Research Utilization Support and Help (RUSH) Project

Effect of a web-based training program on practice patterns for professionals recommending manual wheelchairs.

Final Report
December 10, 2008

Laura Cohen PT, PhD, ATP
&
Stephen Sprigle PT, PhD

Georgia Institute of Technology
Center for Assistive Technology and Environmental Access (CATEA)
Atlanta, Georgia

I. Executive Summary

BACKGROUND & PURPOSE: Keeping up with the rapid pace of change in the healthcare system and the development of technology has dictated that clinicians learn about ways to improve quality of care over the course of their careers. Yet there has been little study of the association between the process of rehabilitation education and quality care. The objective of this study is to measure the utilization of web-based rehabilitation research training by measuring short- and mid-term impacts on knowledge and attitudes of clinicians. In particular, this study examines the effect of a web-based training (WBT) program on clinician *knowledge* of manual wheelchair technology, and *attitudes* towards practice for professionals recommending seating and wheeled mobility equipment. Furthermore, building on our previous work we compare the effectiveness of a two-day traditional continuing education (TCE) program and a WBT program.

METHODS: A web-based training (WBT) intervention tailored for clinicians responsible for recommending manual wheelchair technologies was designed synthesizing "best practice" and "state of the science" research literature pertaining to seating and mobility for manual wheelchair users. A pretest-post test design with control group was employed using a convenience sample (39 WBT, 28 Control). Two measures designed to detect change in clinical knowledge, and attitudes were administered before, after and 6 months following the intervention. The control group completed the knowledge measure at time of initial contact, and 6 months later. Historical data with a sample of 89 TCE subjects were used to compare the effectiveness of delivery methods (traditional vs. web based training).

RESULTS: A significant improvement in Knowledge scores was seen immediately after and 6 months following WBT. Changes in Knowledge scores over time were different in the WBT group compared to the TCE group ($p = .000$, partial $eta^2 = .060$) indicating that the two training methods did not result in similar changes in Knowledge scores. However, both had a net result of increased Knowledge scores. Between group differences were significant for pretest ($p=.009$) and posttest ($p=.011$) but not follow-up. There was no interaction between changes in attitude across groups for the Confidence, Independence and Leadership domains. The lack of an interaction indicates that attitude changes were similar across training methods indicating WBT as an equally effective means of training. The WBT group reported greater feelings of Independence and Leadership but no change in Confidence or Resourcefulness.

CONCLUSIONS: WBT resulted in positive changes in Knowledge over time. WBT also had a positive impact on the attitude domains of Independence and Leadership. Comparison between WBT and TCE indicated that both offer comparable benefits but the TCE had a little greater impact on attitude changes. Overall, evidence suggests that WBT has utility as a knowledge transfer mechanism.

II. Introduction

The literature provides little guidance to identify the most effective way to train professionals and limited evidence about whether or not training has an effect on practice patterns or patient outcomes. This *Knowledge Transfer Model* project explored the effectiveness of a web-based training program (WBT) on *knowledge and attitudes* of professionals responsible for recommending manual wheelchairs for individuals with mobility impairments.

Training is an important aspect of all Rehabilitation Engineering Research Centers (RERCs). Educational programs are a common way used to disseminate knowledge acquired through research. A challenge faced by RERCs is the incorporation of research results into clinical practice. Results of rehabilitation research often do not reach frontline professionals to influence practice patterns and client/patient outcomes. Since RERCs are focused on a specific area of rehabilitation research, centers are challenged to train clinicians and other stakeholders about the current state of science with the intent that new knowledge and skills will result in improved clinical outcomes.

This research project (RUSH-WBT) extends the Mobility RERCs dissemination and training activities to include the study of utilization of rehabilitation research training. RUSH-WBT accomplishes this by measuring short- and mid-term impacts on *knowledge and attitudes* of clinicians who prescribe wheeled mobility.

