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: 8.11±.46) 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.
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,2,7-14 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.15 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 studies19-21 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).

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 lower than 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 implementation23 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

List of abbreviations:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
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<tbody>
<tr>
<td>ASP</td>
<td>assisted sitting pivot</td>
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<tr>
<td>AT</td>
<td>assistive technology</td>
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<td>CPG</td>
<td>clinical practice guideline</td>
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<td>ICC</td>
<td>intraclass correlation coefficient</td>
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<tr>
<td>IG</td>
<td>intervention group</td>
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<tr>
<td>ISP</td>
<td>independent sitting pivot</td>
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<tr>
<td>OT</td>
<td>occupational therapist</td>
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<tr>
<td>PT</td>
<td>physical therapist</td>
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<tr>
<td>PVA</td>
<td>Paralyzed Veterans of America</td>
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<tr>
<td>SCG</td>
<td>standard-of-care group</td>
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<tr>
<td>SCI</td>
<td>spinal cord injury</td>
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<tr>
<td>TAI</td>
<td>Transfer Assessment Instrument</td>
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for clinicians and used medical terminology. Within the clinician education materials, treatment strategies are provided to assist in the implementation of the specific CPG recommendations. Separate materials (appendix 2: Patient materials) were developed for IG participants. These were developed for adults without medical education as a supplement to the clinician materials. IG participants were given the printed materials (with pictures) and a DVD showing transfer skills to take home. Clinicians were able to choose which materials to give to patients and only provided information that is specific to the individual’s needs. For example, patients who perform dependent transfers were not given materials on independent transfers. Clinicians may contact the corresponding author to gain permission to use the materials in a clinical setting. Participants in the SCG received standard instruction on transfer skills by PTs and OTs working on an inpatient SCI unit.

Transfer evaluation

The transfer skills of study participants were evaluated at 4 time points: (1) at the time of discharge from acute rehabilitation, (2) 6 weeks postdischarge, (3) 6 months postdischarge, and (4) 1 year postdischarge. Both power and manual wheelchair users were asked to complete up to 4 transfers, depending on the individual’s level of fatigue, to and from either a mat table or a hospital bed. A transfer is considered moving in one direction. The height of either the mat table or hospital bed could be adjusted, depending on the individual’s preference. If participants needed assistance to transfer, their primary caregiver was asked to attend the study visit. If unable to attend, the evaluator assisted. Participants were able to use any assistive technology (AT), such as transfer boards or transfer lifts, they required and use any technique preferred. Transfers were classified as follows:

1. Independent sitting pivot (ISP): The individual remains in a sitting position, places 1 hand on the surface he/she is transferring to, and 1 hand on the surface that he/she is currently sitting on. The buttock is lifted and moved to the new surface. No AT or human assistance is used.
2. Assisted sitting pivot (ASP): The individual performs a similar transfer as the ISP but requires human assistance (<100%), AT, or both.
3. Dependent transfer: Caregiver performs 100% of the physical work with or without the use of a transfer lift or other AT.

During the evaluation, participants who used human assistance were required to give instructions on how to perform the transfer to either their caregiver or the evaluator.

As participants transferred, the primary blinded evaluator used the Transfer Assessment Instrument (TAI), a newly developed outcome measure to assess transfer quality. A full description of the tool is described by McClure et al. Participants receive a score between 0 and 10, with 10 indicating a high-quality transfer. Participants are only evaluated on the quality of the transfer, such as hand placement or distance from the target surface, not how much assistance is given. Regardless of assistance provided or level of injury, all participants have an equal opportunity to score a 10. The TAI has been found to be moderately reliable, with an intrarater intraclass correlation coefficient (ICC) of .642 and intrarater ICC reliability ranging from .35 through .89.

Data analysis

General exploratory analysis was performed, and Shapiro-Wilks testing found the data to be normally distributed. Although the key variables are ordinal in nature, we used parametric statistics based on the findings of Norman. General descriptive statistics were calculated using SPSS version 19. A 2×3 mixed-effects model was performed using SAS 9.3. A customized Proc Mixed program was written to use all available data. Significance was set a priori at \( P = .05 \). No corrections were made for multiple comparisons because of small sample size.

