Development, validation, impact of a suite of outcomes tools to give triangulated data on the appropriateness of wheelchairs designed for use in low-income settings

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Introduction

Research directly comparing different health-related interventions is essential to confirm that the goals of those interventions are achieved. Laboratory studies involving task wheelchair use to ISO standards are an important part of the picture, but they are incomplete. Direct feedback from people involved in wheelchair use and provision is of key importance [1,2]. Collecting data over time places a heavy load on busy clinicians. A tool that is going to be of real use must be brief and simple to use. Outcomes tools which are not wheelchair specific are necessarily vague. Studies designed to produce data suitable for parametric statistical such as analysis of variance (ANOVA) are known to be more likely to discern meaningful differences as are mixed methods studies which include qualitative as well as quantitative data [3]. High variation among wheelchair users presents a challenge. A wheelchair user with a very strong upper body may be able to roll farther and more quickly in almost any chair on any surface than the wheelchair user who relies in a wheelchair with fixed legs which limit their ability to control the chair. We found no study in which one participant uses a wheelchair with fixed legs and second with active legs. Further, a recent wheelchair types include small wheelchairs designed for use in low-resource settings. We felt we could provide meaningful data on four topics: Is it broken? Does it roll well? Does it suit its user? Is the user satisfied? To that end, 4 outcomes tools were developed. Visual analogue scale (VAS) format questions were used to produce data suitable for ANOVA. To provide a shared understanding of the rating scale, emoticons were used as anchors underneath the visual analogue line. Each VAS question also solicited an explanatory qualitative comment (Figure 1). Each outcome could be completed in a short time period. Each was designed to provide a snapshot of function at one moment in time. Validation studies have been published covering construct validity and reliability. Comparative studies on different wheelchair types also have been published. The tools are very briefly described below in the order of their development. For more information, related research publications are available at www.atcatalyst.org. The tools are available open source on the same website.

Wheelchair Components Questionnaire (WCQ): The WCQ addresses the “Is it broken?” topic. It is a professional report tool for wheelchair professional to assess the maintenance condition of a wheelchair. The WCQ does not require the tracking of repairs over time and is brief with only eight questions. Questions are written to relate wheelchair regions to regions of the human body so that all questions can be completed for almost all wheelchairs in use. Figure 1 is a question from the WCQ [8,9,10]

Wheelchair Interface Questionnaire (WIQ): The WIQ addresses the “Does it suit its user?” topic. Therapists with wheelchair experience and training are the population most able to answer this question. The WIQ provides a moment in time assessment based on informed professional opinion on the quality of the interface between individual users and their wheelchairs. Because of the difficulties in interacting with non-verbal wheelchair users, or small children, or those who only speak a mother-tongue, interaction with the wheelchair user is encouraged but not required [2,7].

Wheelchair Satisfaction Questionnaire (WSQ): The WSQ addresses the “Are the users satisfied?” topic. It collects data on a wheelchair user’s satisfaction with their own wheelchair at a given moment in time. This tool has 16 questions that cover satisfaction with regions of the wheelchair supporting different body regions. It also includes questions on other aspects of satisfaction with a wheelchair [1,11].

Results

The AMT and the WCQ (see methods for acronyms) were the first two outcomes tools to be developed, and these have been used in several comparative studies [4,6]. There were responses on the part of the wheelchair companies whose wheelchairs had been involved in studies. Free Wheelchair Mission modified the attachment of footplates on their Gen 2 wheelchair. A designer who had been working with Hope Haven, has indicated that our study results were a key factor in his development of the concepts behind the BeeLive wheelchair innovative. Wheelchairs for Kids modified the design of their lateral trunk supports and castor bearings. Several manufacturers indicated that problems revealed in our studies had been due suppliers providing inadequate parts; for example, Whirlwind altered the subcontractor for the caster material when our study revealed failure of castor wheel material. The WIQ and WSQ have recently finished final validation [1,7].

Discussion and Conclusion

Responses to our studies indicate that our goal of providing feedback specific enough to spark positive change in wheelchair design and provision was met. For a full picture of the function of a wheelchair or wheelchair type, it is helpful to be able to answer four questions: is it broken? Does it suit its user? Does it roll well? Is the user satisfied? The first two are completed by wheelchair professionals, the last two by wheelchair users. All are wheelchair specific and are designed so that feedback is explicit enough to spark beneficial changes to the design of wheelchair parts. To provide useful functional information, all are mixed methods design including qualitative explanatory comments along with quantitative data. All four outcomes tools can be used successfully in studies on specific types or makes of wheelchairs, they can be used to improve local wheelchair services.

Works cited