A substantial deliverable from our previous RUA project (RUSH-TCE) was an evidence-based curriculum designed to interpret and relate current seating and manual mobility research to daily clinical practice using a face-to-face traditional continuing education (TCE) program. In accordance with the Best Practice Knowledge Transfer Model, we leverage this work. The Mobility RERC translated the evidence-based curriculum into a web-based training (WBT) program, designed for greater continuance and broader reach. RUA support enabled the study of the impact and effectiveness of the web-based training approach and the ability to build on our previous work to compare the effectiveness of a two-day traditional continuing education (TCE) program and a WBT program.

This final report discusses the research activities that were implemented to meet the two specific aims and the results of the project. The report concludes with a discussion of future implications.

III. Specific Aims

The objective of RUSH-WBT is to measure the utilization of web-based rehabilitation research training by measuring short- and mid-term impacts on knowledge and attitudes of clinicians. This project builds on our previous work by examining the effectiveness of a WBT program; and comparing the effectiveness of a WBT program with a TCE training program. Specific Aims for the utilization research were:

Specific Aim 1:

Compare the effects of training on knowledge and attitudes using measurements taken before, immediately after and 6 months following a WBT program.

Specific Aim 2:

Demonstrate the effectiveness of WBT compared to TCE training.

IV. Training Intervention

The training program was specially designed synthesizing "best practice" and "state of the science" research literature pertaining to seating and mobility for manual wheelchair users. Program content was founded in an established body of literature pertaining to manual wheelchair configuration, durability, wheelchair propulsion biomechanics, wheelchair mechanics and seating and posture.

A. Web-based Training Curriculum

The Mobility RERC translated our two-day evidence based training curriculum developed for a traditional continuing education course for our previous RUA project to an interactive web-based program. The course, entitled *Evidence-Based Manual Wheelchair Prescription & Practice,* is comprised of 14 modules.

* Module 1: Introduction
* Module 2: Pre-test
* Module 3: Team Roles & Responsibilities
* Module 4: Evaluation and MAT Assessment
* Module 5: Manual Wheelchair Features and Terminology
* Module 6: Postural Stability and Pressure
* Module 7: Wheeling
* Module 8: Optimizing Wheeling
* Module 9: Putting it All Together
* Module 10: Training
* Module 11: Documentation
* Module 12: Scoop on Funding
* Module 13: Post-test
* Module 14: In Closing

The web-based course was designed to address several modes of learning in order to provide significant experiences for each participant. By design, modules included didactic content, critical thinking discussion points, homework assignments (some with an experiential activity), and a unit posttest. The didactic section of each module synthesized and presented current research and the lab session of select modules applied the research to clinical practice. The homework assignments provide the participant a way to take the information into the clinical setting. We wanted to teach participants to be good consumers of technology. Homework assignments actively required participants to compare and contrast products, a skill needed for any exhibit hall. This type of activity was used to facilitate knowledge organization for specific technologies and appropriate applications. Likewise, critical thinking skills were used to work out problematic case examples. As learning linked to clinical practice is the basis for this program, clinical examples were used to provide exposure to "real-life" situations. Role reversal was also used to facilitate learning and included the participant acting as a third party reviewer responsible for approving or denying a manual wheelchair request based on documentation

provided. Online course materials included program goals, objectives, and course notes. A summary and extensive bibliography of manual wheelchair research was provided, as well as suggested reading, resources and additional references.

B. Training Utilization Model

A model of training utilization that draws on the Research Utilization Support and Help (RUSH) model *Best Practice Knowledge Transfer Model* was used. The overall aim of this training utilization model is to facilitate the transfer of knowledge and best practices among service providers with clinical responsibilities for wheeled mobility recommendations, but limited professional training and continuing education opportunities in this content area. We hypothesized that exposure to scholarly research and "best practices" would translate into change in knowledge, attitudes and behaviors among service providers affecting utilization outcomes.