Results

Demographics

Between March 2007 and December 2011, 70 study participants were enrolled and tested, with 32 randomly assigned to the IG and 38 to the SCG. The randomization flow chart in figure 1 shows the distribution of study participants and the number of participants tested at each visit. In addition to the participants who withdrew from the study, some participants were unable to complete the transfer aspect of the protocol because of medical complications including pressure ulcers or orthopedic impairments. These participants were not included in the data analysis for the particular visit.

There were no significant differences in demographic characteristics or type of transfer performed between groups, as shown in table 1.

Because of the acute nature of the study population, 35.7% of participants withdrew before study completion. The most common reason for withdrawal was due to death; 8.6% of all participants died, representing 24% of all withdrawals from the study. Study interventions were not associated with the death of participants, and the institutional review board was made aware of all incidents.

TAI scores

No significant interaction effects, between-subject or within-subject differences of TAI scores, were found between groups, as shown in figure 2A. Across all time points, the IG group had an average score \( \pm \text{SE of } 8.73 \pm .16 \), and the SCG had an average score \( \pm \text{SE of } 8.35 \pm .14 \) (\( P = .73 \)). The greatest difference between groups occurred at the 1-year visit in which the IG had an average score \( \pm \text{SE of } 9.15 \pm .37 \), and the SCG had an average score \( \pm \text{SE of } 8.25 \pm .34 \) (\( P = .078 \)).

Participants were then subdivided by type of transfer performed. No significant differences were found between participants who performed ISP transfers, as shown in figure 2B. A significant main effect difference was found for participants who performed an ASP transfer at the 1-year visit (fig 2C). The IG achieved an average score \( \pm \text{SE of } 9.43 \pm .55 \), and the SCG scored \( 7.81 \pm .46 \) (\( P = .026 \)). For participants who performed a dependent transfer, a main effect of group was found (fig 2D). Across all 4 time points, the IG had a higher average score \( \pm \text{SE of } 9.14 \pm .34 \) compared with the SCG score of 8.09 \pm .29 (\( P = .019 \)).

Discussion

The key findings of this study indicate that use of a structured education program on transfer skills during inpatient rehabilitation has an impact on the quality of transfers performed by participants executing ASP and dependent transfers compared with standard therapy.
Fig 1  Randomized controlled trial flow chart.

Fig 1

Randomized controlled trial flow chart.

Fig 1

Randomized controlled trial flow chart.
Percentages are percent of total participants.

