer goals is to simply ask them. Identification and evaluation of client-specific outcomes is a relatively recent trend in outcome measurement, which provides a relevant and personalized approach to determine the success of an intervention based on a client's specific needs. This flexible format enables the instrument to cover a wide range of disorders or physical impairments³⁹ and ensures that only the most relevant questions or domains are included.⁴⁰ Day et al suggested that goal-oriented measures are required to provide a comprehensive approach to outcome measurement in the field of assistive technology.⁴¹ Studies have also shown that a client-centred approach can provide a reliable, valid and responsive measure of outcome after intervention.^{42–44} This approach is so appealing to clinicians and researchers that many have used or modified existing client-centred instruments, such as the Canadian Occupational Performance Measure (COPM)^{45–47} or the Goal Attainment Scale (GAS)^{48, 34} to assess the needs of individuals who use wheelchairs. Clinical experience and other evidence⁴⁵ suggest, however, that these instruments are not specific enough to capture information that is meaningful for wheelchair prescription and can take too long to apply and score.

The need for a new tool to measure the outcome of wheelchair prescription was supported by the current push for evidence-based practice⁴⁹ and the lack of an existing tool to measure outcomes specific to this population. The ICF³⁰ was selected as a framework for this measure for two primary reasons: 1) creating a measure that was congruent with the ICF would promote a focus on participation in the instrument, and 2) as familiarity with the ICF

is increasing, the measure's association with the ICF would assist clinicians to understand, to use and to present the findings.

In this paper the results of the first phase of a multi-year, multi-phase project to develop a client-centred outcome instrument that determines the effectiveness and efficacy of wheelchair provision are presented. The study specific objectives presented in this paper were to: 1) identify the outcomes that prescribers, individuals who use wheelchairs, and individuals associated with them (such as care givers and family members) wish to achieve with wheelchairs or wheelchair seating; 2) identify participant preferences for the instrument content and format; and 3) develop the final instrument format.

Method

A mixed methods research design was used for the development of the new instrument. Specifically a consumer-based approach employing in-depth interviews, supplemented by additional questions in which participant preferences in key areas were quantified, was used for data collection. This technique was intended to maximize the likelihood that the measure would target and be responsive to issues of consumers of seating and mobility devices, in addition to other stakeholders. Participant selection is described in detail in the following section. All participants were interviewed once and most wheelchair prescribers and a small number of participants who used wheelchairs and were considered key informants were interviewed a second time to gather the data necessary to meet the objectives of the study. Key informants were identified by their interest and ability to provide conceptual feedback on the developing measure. Ethical approval was obtained from the local university ethics review board prior to conducting the study.

Objective 1: to identify the outcomes that prescribers, individuals who use wheelchairs, and individuals associated with them wish to achieve with wheelchairs or wheelchair seating

Interview data for this objective was collected using a semi-structured interview guide, which was based on a review of the literature and personal experience of the researchers about wheelchair prescription and common wheelchair outcomes. For example, participants were asked to describe what individuals who used wheelchairs: 1) did over the course of a normal day; 2) wanted to be able to do, 3) were looking for in a wheelchair or wheelchair seating system and 4) would be limited in doing if they did not have their wheelchairs.

Objective 2: to identify participant preferences for instrument content and format

In the first round of interviews, prescribers were asked about what content and format would be most useful in the measurement tool. In the second round of interviews, prescribers were asked to: 1) rank order three potential models for the outcome measure and 2) indicate whether an 11- point Likert scale or a system similar to GAS (in which outcomes are negotiated in objective behavioral terms) would be the preferred response format to evaluate participation outcomes. With GAS outcomes are scored on a scale from -2 to +2. A score of 0 indicates the outcome was achieved, whereas a score above and below 0 indicates the negotiated outcome was either exceeded or not fully met. In the second round of the

interviews, key informants who used wheelchairs were asked to: 1) rank and to comment on the two most popular models for the outcome measure identified by prescribers and 2) indicate whether an eleven point scale or a GAS type system would be the preferred response format to evaluate participation outcomes.

Objective 3: to develop the final instrument format

Based on the data from both rounds of interviews, the researchers made final decisions about the instrument content and format.