In addition, we draw on elements of other RUSH Utilization models. Consistent with the *Collaborative Support Model*, we partnered with professional organizations such as RESNA, NRRTS, APTA and AOTA to promote this specialty web-based curriculum designed for their members. And, in accordance with the *Knowledge Synthesis Model*, web-based training materials summarizing state of the science evidence-based literature as applied to daily practice is made available to stakeholders for further use and distribution. Training materials are made available via website access to increase range for broader dissemination impact; and manuscripts describing the outcome of the educational effectiveness research are planned for peer-reviewed publications.

C. Evaluation Criteria

The upper levels of Kirkpatrick's hierarchy for assessing training effectiveness were the foundation for developing two measures. Specifically, we were interested in learning how clinical practices recommending and specifying manual wheelchairs for clients with mobility impairments change following an educational training program.

Kirkpatrick's level 2 (knowledge) was the basis for developing the Knowledge Questionnaire. A 15-question multiple-choice test assessing knowledge of empirical research and "best practices" as related to manual wheelchair applications was administered before (Pretest), immediately after (Posttest), and 6 months following the WBT program (Follow-up). The WBT Knowledge Questionnaire included eight questions that were used during study of the two day educational program. These like items were used to compare the effects of the WBT and TCE course formats.

A Manual Wheelchair Practice Questionnaire was used to explore Kirkpatrick's level 3 (transfer). This level is intended to measure the transfer that has occurred in a learner's attitudes due to a WBT program. Evaluation at this level attempts to answer the question, "Is the newly acquired attitude being used in everyday clinical practice?" Questions were asked about recommending and specifying manual wheelchair equipment and the attitudes towards practice while doing so. Items were grouped into four domains: Independence, Confidence, Leadership, and Resourcefulness. We explored whether changes in these four domains could be detected immediately following the web-course intervention and, if so, whether or not a change persisted 6 months afterward.

V. Study Enrollment

A total of 40 subjects were consented and enrolled in the RUSH-WBT study and 39 completed the study. One subject withdrew from the study due to personal reasons. Historical data from the 26 control subjects from the RUSH-TCE study were used for control group comparisons.

Similarly, historical data collected in the RUSH-TCE project were used for between subject analyses. Subjects were categorized by 4 groups.

- From the WBT Project
    1. WBT Cohort was followed for 6 months after the intervention (n=39)
- From the TCE Project
    2. Utilization Cohort represents subjects followed for one year (from 6 months before to 6 months after the intervention) (n=37)
    3. Conference Only Cohort represents subjects followed for 6 months after the intervention (n=52)
    4. Control group represents subjects followed for 6 months with no intervention (n=26)

For the purposes of the final analysis the Utilization Group and Conference Only Cohort were combined to represent the TCE group (n=89). Table 1 provides a demographic summary by group and Table 2 shows group designation and timing of interventions and study measures.

Table 1: Demographic summary by group

	Util. Cohort		Conf. Only		TCE		WBT		Control	
N	37		52		89		39		26	
Gender										
Female	32	86%	43	85%	75	84%	33	85%	24	92%
Male	5	14%	9	17%	14	16%	6	15%	2	8%
Occupation										
PT	31	84%	39	75%	69	78%	20	51%	26	100%
OT	6	16%	9	17%	15	17%	18	46%	0	0%
PTA	0	0%	1	2%	1	1%	1	3%	0	0%
OTA	0	0%	4	8%	4	4%	0	0%	0	0%
Other prof.	2	5%	1	2%	3	3%	3	8%	0	0%
Degree(s) earned										
BS	29	78%	34	65%	62	70%	30	77%	16	62%
MS	14	38%	20	38%	34	38%	16	41%	12	46%
MS Advanced	7	19%	4	8%	11	12%	6	15%	2	8%
Clinical Doctorate	1	3%	2	4%	2	2%	9	23%	3	12%
Advanced Doctorate	1	3%	1	2%	2	2%	1	3%	0	0%
PhD	1	3%	1	2%	2	2%	0	0%	0	0%
Other Degree	5	14%	8	15%	13	15%	0	0%	1	4%