Table 1  Demographic characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>IG (n = 32)</th>
<th>SCG (n = 38)</th>
<th>Total (n = 70)</th>
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<tbody>
<tr>
<td>Age (y)</td>
<td>47.38±15.2</td>
<td>45.8±18.0</td>
<td>46.5±16.7</td>
</tr>
<tr>
<td>Length of stay (d)</td>
<td>40.7±13.8</td>
<td>42.6±22.4</td>
<td>41.7±18.9</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>24 (75.0)</td>
<td>27 (71.1)</td>
<td>51 (72.9)</td>
</tr>
<tr>
<td>Women</td>
<td>8 (25.0)</td>
<td>11 (28.9)</td>
<td>19 (27.1)</td>
</tr>
<tr>
<td>Level of injury</td>
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<td></td>
</tr>
<tr>
<td>Paraplegia</td>
<td>18 (56.3)</td>
<td>25 (65.8)</td>
<td>43 (61.4)</td>
</tr>
<tr>
<td>Tetraplegia</td>
<td>14 (43.8)</td>
<td>13 (34.2)</td>
<td>27 (38.6)</td>
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<tr>
<td>Study status</td>
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<td></td>
</tr>
<tr>
<td>Completed</td>
<td>21 (65.6)</td>
<td>24 (63.2)</td>
<td>45 (64.3)</td>
</tr>
<tr>
<td>Withdraw</td>
<td>11 (34.4)</td>
<td>14 (36.8)</td>
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<tr>
<td>Reason for withdrawal</td>
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<tr>
<td>Death</td>
<td>2 (6.3)</td>
<td>4 (10.5)</td>
<td>6 (8.6)</td>
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<tr>
<td>Moved</td>
<td>2 (6.3)</td>
<td>2 (5.3)</td>
<td>4 (5.7)</td>
</tr>
<tr>
<td>Declined to continue participation</td>
<td>4 (12.5)</td>
<td>2 (5.3)</td>
<td>6 (8.6)</td>
</tr>
<tr>
<td>Ambulatory</td>
<td>2 (6.3)</td>
<td>4 (10.5)</td>
<td>6 (8.6)</td>
</tr>
<tr>
<td>Medical complications</td>
<td>1 (3.1)</td>
<td>2 (5.3)</td>
<td>3 (4.3)</td>
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<tr>
<td>Type of transfer performed</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>ISP</td>
<td>7 (21.9)</td>
<td>10 (26.3)</td>
<td>17 (24.3)</td>
</tr>
<tr>
<td>ASP</td>
<td>13 (40.6)</td>
<td>16 (42.1)</td>
<td>29 (41.4)</td>
</tr>
<tr>
<td>Dependent</td>
<td>12 (37.5)</td>
<td>12 (31.6)</td>
<td>24 (34.3)</td>
</tr>
<tr>
<td>Randomization</td>
<td>32 (45.7*)</td>
<td>38 (54.3*)</td>
<td>70 (100.0)</td>
</tr>
</tbody>
</table>

NOTE. Values are mean ± SD, n (%), or as otherwise indicated. Abbreviation: NA, not applicable. * Percentages are percent of total participants.

Impact on long-term upper extremity health

Performance of higher-quality transfers may have an impact on upper extremity health in the long-term, especially when combined with general education on upper extremity preservation techniques. Upper extremity health is particularly important for individuals affected by tetraplegia. Past research has found that persons with tetraplegia experience higher levels of pain compared with individuals with lower-level injuries.1,12,28 Of the participants evaluated, 20.7% of the ASP transfer group and 83.3% of the dependent group have tetraplegia. Further investigation of participants with tetraplegia found a significant main effect of group difference in which the IG had a higher average TAI score ± SE compared with the SCG (8.99±.26 vs 8.22±.25, P = .033) across all 4 time points. Evaluation and treatment of pain in persons with tetraplegia is extremely complex because of the interaction of both musculoskeletal and neuropathic pain. Although transfers are not the only cause of shoulder pain for persons with tetraplegia, proper performance may decrease the amount of musculoskeletal pain experienced. Silfverskiöld and Waters1 found that the functional impact of pain was much greater for persons with tetraplegia than for those with paraplegia. While methods to preserve upper extremity function are critical for all wheelchair users, those with higher-level injuries need to be particularly vigilant.

Transfer evaluation

The findings of this study also help to further validate utilization of the TAI in a clinical setting. The tool is able to detect significant differences between participants based on the type of education provided, thus indicating it is sensitive to changes in transfer performance. Along with a structured education protocol, the TAI is a critical component to improve overall transfer education. By objectively evaluating transfers, clinicians are able to improve the feedback they provide to patients during therapy sessions. The combination of a structured education protocol and an objective measurement system allows a clinician to provide detailed, evidenced-based education.

Study limitations

There are several limitations to consider with the study. Although we were able to recruit 70 participants, only 35 (50%) were evaluated at the 1-year study visit. While the large percentage of participants who withdrew the potential to bias study results, the reasons for withdrawal were not related to study interventions. In addition, there were no significant differences based on demographic characteristics between participants who withdrew and those who completed the study.