Participant Selection

Individual semi-structured interviews were conducted with participants from three different groups. These groups included wheelchair prescribers, individuals who used wheelchairs, and their associates. These groups were selected and an attempt was made to target a variety of participants from each group, as their different perspectives would enable better triangulation of the data for each of the study objectives. Participants, therefore, represent a purposive sample. Individuals who used wheelchairs varied in terms of their: 1) diagnoses, 2) living situation 3) wheelchair use (manual, power, both), geographical location (Edmonton, Alberta or Vancouver, British Columbia and 4) funding. Prescribers varied in terms of: 1) clinical population they worked with, 2) type of wheelchair they prescribed, 3) work-site (residential care, community, seating clinic, private practice), 4) geographical location (British Columbia, Alberta, New York State) and 5) profession (occupational or physiotherapy). Individuals who used wheelchairs and their associates were recruited via letters of invitation given out by the wheelchair prescribers enrolled in the study and by other therapists who were known to the study investigators.

Description of Participants

Thirty initial interviews were conducted with a total of 34 interviewees, including 13 wheelchair prescribers, 14 individuals who used wheelchairs, seven wheelchair associates (described below). Table 1 describes the participants in terms of their age, experience and other pertinent information. Although most interviews were conducted with individuals, sometimes family members of other participants were interviewed together at their request. Fourteen follow-up interviews were conducted with 11 of the 13 prescribers and four of the individuals who used wheelchairs, who were considered to be key informants. Two wheelchair prescribers could not be contacted for follow-up interviews.

Wheelchair prescribers—Prescribers from the United States and Canada who had a broad cross-section of experience were targeted. Their client base included children, adults and/or older adults, who had both progressive (e.g., multiple sclerosis) and non-progressive (e.g., spinal cord injury) disabling conditions and diverse mobility and seating needs who lived in community and institutional settings.

Individuals who used wheelchairs—This group consisted of adults who had either a progressive or non-progressive physical condition, who lived in either the community or a residential facility. They needed to have used a power or manual wheelchair for at least six months. They were required to communicate in English and be able to provide informed

consent. Eleven of the individuals who used wheelchairs lived in the Lower Mainland of British Columbia and two lived in Edmonton, Alberta. The two individuals from Alberta were included to provide an alternative perspective from those living in Vancouver, as these centers differed in terms of their climate, wheelchair prescription services and wheelchair funding opportunities.

Associates of individuals who used wheelchairs—Spouses, family members, friends and caregivers were defined as associates. Associates needed to communicate in English and provide informed consent. Associates gave insights about wheelchair use for individuals who were unable to participate in the study, such as those with dementia, or other cognitive disorders.

Data Collection

All of the interviews were completed within a range of 40 and 120 minutes and all were audio recorded and transcribed verbatim by a research assistant. The names and places in the transcripts were replaced by pseudonyms by the first author to protect the identity of participants. Field notes were taken and the first author who conducted all the interviews kept a personal journal. The content of the field notes included interview date and time, location, description of the environment, non-verbal behaviour, impressions, and technological problems. The personal journal described how the research was conducted and included the interviewer's thoughts and feelings about the research process.⁵⁰ A review of the field notes and the personal journal was used as a reflective tool to explore how the interviewer influenced the research process,⁵¹ and was reviewed by the third author.

Data Analysis

Analysis of the qualitative data occurred on a continual basis throughout the research process⁵⁰ using Atlas Ti qualitative analysis software.⁵² The study co-authors provided feedback about ongoing analysis and coding of the interviews. As transcripts were received, they were analyzed thematically and a large number of codes were identified by the first author with input from the co-authors. As analysis progressed, these codes evolved, some of the codes were collapsed and interviews re-coded. At the completion of analysis, a conceptual understanding of the outcomes that individuals wanted to achieve with wheelchair mobility and seating was developed. For the quantitative data, the average ranking of each item was calculated for those items that were rank ordered.

Trustworthiness Strategies

This study employed a variety of trustworthiness strategies. As a method of triangulation and to demonstrate the plausibility of the data, multiple perspectives were obtained from a wide variety of individuals who use wheelchairs, their associates and clinicians. As a form of member checking, in the second round of the interviews, participants were given the opportunity to review and critique a summary of their own interviews and the findings of the first round of interviews. All of the participants reported that these summaries reflected their comments accurately. Involvement of the co-authors in the coding and analysis of the interviews represented another strategy to improve the plausibility of the study findings.

Results

The findings of the study are presented in relation to the study objectives.

Objective 1: To identify the outcomes that prescribers, individuals who use wheelchairs, and individuals associated with them wish to achieve with wheelchairs or wheelchair seating

Four main themes described participants' thoughts about the new outcome measure and the outcomes that participants wanted to achieve with wheelchairs or wheelchair seating. Quotes represent apt illustrations of the themes generated. These themes included: 1) support for a new outcome measure, 2) participation in activities at home, 3) participation in activities in the community and 4) measurement of body function and structure outcomes.