Table 2: Group designations and timeline of measurements

		6 month pre	Immediately PRE	INTERVENTION	Immediately POST	6 month follow up
		Time 0	Time 1		Time 2	Time 3
	WBT		DKM		KM	KM
TCE	Utilization Cohort	DKM	KM		KM	KM
	Conference- Only Cohort		DKM		K	KM
	Control Group		DKM			KM

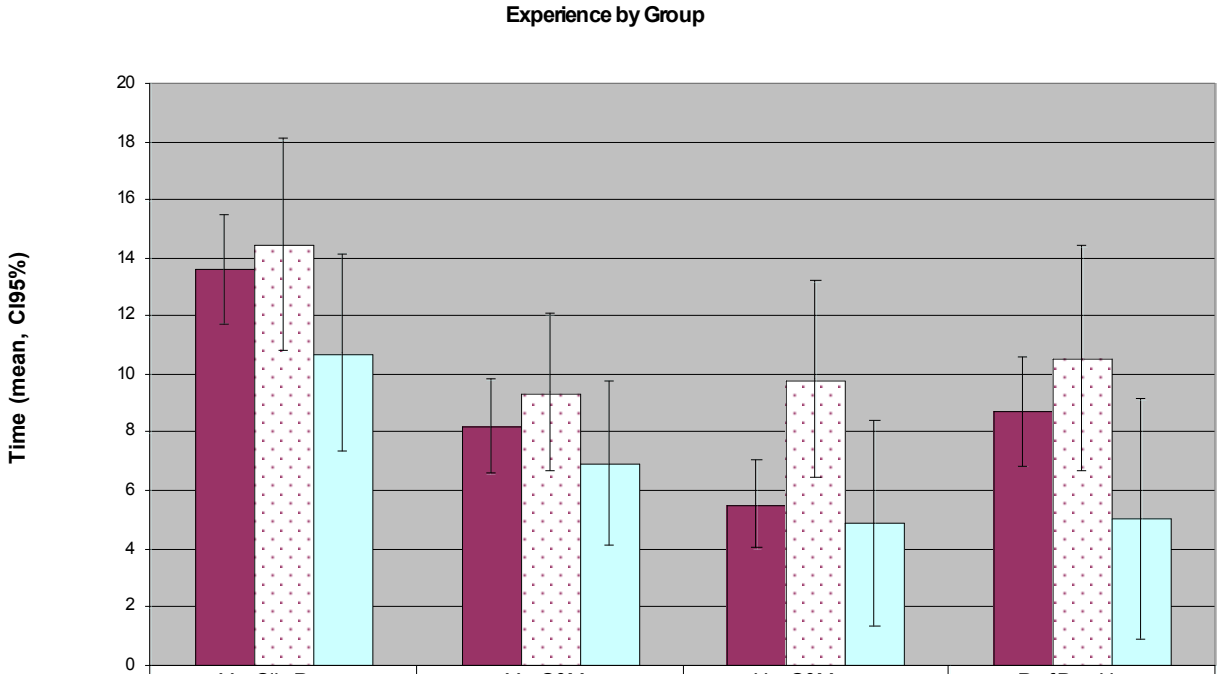
* Note: WBT= Web-based Training, TCE= Traditional Continuing Education. TCE comprised of Utilization Cohort followed for 12 months and Conference-Only Cohort followed for 6 months. D= Demographic Questionnaire, K= Knowledge Questionnaire, M= Manual Wheelchair Practice Questionnaire

VI. Group Demographic Results

Figure 1 shows there were no statistically significant differences between the WBT, TCE or control groups for years of clinical practice, years of seating and mobility, hours of seating and mobility service or professional development hours. All three groups averaged over 10 years of clinical service. The largest difference in the groups was in the number of hours per week providing seating and mobility services. Although not significant, the WBT group performed an average of 9.8 hours whereas the TCE group performed 5.5 hours.

