

# DEVELOPMENT OF A WHEELCHAIR MAINTENANCE TRAINING PROGRAM AND WHEELCHAIR MAINTENANCE QUESTIONNAIRE

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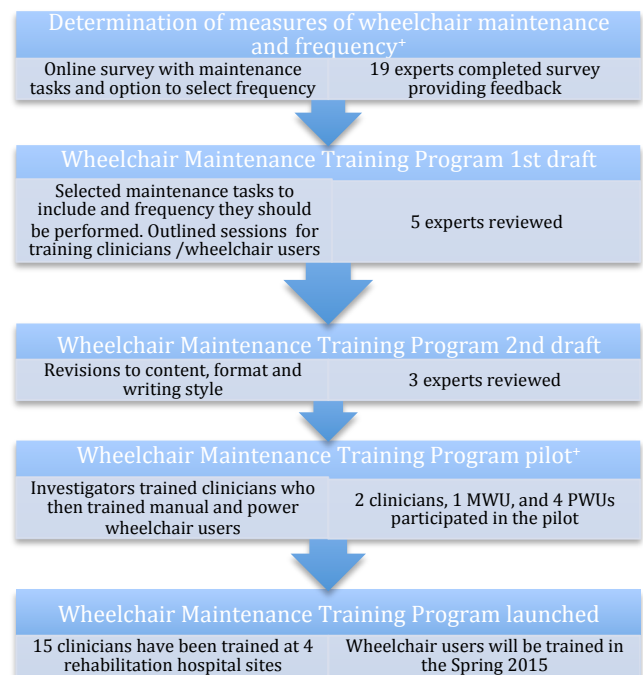
## INTRODUCTION

In the United States (US), approximately 3.6 million non-institutionalized people older than 15 years of age use wheelchairs (Brault, 2012). For this population, access to an appropriate wheelchair is an important step towards participation in society (World Health Organization, 2008). Therefore, wheelchair related problems, such as breakdown, can have a negative impact on wheelchair users (Mann, Hurren, Charvat, & Tomita, 1996). Poorly maintained wheelchairs have been linked to an increased risk of breakdowns, injuries and increased costs of care (Calder & Kirby, 1990; Kirby & Ackroyd-Stolarz, 1995; Toro, Garcia, Ojeda, Dausey, & Pearlman, 2012; Ummat & Kirby, 1994). Studies have found an increase in the number of wheelchair users with spinal cord injury who report at least one wheelchair breakdown in the past 6 months (McClure et al., 2009; Toro, Pearlman, Oyster, & Boninger, 2014; Worobey, Oyster, Nemunaitis, Cooper, & Boninger, 2012). In addition, wheelchair users have been stranded, injured and have missed school and medical appointments due to these wheelchair breakdowns (McClure et al., 2009; Toro, Pearlman, Oyster, & Boninger, 2014; Worobey, Oyster, Nemunaitis, Cooper, & Boninger, 2012). Research indicates that wheelchair maintenance performed by occupational therapists reduced the number of accidents and injuries for wheelchair users (Hansen, Tresse, & Gunnarsson, 2004). The World Health Organization (WHO) also suggests that performing regular maintenance and servicing of wheelchairs could improve their reliability (World Health Organization, 2008). Based on the evidence of increasing breakdown frequency, the associated consequences and the benefits of maintenance, there is a need to increase the number of wheelchair users and caregivers who receive training in wheelchair maintenance (World Health Organization, 2008). Therefore, the goal of this project was to develop a maintenance training program to increase the number of manual wheelchair users (MWUs) and power wheelchair users (PWUs) who can benefit from improved maintenance.

