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ORIGINAL ARTICLE

Impact of the Clinical Practice Guideline for Preservation of Upper Limb Function on Transfer Skills of Persons With Acute Spinal Cord Injury

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Abstract

Objectives: To describe the development of a strict education protocol to implement the clinical practice guideline "Preservation of Upper Limb Function Following Spinal Cord Injury" into a clinical setting, and evaluate the effect of the protocol on transfer quality.

Design: Randomized controlled trial.

Setting: Acute Model Spinal Cord Injury Systems rehabilitation facility and community.

Participants: Volunteer sample of full-time wheelchair users (N=70) with new spinal cord injuries randomized (1:1) to an intervention and standard-of-care group.

Intervention: The intervention group was educated on transfer skills with a structured protocol implemented by a physical and occupational therapist who were extensively educated on the clinical practice guidelines and current transfer research. The standard-of-care group received standard therapy services.

Main Outcome Measures: Comparison of transfer quality evaluated by the Transfer Assessment Instrument at 4 time points during first year after injury.

Results: No significant differences were found between study groups. Secondary analysis based on type of transfer performed found that participants in the intervention group who performed assisted sitting pivot transfers performed higher-quality transfers (mean ± SE: 9.43±.55) compared with the standard-of-care group (mean ± SE: 7.81±.46) (P=.026) at 1 year after discharge. Also, participants who performed a dependent transfer had a higher average score across all 4 time points (mean ± SE: 9.14±.34) compared with the standard-of-care group (mean ± SE: 8.09±.29) (P=.019).

Conclusions: For participants who perform assisted or dependent transfers, use of an evidenced-based, structured education program during acute inpatient rehabilitation has the potential to significantly improve the quality of transfers. Further follow-up testing is necessary with a larger sample size to determine the long-term effects.

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As a result of paralysis caused by spinal cord injury (SCI), full-time wheelchair users must perform transfers to complete common but essential activities of daily living such as getting out of bed and into the shower or a car.[1-3] On average, a manual wheelchair user will perform between 14 and 18 sitting pivot transfers a day.[2,4,5] Because of their vital importance and frequent execution, transfers are a key element to an active and productive life. If a full-time wheelchair user is unable to transfer, or transfers become more difficult and painful because of upper extremity impairments, the individual's quality of life may become impaired.[6]

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Unfortunately, upper extremity impairments are very common among wheelchair users. Thirty-one percent to 73% of wheelchair users report some type of upper extremity pain, impairment, or both during their lifetime,[2,7-10] which may begin as soon as 2 to 3 months after injury. Of 169 people in an acute rehabilitation facility, 55% reported shoulder pain.[11] In the first 6 months after injury, 75% to 78% of individuals with tetraplegia and 35% with paraplegia reported nontraumatic shoulder pain.[1,12] While the etiology of shoulder pain is complex, and for persons with tetraplegia often has a neuropathic component, it is likely that overuse also contributes to the development of shoulder pain.

Previous research has found transfers to be one of the primary causes of upper extremity pain and impairments because of the application of high forces in a repetitive manner on a joint designed for mobility, not stability.[7] Ninety-two percent of wheelchair users reporting shoulder pain hypothesized that their pain originated from transfer activities and wheelchair propulsion.[13] Long-term wheelchair users reported that the highest levels of pain occurred when transferring to nonlevel surfaces, along with ascending a ramp, performing overhead reaching, and washing their back.[3]

Because of the importance of the upper extremity, even a minor impairment or injury can significantly impact a wheelchair user's ability to perform a transfer, limit independence,[1] and decrease quality of life.[7,14] Of individuals who report upper extremity pain, 26% state they need additional help with functional activities, and 28% report independence limitations.[15]