Results did show a significant difference in major occupations (PT vs. OT) between the TCE and WBT groups (χ^2=11.55, p<.001) with a more even distribution of physical therapists (PTs) and occupational therapists (OTs) in the WBT group. We do not expect this difference in professional distribution to influence group comparisons for the purposes of this study. There are recognized regional differences in practice; in some regions PTs are responsible for seating and mobility service provision and in other locations OTs are the lead providers. The WBT course has representation from 19 states whereas the TCE program represents only 6 states perhaps accounting for the difference in professional distribution.

Figure 1: Experience summary by group



	Yrs Clin Prac	Yrs S&M	Hrs S&M ser	Prof Dev Hrs
TCE	13.61	8.20	5.54	8.71
WBT	14.44	9.38	9.82	10.56
Control	10.73	6.94	4.88	5.02

Note: Yrs Clin Prac= years of clinical practice, Yrs S&M= years of seating and mobility, Hrs S&M ser= hours of seating and mobility service, Prof Dev Hrs= hours of professional development.

VII. Results and Discussion

A. Knowledge Scores of WBT, TCE and Control Groups

Hypothesis 1: Training participants will demonstrate a significant improvement in knowledge score as measured by a Knowledge Questionnaire compared to a Control group.
Hypothesis 2: WBT participants will demonstrate no significant improvement in Knowledge score compared to a TCE training group as measured by a Knowledge Questionnaire.

As indicated in Table 2, Knowledge of WBT and TCE participants was measured before (Pretest), immediately after (Posttest) and 6 months following a WBT program (Follow-up). Control subject Knowledge was measured twice over a 6-month span corresponding to the Pretest and Follow-up timeframes.

1. Results and analysis

Knowledge test results are reported in four sections: 1) comparing WBT and Control groups using the 8 questions offered to both Groups, 2) comparing WBT and TCE groups using the 8 questions offered to both Groups comparing, 3) WBT results over time using the full 15-item questionnaire, and 4) influence of Pre-test Knowledge levels.

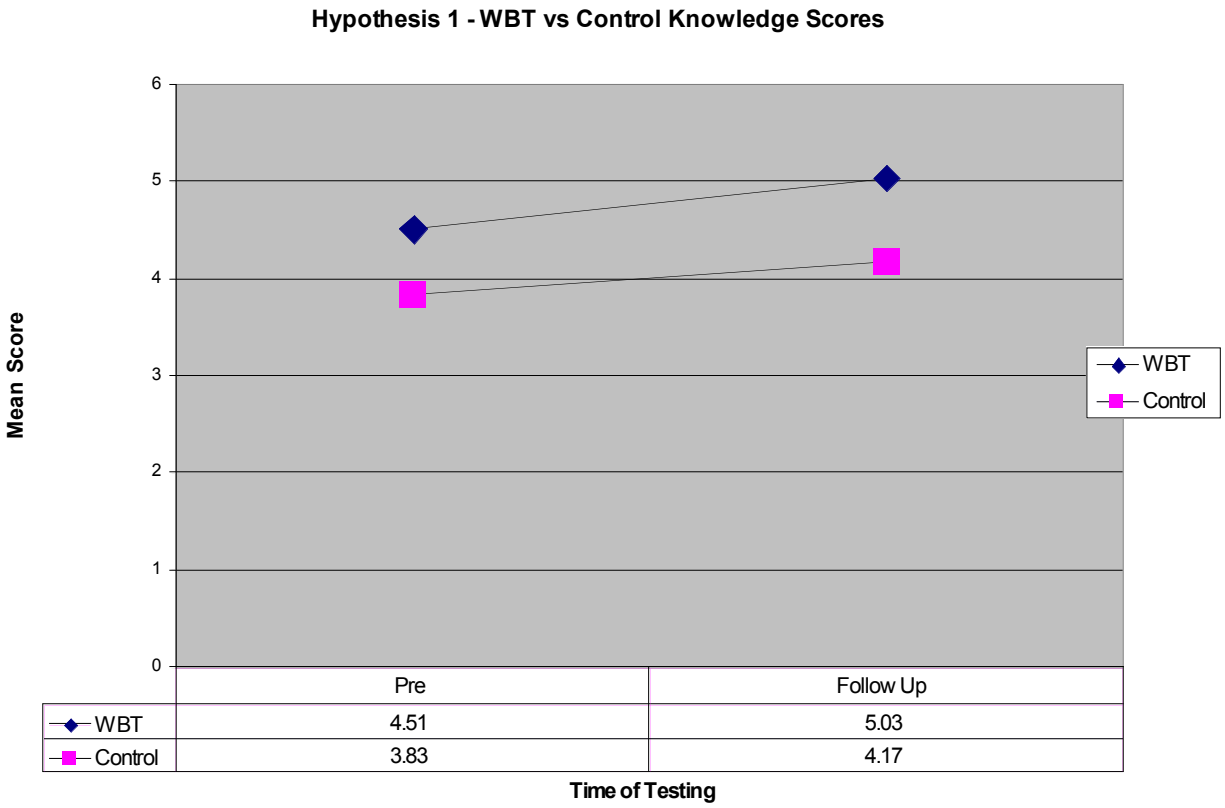
Analyses of Knowledge scores for the utilization cohort found no significant change in Knowledge scores leading up to the training (from 6 mo before training to Pretest). Similarly, the control group showed no significant change in Knowledge scores over a 6 month period. These results indicate that score improvement was not due to time or practice with the test.