## METHODS

### Wheelchair Maintenance Training Program

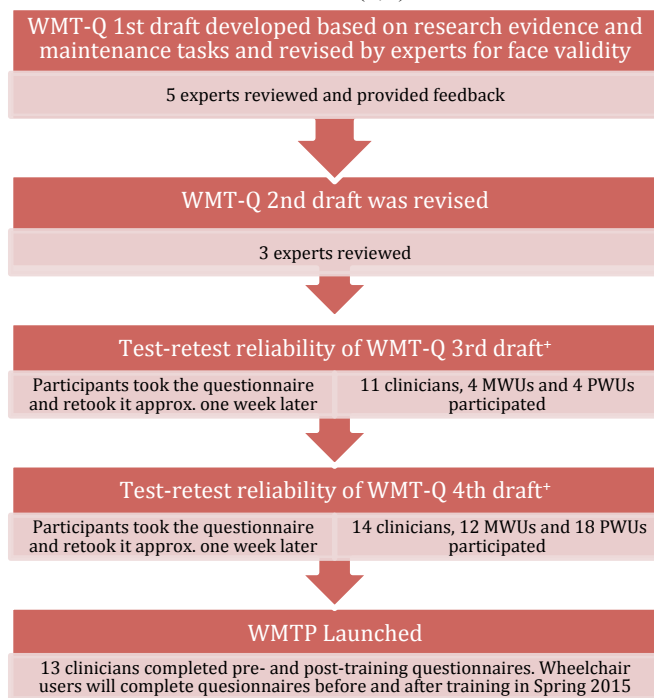
The initial draft of the Wheelchair Maintenance Training Program (WMTP) was based on a list of inspection and action maintenance tasks found in existing resources on wheelchair maintenance such as websites and books (Cooper, 2013; Denison, 2006; Khasnabis & Mines, 2012; Koontz, NA). The training materials were developed iteratively through expert advice and feedback (**Error! Reference source not found.**). The WMTP's content, timing, and format was revised for each iteration according to expert feedback. The experts consisted of wheelchair users, wheelchair technicians and seating and mobility clinicians. Materials were developed for two purposes: 1) to train clinicians on how to train wheelchair users (i.e. training of trainers) and 2) for use by clinicians to educate wheelchair users (and caregivers when applicable). Materials included power point presentations, videos, checklists, reminders cards, and a clinician's reference manual.



**Figure 1.** WMTP Iterative Development. \*Indicates study approved by the University of Pittsburgh IRB

### Wheelchair Maintenance Training Questionnaire

In addition, three versions of the Wheelchair Maintenance Training Questionnaire (WMT-Q), a knowledge-based wheelchair maintenance questionnaire, were developed for the follow groups: clinicians, MWUs, and PWUs. These questionnaires were developed to evaluate whether the training impacted the knowledge of wheelchair maintenance and frequency of wheelchair maintenance performance among clinicians and wheelchair users. Each questionnaire had three sections: open-ended questions about what maintenance should be performed, a multiple choice section about research evidence and best maintenance practices, and capacity and performance questions regarding whether the clinicians/wheelchair users know how to perform specific maintenance tasks and if so, how often they perform it (Mountain, Kirby, & Smith, 2004). Figure 2 shows the iterative process for evaluating test-retest reliability measures of the three questionnaires. Iterations of the questionnaires revised content, format, and writing style. The test-retest reliability was calculated for the total score of each section using the two-way mixed consistency model intra-class correlation coefficient ICC(3,1).



**Figure 2.** WMT-Q iterative process development. <sup>+</sup>These studies were approved by the University of Pittsburgh IRB.

The WMT-Q was launched in the summer of 2014. As of December 2014, two investigators from the University of Pittsburgh have trained 15 clinicians at four sites in the US. Clinicians provided feedback on the training they received. The WMT-Q clinician version was administered before training and then approximately one week after training. The Wilcoxon sign ranked test was used to

explore if there were significant differences in scores before and after the training.

## RESULTS

Table 1 contains each training material component and a brief description. Overall the training was found useful, relevant, understandable, easy to tolerate, and enjoyable. Positive comments from trainees included: “Now I am more comfortable with what to look for and what can be handled. Very well detailed and constructed.” Clinicians’ suggestions were to emphasize the importance of the use of the appropriate tools while tightening bolts and nuts as well as to include a checklist to guide the hands-on activity for wheelchair users. Both were implemented into the materials. Test-retest reliability of the WMT-Q’s sections is shown in Finally, we are working on disseminating this training program further. For instance, we are adapting it into an online training program that will be tested in 2016. In addition, the manual wheelchair portion of the training is also being translated to Spanish and adapted to the Mexican context. It will be launched in the Spring 2015.