Support for a new outcome measure

All prescribers, indicated support for a new outcome measure specific to wheelchairs and wheelchair seating for two primary reasons. First, some felt that they wanted to use an instrument like the Canadian Occupational Performance Measure (COPM), but found it unsuited to wheelchair and wheelchair seating. Sylvia used the COPM occasionally, and Mindy and Cassandra had tried using it, but found it did not work with the clients they had. Cassandra, for example, explained, "the thing about the COPM is because it's so generic, [and] it's not focused on one particular area of OT practice, it can almost be too general and it's kind of hard to use." Second, many clinicians supported a new measure for they hoped it would be helpful to use when advocating for wheelchairs and wheelchair seating. In this regard, Zack noted, "I want to get information to justify getting more [and] better equipment."

Outcomes

Participants identified a large number of outcomes they wanted to achieve with wheelchairs and wheelchair seating. To get a sense of the relative strength of each of these activities the number in parenthesis indicates the number of interviews in which these outcomes were identified as desired by participants. When only one or two participants identified an outcome the name of the participant(s) was included in square brackets. Overall participants identified 109 outcomes that they wanted to achieve.

Participation at home—"I do a fair amount [of things] inside the house. I think I'm a house kind of gal as opposed to an outsider." [Leah]

The participation at home theme included activities that occurred within the participant's primary residence. This included long-term care facilities for some participants. Some of the common responses within this theme were activities of personal care, such as bathing (23/31), dressing (12/31) and watching television (11/31). Some of the least common in home activities occurred within residential facilities and included unexpected outcomes such as drag racing power wheelchairs down facility corridors [Rachel] and eloping (escaping) [Zack] from the facility.

Participation in the community—“You want to be able to go pretty much wherever you want: [...] on sidewalks, in and out of stores and maybe across a field.” [Allison]

Common responses for the participation in the community theme included instrumental skills of daily living such as shopping, (18/31) and going to school or educational sessions (9/31). Some of the less common community activities were panhandling [Jonathan], collecting recyclable bottles [Jonathan/Cassandra], stand-up comedy [name withheld to protect anonymity] and berry picking [Cassandra]. The participation in the community and participation at home themes were not mutually exclusive, and some activities such as eating, using the washroom, and socializing occurred in both settings.

Based on the ICF classification system, most of the community and at home outcomes identified by participants were at the participation level. Only four of the 109 outcomes identified by participants were at the more fundamental activity level. These included carrying things (3/31), reaching (3/31), getting down to the ground [Nancy] and transferring from one surface to another while seated (10/31).

Body function and structure—“Comfort of course is priority because he’s in it for so many hours.” [Nellie]

The body function and structure theme described outcomes that participants also wanted to achieve based on the ICF body function and body structure domains. These outcomes included improving or maintaining comfort (31/31), positioning (29/31), skin condition (27/31), sitting tolerance (19/31), energy conservation (11/31), and breathing (9/31), spasticity control (7/31), and temperature regulation [Samuel].

Objective 2: To Identify Participant Preferences for the Instrument Content and Format

In examining the qualitative data regarding prescribers’ preferences for an outcome measure, three potential outcome measure models, based on the ICF,³⁰ were identified. In Model one, goals were to be preferentially identified at the participation level and sometimes at the activity level. Although these goals would represent the outcomes to be achieved, every issue would be explored along the body function, activity and participation continuum. For instance, while the problem that the client initially identified may have been that he /she had low sitting tolerance (activity level) or a pressure ulcer on his/her buttocks (body structure), the primary outcome of concern would be his/her ability to go for a coffee with his/her spouse or to watch his/her daughter play soccer.

In Model two, outcomes would be identified at any level of the ICF: body structure and function, activity or participation. In this model, there might be multiple levels of outcome. For example, for the individual described above, outcomes to be achieved could include improving sitting tolerance, pressure ulcer healing and/or the ability to go for coffee and to attend soccer games.

Model three represented a hybrid of Models 1 and 2. In this model, the measure focused on identifying participation issues as noted in Model one but also included a number of standing body function and structure questions.

When prescribers were asked to indicate which model they preferred, they were divided between Models two and three. Six prescribers indicated they preferred Model three and four indicated they preferred Model two. When individuals who used wheelchairs were asked about which of these models they preferred they indicated unanimous support for Model two.

