ORIGINAL ARTICLE

Reliability and Validity Analysis of the Transfer Assessment Instrument

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ABSTRACT. McClure LA, Boninger ML, Ozawa H, Koontz A. Reliability and validity analysis of the Transfer Assessment Instrument. Arch Phys Med Rehabil 2011;92: 499-508.

Objectives: To describe the development and evaluate the reliability and validity of a newly created outcome measure, the Transfer Assessment Instrument (TAI), to assess the quality of transfers performed by full-time wheelchair users.

Design: Repeated measures.

Setting: 2009 National Veterans Wheelchair Games in Spokane, WA.

Participants: A convenience sample of full-time wheelchair users (N=40) who perform sitting pivot or standing pivot transfers.

Interventions: Not applicable.

Main Outcome Measures: Intraclass correlation coefficients (ICCs) for reliability and Spearman correlation coefficients for concurrent validity between the TAI and a global assessment scale (0–100 visual analog scale [VAS]).

Results: No adverse events occurred during testing. Intrarater ICCs for 3 raters ranged between .35 and .89, and the interrater ICC was .642. Correlations between the TAI and a global assessment VAS ranged between .19 (P=.285) and .69 (P>.000). Item analyses of the tool found a wide range of results, from weak to good reliability. Evaluators found the TAI to be safe and able to be completed in a short time.

Conclusions: The TAI is a safe, quick outcome measure that uses equipment typically found in a clinical setting and does not ask participants to perform new skills. Reliability and validity testing found the TAI to have acceptable interrater and a wide range of intrarater reliability. Future work indicates the need for continued refinement including removal or modification of items found to have low reliability, improved education for clinicians, and further reliability and validity analysis with a more diverse subject population. The TAI has the potential to fill a void in assessment of transfers.

Key Words: Outcome Assessment (health care); Rehabilitation.

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PEOPLE WITH MOBILITY impairments who are full-time wheelchair users perform transfers frequently to complete basic activities of daily living, such as getting in and out of bed or on and off a tub/shower seat, commode, and motor vehicle seat. Transfers, along with wheelchair propulsion, weight relief, and overhead reaching, have been identified as key activities leading to the development of shoulder pain and injury.[1] Pain and overuse injuries are significant, leading to increased health care expenses, limitation in activity, depression, decreased societal participation, and a reduced quality of life.[2] In a survey of 130 persons with spinal cord injury, 65% reported that pain interfered with their ability to transfer.[1] Transfer skills are also important to a wheelchair user's safety. Between 1973 and 1987, 8.1% of falls (reported to the U.S. Consumer Products Safety Commission) were related to transfers.[3] Research on wheelchair-related accidents found that performing sideways transfers without a board was one of the factors associated with increased risk of accidents and falls.[4]

Persons first requiring full-time use of a wheelchair typically participate in some form of rehabilitation therapy in which education is provided on how to perform an appropriate, safe, and efficient transfer. Obtaining independence with transfers is typically a top goal of both patients and therapists because transfers are needed to perform many critical functional activities. Even with such an emphasis placed on transfers, there is wide variation in the amount and type of training provided[5] and no uniform way to evaluate transfer quality. Observation by a therapist and qualitative assessment is the standard method of evaluating transfers. Research on clinical assessments has found that subjective evaluations are less precise than objective measurement tools.[6] Currently there is no validated tool to assess the quality of transfers and to identify where improvements are needed.

The purpose of this study was to investigate the safety, feasibility, validity, and the intrarater and interrater reliability of the TAI, a newly developed outcome measure to assess transfer quality.

METHODS

Description

The TAI was designed to be used by clinicians to evaluate transfer quality and a patient's adherence with best transfer techniques. The instrument assesses conservation of upper-limb function, safety, and how well people can direct caregivers to assist them with a transfer, if necessary. Initial items on the TAI were based on CPG recommendations,[7] review of current transfer literature,[8] and techniques that have been successfully used in the clinic. The tool is set up to evaluate

List of Abbreviations

CPG	clinical practice guideline
ICC	intraclass correlation coefficient
NVWG	National Veterans Wheelchair Games
TAI	Transfer Assessment Instrument
VAS	visual analog scale

independent transfers, modified independent transfers (with the use of assistive devices, including transfer boards), human-assisted transfers, and dependent transfers (using only human assistance or human assistance and a lift.) The TAI is made up of 2 parts. In part 1, a transfer is broken down from start to finish into small components, and the persons is evaluated on each of these small components. Part 2 evaluates the person's global performance on quality, conservation techniques, safety, and direction of care.

The tool is intended to be used by clinicians (typically occupational and physical therapists) who instruct full-time wheelchair users on transfer skills and have been trained to use the outcome measure.