Table 3 shows the scores for clinicians on the questionnaire. There was a significant increase in capacity score ( $p=.005$ ), multiple choice maintenance knowledge score ( $p=.005$ ), and in the manual wheelchair maintenance open ended question score ( $p=.007$ ). However, there was no significant difference between pre- and post-training scores for power wheelchair maintenance open ended questions.

**Table 1.** Materials that comprise the WMT-Q

Material	Description	When is it used?
Clinician Training Power Point Presentation	Guide to train clinicians on how to train wheelchair users to perform maintenance	During clinicians’ training
Clinician reference manual	Handed out to the clinicians during training. Includes detailed guidance on how to deliver the training to MWUs and PWUs	Clinicians use it to prepare for and during wheelchair users’ training
WMT-Q power point presentation (MWU & PWU versions)	Used by clinicians to train wheelchair users on how to perform maintenance on their wheelchair	During wheelchair users’ training
How to care for a wheelchair at home video (MWU & PWU versions)	5 minute video that demonstrates how to complete maintenance tasks	During wheelchair users’ and clinicians’ training

Wheelchair Maintenance Reminder Cards (MWU & PWU versions)	Given to the wheelchair users at the end of the training as reference material	During wheelchair users' training
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**Table 2.** WMT-Q test-retest reliability for each sub score.

WMT-Q	ICC(3,1)		
	Open-ended	Multiple choice	Capacity/performance
Clinicians	.783*	.876*	.856*
Manual wheelchair users	.482 <sup>^</sup>	.579 <sup>+</sup>	.707 <sup>+</sup>
Power wheelchair users	.625 <sup>+</sup>	.770*	.507 <sup>+</sup>

\*p<.001; <sup>+</sup>p<.05; <sup>^</sup>p>.05

**Table 3.** WMT-Q pre-training and post-training scores for clinicians.

	Pre-training Mean (IQ)	Post-training Mean (IQ)
Manual wheelchair open ended	26.8 (19.6) <sup>^</sup>	51.8 (25.0) <sup>^</sup>
Power wheelchair open ended	28.1 (21.9)	50.0 (43.0)
Multiple choice	56.8 (26.1) <sup>^</sup>	84.1 (28.4) <sup>^</sup>
Capacity	48.4(48.4) <sup>^</sup>	100 (0) <sup>^</sup>

<sup>^</sup>p<0.007

## DISCUSSION

The WMTP is a “living” program that will continue to improve based on the experience that is gained during the implementation. The WMT-Q test-retest reliability has significantly improved throughout the iterations and has reached an acceptable level for most sections. The questionnaires also have the potential to be translated and validated for use in different countries and contexts. The significant increase in WMT-Q score suggests that clinicians had increased knowledge of wheelchair maintenance following the training.

Future work will investigate whether the clinicians who have received training can effectively train wheelchair users. This cohort of trained clinicians is expected to train MWUs and PWUs who have a non-progressive spinal cord injury in Spring 2015. The impact of this training program on wheelchair users will be evaluated. We will investigate whether the training improved the knowledge of wheelchair maintenance as well as if it resulted in a reduction in wheelchair breakdowns and the related consequences. In addition, future work could evaluate clinicians at later follow-up time points to assess if they have retained the knowledge and if the frequency at which they are teaching or encouraging their clients to perform maintenance has increased.

Finally, we are working on disseminating this training program further. For instance, we are adapting it into an

online training program that will be tested in 2016. In addition, the manual wheelchair portion of the training is also being translated to Spanish and adapted to the Mexican context. It will be launched in the Spring 2015.

### ACKNOWLEDGEMENTS

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