WBT and Control Groups

The results of a repeated measures ANOVA showed no interaction between Group (Control and WBT) and repeated Knowledge test scores (Pre-test and 6 month Follow-up), (partial Eta squared of .003 and observed power of .070). (Figure 2)

These results indicate that changes in Knowledge scores over time did not vary across the WBT and Control Groups. In fact, as illustrated in Figure 2, both groups showed a similar response over time when considering the same 8 items.

Figure 2: Hypothesis 1



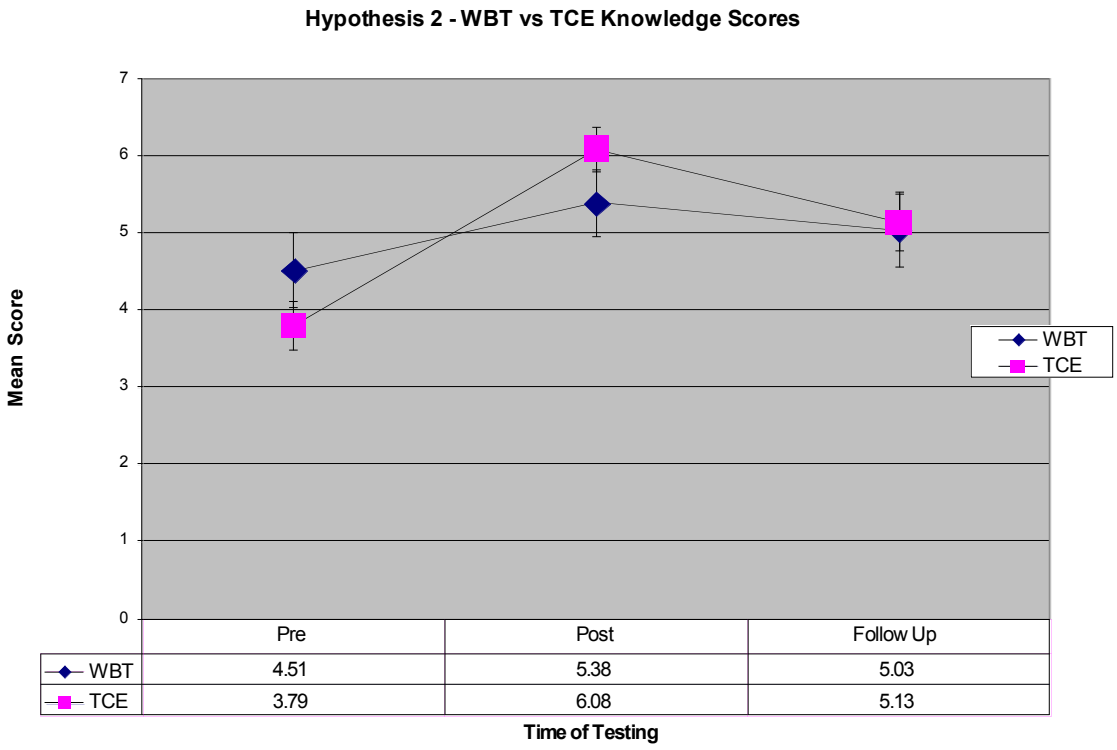
WBT and TCE Groups.