Participants identified a wide variety of reasons to adopt or not adopt Models 2 and 3. Some participants felt Model two might be more intuitive for individuals who used wheelchairs, as it worked on any outcome that they identified, without the need to transform the goals into participation outcomes. For example, Margaret stated “Model two is what happens to me clinically. [My clients] often choose [an outcome] in any one of those [ICF] areas.” Similarly, Elaine noted, “I think I would find it easier with giving more prompts [at all levels of the ICF as in Model two]. [Model three] is very global [... and you might wonder] what does [the prescriber] really want? What does he really mean?” Other participants, however, preferred Model three and indicated that the body function and structure outcome questions in this model were quite useful. Rachel stated that these questions “allow[ed] that knowledge that therapists had [about positioning and pressure reduction etc.] into [the outcome identification process].” Zack noted that “those body function questions [were] a pre-requisite to anything you want to do in [a wheel] chair.” Of the prescribers, only Mindy ranked Model one as her first choice indicating, “I prefer Model one [...because] that’s where I want to be [with my practice].

In the second round of interviews, participants were divided as to which method of evaluating activity and participation outcomes should be adopted. Two primary methods were identified: indicating achievement of the outcome on an 11-point scale or using something similar to GAS. Three of four individuals who used wheelchairs preferred the 11-point scale, whereas ten of eleven prescribers preferred GAS. Prescribers and Nancy, indicated that they liked a GAS type system because it was more objective compared to an 11-point scale: “[Using an 11-point scale is] based on what you’re feeling of a number three is. It’s that vague.” [Nancy]. As well, some prescribers indicated GAS would also be helpful when dealing with multiple caregivers. For example, Margaret noted that with GAS it didn’t matter if “it’s the teacher, the student, his peers or his mom [who evaluated outcome achievement, because the outcomes were so objective].” Most individuals who used wheelchairs preferred rating satisfaction with performance because they found it easier to understand and gave them more control to indicate success of intervention. Melinda noted “so many things about a chair are not [evaluated] in the same way a specific task would be [in GAS].” Concern was also expressed about the amount of time GAS would take.

Objective 3: To Develop the Final Instrument Format

To create the final instrument three main contentious issues needed to be resolved, which included deciding on: 1) which outcome measure model would be used; 2) how activity and participation outcomes would be assessed and; 3) if Model three were selected, which/how body function/structure items would be evaluated.

Choosing an outcome measure model—Given that Model one was least preferred by prescribers during the second round of the interviews, this model was discarded. Although key informants supported Model two, it received only four first place votes from prescribers, whereas Model three received six first place votes. Given that the outcome measure was intended to primarily address outcomes at the participation level, the authors selected outcome Model three as a foundation for the new instrument.

Deciding how activity and participation outcomes should be rated—In terms of the method of evaluation, rating of achievement on an 11-point scale was selected over the GAS system, because of the complexity and time required to administer GAS. Responding to concerns about the difficulty using the scoring system of the COPM, the authors decided clients would be asked to rate their satisfaction with performance, rather than rate satisfaction and performance separately, which prescribers reported was difficult. Sarah, for example, noted, “[Adults without cognitive problems] didn’t like the COPM rating scales. They really had a tough time with [the separate rating scales for performance and satisfaction].”

In order to allow weighting of the outcomes, an idea suggested by study participants and that is used in other outcome measurements, the authors determined that clients would be asked to rate the importance of each outcome selected. This would enable prescribers to understand the relative importance of each outcome that clients identified, allow the satisfaction scores to be weighted and ensure the overall score would be more useful for making comparisons between wheelchairs and wheelchair seating.

Measuring body function and structure outcomes—As Model three was selected as a basis for the outcome measure, body function and structure items needed to be selected. The three most important outcomes identified by participants were included in the final version of the measure: comfort, positioning and skin condition. Although sitting tolerance was the fourth most popular outcome, it was also noted to be an overlapping construct with comfort and therefore did not require additional measurement. Similarly, it was noted that breathing was related to positioning and could therefore be assessed with the question about positioning. For ease of administration and consistency the same 11-point response scale used for activity/ participation outcomes was selected for the positioning and comfort body structure /function questions. A categorical judgment, YES/NO, response was used for the question about skin integrity, the second most important body structure and function item identified by prescribers. This was supplemented by additional information about duration, as this item did not work with a 11-point scale.