Another potential limitation to consider is the use of the TAI to measure transfer quality. Although this tool has been found to have moderate reliability, it is a new outcome measure that has not...
been extensively tested. The TAI, however, is the only outcome measure currently available to test transfer quality and the only objective way to compare study groups. Currently, the tool is being refined and additional reliability and validity testing conducted.29

Finally, there is a potential that the SCG clinicians were exposed to the standardized transfer education materials. The University of Pittsburgh is a leader in the field of upper extremity preservation research. Therefore, it is possible that the SCG clinicians have more awareness of the transfer education compared with other inpatient clinicians, and were providing this education to their patients. This would only minimize our findings. Greater differences may be seen at locations with less awareness of the CPG for preservation of upper limb function.

Conclusions

This single-blind randomized trial evaluated the quality of transfers of persons with SCI during the first year after injury. Results found that participants performing ASP and dependent transfers who received structured education during their inpatient rehabilitation stay performed higher-quality transfers compared with those who did not receive the education. The structured education may improve the ability of patients to learn proper transfer techniques and translate the information to their caregivers. While further testing is necessary to determine the long-term effects, this evidenced-based protocol has good potential to improve the education that is provided during acute inpatient rehabilitation, particularly for persons performing assisted transfers.

Suppliers

a. IBM Corp, 1 New Orchard Rd, Armonk, NY 10504-1722.
b. SAS Institute Inc, 100 SAS Campus Dr, Cary, NC 27513.

Keywords

Medical education; Rehabilitation; Spinal cord injuries; Wheelchairs

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Appendix 1 Clinician Education Materials

Module A: Transfer education

**Time frame:** This module will begin when different transfer techniques are introduced. This module will be ongoing during the patient’s rehab stay.

Instruct patient to:

**Setup phase**
- Educate the patient to set up the transfer as “easy” as possible.
  - Educate patients to set up their chair as close to the surface they are transferring to as possible. (The chair should be touching the surface.)
    - This will decrease the amount of shoulder flexion/abduction that patients must position their arm in to reach the surface.
  - Educate patients to position their chair on a 20° to 45° angle (between their chair and the surface they are transferring to).
    - This position will help to:
      - Put their shoulder in optimal alignment for the correct transfer position
      - Decrease the distance and amount of time they have a significant amount of weight on their shoulder

- Educate patients to position their chair in preparation for a transfer so they do not have to go over the rear wheel (ie, transfer in front of the rear wheel).
  - This will decrease the height patients must lift themselves during the transfer.
- If necessary, educate patients to remove their armrest or attempt to take it out of the way before they transfer.
- Educate patients to place their feet in the most stable position (on the floor if possible) before they transfer.
  - Explain to patients that their legs can support some of their body weight. This will decrease the amount of stress they put on their shoulders.
- Educate patients to make sure that they are sitting on the front two thirds of their chair (or close to the edge of the surface they are transferring from).
  - This will decrease the amount of distance and thus work they have to do to move from one surface to another.
- Hands are in a stable position before the start of the transfer.
- Push-off hand is close to the body.
- Leading hand is close to where they will be landing.

**Performance Criteria:** Patients will make every attempt possible to set themselves up for and execute a transfer that requires the least amount of skill and requires the least amount of strength to perform.

- Limit the number of transfers they perform with their shoulders in an internally rotated/abducted/flexed position.
  - Educate patients to keep their leading arm abducted approximately 30° to 45° when transferring. (Have patients attempt to align the shaft of their humerus with their glenoid fossa.)

**Performance Criteria:** Patients will limit the number of transfers that require an internally rotated (IR)/abducted (ABD)/flexed (Flex) shoulder position. Patients will not fully weight bear on the arm that is in an IR/Flex/ABD position.

- Avoid placing their hands on a flat surface when a handgrip is available.
  - Patients can use armrests on wheelchairs, the edge of the mat table/bed, armrests on chairs, the edge of a tub bench, or arm of a bedside commode.
  - If no handgrip is available, patients should keep their hand flat.
  - Be sure to educate patients that it is more important to maintain the proper shoulder position (keeping humerus in line with glenoid fossa), compared to reaching for an armrest further away.