Because of the significant problems caused by upper extremity impairments, prevention of injury is necessary to preserve quality of life and prevent impairments.[16] Currently, available treatment options are limited and often ineffective because of the inability of wheelchair users to rest their upper extremity. Therefore, both clinicians and wheelchair users must understand the causes of and methods to prevent upper extremity impairments.[17] To educate clinicians, the clinical practice guideline (CPG) "Preservation of Upper Limb Function Following Spinal Cord Injury"[16] was developed by the Consortium for Spinal Cord Medicine and the Paralyzed Veterans of America (PVA). The intent of the CPG is to assist health care professionals when providing education to wheelchair users on upper extremity preservation methods by providing recommendations on proper performance of common activities, such as transfers and wheelchair propulsion. The CPG was extensively researched, peer reviewed, and published by the PVA in 2005.[16]

Despite the importance of transfers, there is wide variation in the amount and quality of training provided during acute inpatient rehabilitation.[18] The CPG helps to consolidate the research. However, previous studies[19-21] have found that in order to make substantial and lasting changes, clinicians and patients must be educated in a strict and structured manner. The purpose of this article is to describe the development of a structured education program to educate both clinicians and wheelchair users on best practices, and perform a randomized controlled trial to investigate the impact of structured education and strict adherence to the CPG recommendations on transfer skills and quality. We hypothesized that wheelchair users who are strictly educated on the CPG, the intervention group (IG), will have superior transfer skills compared with a standard-of-care group (SCG).

List of abbreviations:

ASP	**assisted sitting pivot**
AT	**assistive technology**
CPG	**clinical practice guideline**
ICC	**intraclass correlation coefficient**
IG	**intervention group**
ISP	**independent sitting pivot**
OT	**occupational therapist**
PT	**physical therapist**
PVA	**Paralyzed Veterans of America**
SCG	**standard-of-care group**
SCI	**spinal cord injury**
TAI	**Transfer Assessment Instrument**

Methods

A single-blind (investigator blinded to group assignment), randomized controlled trial was conducted at the University of Pittsburgh Medical Center Rehabilitation Institute in Pittsburgh, Pennsylvania. Study participants enrolled in the IG of the clinical trial were educated and evaluated on a variety of topics related to upper extremity preservation; however, for the purposes of this article we will focus primarily on the intervention affecting transfer skills.

After receiving approval by the University of Pittsburgh Institutional Review Board, new admissions to the rehabilitation institute were screened to determine if they were (1) between 16 and 110 years of age, (2) a first-time wheelchair user, (3) had a nonprogressive SCI with residual neurologic deficits, and (4) were anticipated to be a full-time wheelchair user. Participants also completed a modified Mini-Mental State Exam.[22] Those who scored below 17 out of 25 points were not invited to participate because they were potentially not able to learn the required skills. If a participant met all inclusion criteria and was agreeable to study participation, an informed consent approved by the University of Pittsburgh Institutional Review Board was signed. After enrollment, participants were randomly assigned to either an SCG or IG. Because of the impact of level of injury and sex on pain, a stratified randomization scheme was used to ensure an equal allocation of men and women and those with tetraplegia and paraplegia in each group. Instruction on transfer skills was provided to IG participants by a physical therapist (PT) and occupational therapist (OT) who followed a strict education protocol based on the CPG. Education was only provided during the inpatient, acute rehabilitation stay within standard treatment times.

CPG development

The strict protocol and corresponding education materials used by the IG clinicians were developed by a physiatrist, PT, and OT who were familiar with the CPG and practice in the field of SCI rehabilitation. Two sets of materials were developed, one for the IG clinicians and the other for IG study participants. The development team evaluated past guideline implementation methodologies and used effective techniques.[20,21] The primary factors the team focused on included identification of specific barriers hindering guideline implementation[23] and ensuring that the education materials had sufficient details and were formatted in an easily digestible manner. A full description of the materials used by the PT and OT is described in McClure and Boninger.[24]

The transfer educational materials used by the IG PT and OT as part of the research study are available as an appendix (appendix 1: Clinician materials). These materials were designed specifically