The Tool—Upon deliberation the final format of the tool was determined by the authors of the study (see appendix A). The first part of the tool consists of two questions to identify participation level outcomes at home and in the community. For all participation outcomes the current level of satisfaction with performance and importance of the outcome are rated on an 11-point scale (0–10). The second part of the tool consists of three body structure and format questions about comfort, positioning, and skin condition. Following intervention the tool can be re-administered and change scores calculated.

Discussion

As pointed out by prescribers in the study, an appropriate client-specific wheelchair outcome measure does not exist. Clinicians in the study wanted a measure that was easy to use and was specific to wheelchairs. Although not a random sample of wheelchair prescribers, clinician participants in the study indicated strong support for the development of this new outcome measure.

The 105 participation level actions facilitated by wheelchairs and wheelchair seating noted in this study is in keeping with findings by Mills et al.,³⁶ whose 20 subjects reported 154 self-care, leisure, and productivity tasks related to function. The manner in which a person with a disability uses his or her wheelchair therefore seems to be very individualized. Given the large number of activities, a client-specific approach is particularly well suited for a wheelchair outcome measure, as a more population based outcome measure would be unlikely to capture the range and specificity of outcomes that clients want to achieve.

It is interesting to compare participant outcome measure model preferences with the ICF and the Canadian Model of Occupational Performance (CMOP). Although Model one fits well with ICF and Canadian Model of Occupational Performance (CMOP), this model was least preferred by clinicians and, did not seem well supported by clients. Although prescribers indicated that they supported identification of outcomes at the participation level, many still wanted to include key body function and structure outcomes in the measure. Clients on the other hand wanted to be able to identify outcomes at any level. Some possible explanations for this client preference is that this system might be simpler for clients, involve less negotiation with the prescribers and allow clients to identify the specific outcomes they wanted to achieve, which is reminiscent of a client-driven frame of reference⁵³ As well, this preference might also reflect the possibility that there may be a disconnect between body function and structure outcomes and participation outcomes. For, example, perhaps some individuals who use wheelchairs might suffer through pain and discomfort while still maintaining participation, until it gets to the point that these symptoms limit their activities. Although therapists and clients recognize that body structure and function outcomes are an important component of higher-level outcomes, it seems that both groups wished to have these formally acknowledged as in Models two and three. This finding suggests that body function and structure concerns need to be identified to involve clients in the outcome negotiation process. By selecting Model three, the authors sought to provide a more comprehensive measure for therapists to use, yet keep activity and participation outcomes conceptually distinct, as this is the unique contribution of the WhOM. Another reason for not selecting Model two was that, as only four of the 109 outcomes identified by participants were at the activity level, it seems participation and body function and structure outcomes were actually most important for participants. Model three is also in keeping with the work of a number of disability scholars who have advocated for a renewed social model of disability that recognizes both the lived experience of body structure and function problems and the manner in which participation is socially mediated.^{54,55}

Considering the body structure and function outcomes that were incorporated into the WhOM, one of the most controversial items was that of skin integrity. Although this item

was identified as an outcome by most participants, it is also the body function and structure outcome that is least attributable to wheelchair and wheelchair seating intervention, as some pressure areas, particularly coccygeal, may occur from lying rather than sitting. Despite this fact, some prescribers were adamant that this item be included. Given that provision of some seating systems, such as tilt, lateral tilt or power tilt, however, may be useful for treating pressure areas that may have occurred outside the wheelchair, the inclusion of this item seems reasonable.

The difference between therapist and user preferences regarding the method of evaluating activity participation is striking. Although individuals who used wheelchairs preferred rating satisfaction with performance, clinicians preferred a GAS like system because the outcomes were more “objective.” Clinicians may have had negative experiences with the COPM as suggested by some prescribers and noted in the literature.^{56, 57, 45} Individuals who use wheelchairs may have preferred self-rating for satisfaction with performance, because self-rating gives them more control when evaluating success of intervention, as it represents their subjective satisfaction with performance rather than a more objective ability to perform targeted outcomes identified using GAS. Although selecting satisfaction with performance went against the preferences of a majority of prescribers in the study, it was in keeping with their comments that the ultimate outcome measure should be quick and easy to administer, while GAS would require more work, which might have a negative impact on the utility of the instrument.