A repeated measures ANOVA indicated that the interaction between Knowledge scores over time and Groups (WBT and TCE) was significant (Figure 3). Changes in Knowledge scores over time differed across Groups (F=8.108, df=2, p=.000, partial Eta Squared=.060, Observed power=.957).

Between group differences were significant for Pretest (F=1.701, df=86.080, p=.009) and Posttest (F=.154, df=72.750, p=.011) but not Follow-up (F=1.394, df=82.235, p=.700).

These results indicate that changes in Knowledge scores over time were different in the WBT group compared to the TCE group. In other words, the two training methods did not result in similar changes in Knowledge scores, but both had a net result of increased Knowledge scores.

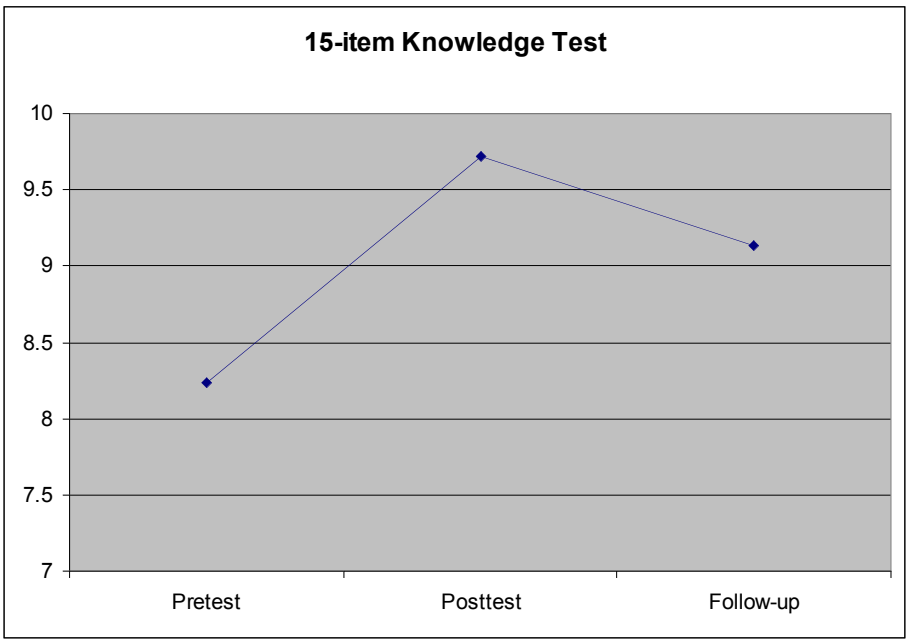
Figure 3: Knowledge scores from WBT and TCE



Full WBT Knowledge test. The results of a repeated measures ANOVA for the 15-item Knowledge test showed differences in scores over time (df=2, F=10.203, p=.000, partial Eta squared= .212 and observed power of .984). Posttest and Follow-up test scores were higher than Pretest scores. Follow-up scores showed a decreasing trend compared to Posttest values (p=0.055).