Development

During a literature review of transfers to develop the CPG for preservation of upper-limb function after acute spinal cord injury,[7] no measurement tool was found to evaluate transfer skills and performance objectively. Researchers concluded that an outcome measure was necessary to determine whether wheelchair users were following the recommendations described in the CPG. The TAI was developed in a similar manner to the Wheelchair Skills Test,[9,10] Berg balance test,[11] and dynamic gait index,[12] which are all clinically useful and highly reliable outcome measures. Tool development and content validity was established via focus group meetings with an interdisciplinary expert panel of rehabilitation professionals with either experience in teaching transfers or personal experience because of disability. This team worked to reach consensus on the items and the domains considered essential for a global measure of transfer construct: (1) preparing for the transfer (eg, setup of the wheelchair with respect to the target surface), (2) use of conservation techniques (eg, alternating leading/trailing arm, using handgrips when appropriate), and (3) quality of the transfer (eg, smooth and controlled, avoiding impingement positions when weight-bearing). The results of the focus group were compiled, and the 2-part scoring protocol was developed.

Scoring

The tool is divided into 2 portions. The first section has 17 items and scores participants on a categoric scale of yes/no/not applicable. An answer of yes equals 1 point, no equals 0 points, and "not applicable" items are removed. All items are added together, multiplied by 10, and averaged, and a score from 0 to 10 points is obtained. The second, 12-item portion is scored on a Likert scale ranging from 0 (strongly disagree) to 4 (strongly agree). Similar to the first section, all applicable items are added together, multiplied by 2.5, and averaged, and a score from 0 to 10 points is obtained. The 2 scores are averaged, and 1 final score is reported (range, 0–10).

$$\frac{\text{Total score: part 1} \times 10}{\text{No. of applicable items}} + \frac{\text{Total score: part 2} \times 2.5}{\text{No. of applicable items}} = (\text{Score}/2) = \text{Final score}$$

The same scoring sheet is used for both manual and power wheelchair users.

Refinement

Initial reliability and validity were tested on 1 study participant as she performed 4 transfers. The reliability of each portion of the tool was evaluated separately; therefore, a range of ICCs is reported. Results yielded weak to acceptable intrarater reliability (ICC, 1.00–.369) and interrater reliability (of 4 raters) (.601–.271). From the initial reliability evaluation and feedback from clinicians and researchers, refinements were made to improve the tool. Changes were integrated into the current version of the tool shown in appendix 1.

Subject Recruitment and Screening

Reliability testing of the TAI was performed at the 2009 NVWG. Potential study participants were approached at random by study investigators and asked to participate. Persons who were willing to participate signed an informed consent document approved by the Veterans Association, Pittsburgh Health System institutional review approval board. Each participant met the following inclusion criteria: (1) between 18 and 110 years of age, (2) used a wheelchair for more than 40 hours a week, (3) English-speaking, and (4) free of open pressure ulcers. We included participants with all types of impairments that required full-time wheelchair use.

Testing Protocol

General demographic information and the type of transfer the person performed were recorded. Participants performed either a standing pivot transfer, in which the person stands up, takes 1 to 2 small steps, and sits on the target surface; or a sitting pivot, in which the person remains in a sitting position and places 1 hand on the surface that the person is transferring to and 1 hand on the surface that the person is currently sitting on. The buttock is lifted and moved to the new surface. Study participants were then asked to transfer from their own wheelchair to a mat table. Participants were told that if they needed assistance, they could ask either their caregiver or 1 of the study raters (a licensed physical therapist) to help. Transfer devices were allowed, if needed. Participants performed up to 4 transfers depending on activity tolerance. One transfer was considered moving in 1 direction either from a wheelchair to a height-adjustable, soft mat table or from the mat table to the wheelchair. As the participant was performing the transfers, 4 physical therapists (with 6–12 years of experience) evaluated the transfer. Three of the therapists used the TAI, and 1 rated participants with a global rating scale. Study participants returned 4 to 72 hours later and performed the transfer portion of the protocol again.

Data Analysis

For each rater and individual item, descriptive statistics were calculated, and the distribution of items was examined to evaluate potential floor/ceiling effects. Items with low/high means, small SDs, and small variances were considered to have a floor/ceiling effect. ICCs were calculated to determine intrarater reliability of each rater and interrater reliability of all 3 raters in both sessions for each item. ICCs were also calculated for each part of the TAI and the total score to determine the intrarater reliability of each rater and interrater reliability of each session. A priori, based on previous studies evaluating reliability, we decided that an ICC greater than 0.8 indicated good reliability, 0.6 to .79 was acceptable, .40 to .59 was moderate, and less than .39 was weak.[12,13] Spearman rank correlation coefficients were calculated to determine the correlation of each rater's total TAI scores with a global assessment of the transfers in session 1 (the global assessment was completed only in session1). The global assessment evaluates the quality of the transfer on a single 100-mm VAS reflecting the global quality of each transfer. The VAS was anchored by 0 (poor transfer) and 100mm (excellent transfer).