Limitations

Although efforts were made to include a diverse selection of prescribers and individuals who use wheelchairs, the views expressed cannot be assumed to represent the views of all such individuals. The strength of the WhOM lies in its assessment of outcomes at the participation level. The measure only lightly touches on body structure and function outcomes, which is appropriate given the large number of standardized assessments of these outcomes already available. The ultimate utility of the new instrument will become apparent with the results of research that is currently underway to assess reliability and validity.

Conclusion

Evidence-based practice demands that clinicians use formal measurement tools that guide practice and assess intervention outcome. The new outcome instrument will elicit goal-oriented interventions, give clients a mechanism to present feedback, and provide clinicians with a method to quantify outcomes of their intervention that are individually meaningful to each client. It will also help justify prescription, when appropriate, of more complex (and ultimately more expensive) wheelchair systems by providing funding agencies with information on benefits that may not otherwise be obvious. Given the cost of wheelchair equipment and the increasing number of older adults, development of this tool is timely to ensure the prescription of the right device at the right time.

Although the final outcome measure is similar to the COPM, there are three critical differences, which are intended to address the problems Barlow⁴⁵ identified with the use of the COPM to assess the effectiveness of wheelchair and wheelchair seating intervention,

namely that the COPM was not specific enough to assist in wheelchair prescription and took too long to administer. These differences are as follows: the WhOM 1) has a simpler scoring system which, it is hoped, will improve clinical utility; 2) has prompts that are focused on wheelchairs and wheelchair seating (specificity); and 3) includes questions about body structure and function concerns, rather than focusing only on participation outcomes.

We believe the new tool will provide a vital and unique component of measurement that will contribute in a complimentary manner to a comprehensive approach to outcome measurement that is necessary in the field of assistive technology.⁴¹ The tool will potentially enable evaluation and comparison in trials of the efficacy and effectiveness of new wheelchair systems that are introduced into the marketplace, as well as other research applications.

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Interaction of Concepts ICF 2001

Figure 1.
The ICF

Table 1

Description of Study Participants

Pseudonym	Description (for prescribers this includes their profession, location of work, and the clientele for whom they usually prescribe. For wheelchair users, this includes their primary diagnosis and place of residence)	Wheelchair Type (Power, Manual or both)	Experience with Wheelchair (Years)	Age (Years)
Prescribers				
Rachel	Residential Care, OT	Power	8	34
Zack	Residential Care, OT	Both	20	43
Adam	SCI, Acute Care, OT	Power	10	37
Sarah	MS, OT	Both	5	37
Christine	Rehab, SCI, OT	Both	3	30
Cassandra	Residential Care, OT	Both	9	31
Yvonne	Varied, PT	Both	21	46
Margaret	Varied, OT	Power	8	42
Deanna	Varied, OT	Both	22	45
Erin	Seating Clinic, OT	Both	11	35
Mindy	Residential, OT	Both	6	33
Monica	Seating Clinic, PT	Both	30	50
Sylvia	Varied, OT/PT	Both	22	47
Wheelchair Users				
Elaine	MS, community	Power	20	60
John	MS, community	Both	5	45
Thomas	CP, community	Power	18	23
Leah	CP, group home	Power	28	34
Allison	SCI, rehabilitation centre	Both	0.5	26
Mitch	MS, residential	Both	10	82
Jack	SCI, community	Both	4	36
Mona	Trauma, community	Manual	10	40
Samuel	SCI, community	Both	35	52
Jonathan	AKA, community	Manual	5	44
Tania	CP, community	Both	30	34
Leo	COPD, community	Power	2	64
Nancy	SCI, community	Both	5	36
Doris	Progressive Neuromuscular, residential	Both	21	51
Associates of Wheelchair Users				
Lenore	Worker, Group Home	Both	26	58
Amy	Worker, TBI, Group Home	Manual	8	40
Nellie	Mother of Group Home Resident with TBI	Manual	22	68
Peter	Father of Group Home Resident, TBI	Manual	22	70
Leanne	Manager, Group Home for individuals with	Manual	20	47

Pseudonym	Description (for prescribers this includes their profession, location of work, and the clientele for whom they usually prescribe. For wheelchair users, this includes their primary diagnosis and place of residence)	Wheelchair Type (Power, Manual or both)	Experience with Wheelchair (Years)	Age (Years)
	TBI			
Henry	Wheelchair Developer	Manual	22	*
Lena	Wife of Leo	Power	2	68

Notes: COPD= chronic obstructive pulmonary disease, TBI = traumatic brain injury, CP = cerebral palsy, MS = multiple sclerosis, SCI = spinal chord injury

* Not included to protect anonymity of respondent