These results indicate WBT course effectiveness concerning Knowledge acquisition. The possible decrease in Knowledge from Posttest to Follow-up indicate that WBT participants appeared to show a decrease in Knowledge over this time period.

Figure 4. Knowledge scores from the 15-item test taken by WBT participants



Influence of Pretest Scores. Pretest Knowledge scores for all groups correlated significantly with Pretest-Posttest improvement (-0.697, df=128, p<.001) and with Pretest-Follow up improvement (-.645, df=128, p<.001). The negative correlations indicate that higher Pretest Knowledge scores were associated with smaller improvement. No ceiling effect for the Knowledge test was found.

A possible confounding factor is differences in pre training Knowledge associated with the composition of the Control and TCE groups versus the WBT group. The WBT group started the training with a higher Knowledge level than either of the other groups (Figures 2 & 3). Although not statistically significant, the hours of seating and mobility services provided per week differed between groups; the WBT group performed an average of 9.8 hours whereas the TCE group performed 5.5 hours and the Control group only 4.8 hours (Figure 1). Group differences in practice exposure perhaps accounts for the initial difference in Knowledge levels between groups. This difference may impact changes in Knowledge scores over time and would, therefore, artificially dampen the apparent effectiveness of the WBT.

B. Changes in Attitude of WBT and TCE Groups

Hypothesis 3: WBT participants will demonstrate no significant improvement in self-reported attitude scores compared to a TCE training group as measured by the Manual Wheelchair Practice Questionnaire.

Hypothesis 4: Training participants will demonstrate a significant improvement in self-reported attitude scores as measured by the Manual Wheelchair Practice Questionnaire, between Pretest & Posttest; Pretest & 6-month Follow-up test, and Posttest and Follow-up test.

The MWC Practice Questionnaire assessed attitude in four domains: Confidence, Independence, Leadership and Resourcefulness. WBT participants took the questionnaire at the Pretest, Posttest and Follow-up time periods. (Table 2). Attitude data of the TCE participants was collected at these three periods within the Utilization cohort only (n=37). The Conference-only group (n=52) only took the Manual Wheelchair Practice Questionnaire twice. Control subjects reported attitudes twice representing the Pretest and Follow-up time periods. Graphs of attitude scores are contained in Figures 4-7.

Because individual items on the Manual Wheelchair Practice Questionnaire survey had such divergent scales, they were normalized against their maximum possible scores for the purposes of analysis. Normalized attitude scores did not show significant interaction between scale domains meaning that this questionnaire performed as designed.

Results and analysis

Attitude scores from the Control group within all four domains were not different between Pretest and Follow-up ($P>0.3$).

To study the interaction between WBT and TCE interventions, General Linear Models were configured for each domain. Domain scores represented the within subject dependent measures and Group (WBT and TCE) comprised the between subject factor. Individual ANOVA for the WBT group combined with Tukey analysis was used for post-hoc comparisons of each timeframe and significance reported for $p<0.05$. Analysis of the TCE group concentrated on the Pretest and Follow-up comparison.

Confidence: No significant interaction
TCE group: Follow-up > Pretest WBT: no change over time
TCE positively impacted Confidence better than WBT

Independence: No significant interaction;
TCE: Follow-up > Pretest WBT: Follow-up> Posttest>Pretest
WBT and TCE impacted Independence in a similar manner. WBT participants reported higher Independence attitudes after 6 months than they did prior to and immediately following training.

Leadership: No significant interaction
TCE: no change over time ($p=0.089$) WBT: Follow-up >Pretest & Follow-up> Posttest
WBT participants reported greater Leadership attitudes after 6 months compared to attitudes prior to and immediately following training.

Resourcefulness: Significant interaction ($p<0.019$)
TCE: Follow-up > Pre WBT: trend toward changes over time ($p=0.053$) but no significant change between Pretest and Follow-up
TCE exhibited a more positive influence on Resourcefulness than WBT. WBT participants did not report any change in attitude from Pretest to Follow-up