**Performance Criteria:** Patients will avoid placing either hand on a flat surface when a handgrip is present during transfers.
Flight:
- Maintain forward trunk flexion during the transfer.
  - **Performance Criteria:** Patients will display a position of forward trunk flexion (trunk near parallel with the floor) during the weight-bearing portion of their transfer.

End:
- Stress the importance of performing a well-controlled transfer.
  - Hands are in contact with both surfaces at the end of transfer.

General:
- **Perform level transfers whenever possible.**
  - Educate patients to look for alternative surfaces to transfer to (not just the easiest place), or adjust the surface (if possible). Example: Adjust the height of their tub seat or bedside commode so they don’t need to perform an uphill transfer.
  - **Performance Criteria:** Patients will make educated choices to perform level or downhill transfers whenever possible.

- **Alternate leading/trailing arm** (ie, don’t always transfer with the right arm as the leading arm).
  - **Performance Criteria:** Patients will alternate right and left upper extremity as their leading/trailing arm and display alternative types of transfers.

- **Use transfer devices to decrease forces placed on the shoulder.**
  - Patients should still be taught to do transfers (if appropriate) without transfer devices to improve their independence. However, the benefits of transfer devices should be highlighted, and all patients should be taught to use transfer devices when convenient (ie, when they are at home and have the device readily available).
  - **Performance Criteria:** Patients will perform transfers with the use of transfer devices in the appropriate situation. Patients will also display good decision-making skills of when to use the transfer devices and what situations are the best to use that device.

Alternative education options
Overall, several studies have discussed the benefits of contextual interference. Contextual interference involves performing practice sessions that include many different concepts. For example, in one treatment session, you could teach your patient...
a bed-to-chair transfer, a sit to/from supine transfer, and wheelchair propulsion. Research has shown this random practice schedule will lead to improved retention of skills in the future. However, when using a random practice schedule, the time it will take the patient to learn the skill will be increased. A possible explanation for this phenomenon is that the patient must actively reconstruct an action plan before performing that action. When performing blocked practice, forming an action plan is often bypassed, and the patient will not retain the information as well. If your patient is having a significant amount of trouble, Winstein has found these other methods to be beneficial.

1. **Extrinsic/augmented feedback:** Sensory information provided by an external force. (Give a lot more assistance than necessary during the transfer so the patient can feel what the motion should be/guide the patient through the motion.)

2. **Mental practice:** If the patient is having particular difficulty with a certain skill, have the patient visualize that part of the transfers (or whatever activity they are doing).

3. **Part to whole practice:** If the patient is having trouble with one particular part of a transfer, have the patient perform different parts of the transfer and then link those parts together.

4. **Knowledge of results delay:** After the patient has been doing a transfer for awhile and getting immediate feedback, decrease the amount of feedback you are giving the patient. (Instead of telling patients how they did after every transfer, reduce feedback to every other transfer, etc.)

5. **Contextual variety:** Have the patient practice the transfers in areas (such as their room) where they are not necessarily focused on therapy.

**Patient Education Materials:**
- Do's and Don'ts of transfers document
- Video/CD of proper transfer techniques

**Module B: Transfer ergonomics**

**Time frame:** This module will begin when different the transfer techniques are introduced. This module will be ongoing during the patient’s rehab stay.

**Instruct patient to:**
- Avoid full wrist extension, when possible, during the weight-bearing portion of their transfers.
  - Emphasize the use of handgrips whenever possible. However, make sure that patients understand that handgrips should only be used when:
    - Patients do not have to move their humerus out of alignment with the glenoid fossa.
    - Patients do not have to reach outside their base of support.

- Avoid placing hand above shoulder when possible.
  - Limit number of floor-to-chair transfers.
  - Position items in home below shoulder level.

**Performance Criteria:** Patients will display correct use of handgrips in the proper situation as defined above.

- Keep arm close to body during transfers.
  - Minimize shoulder abduction/internal rotation/flexion.
  - Position the leading arm in 30° to 45° of abduction.

**Performance Criteria:** The patient will display a position in which the leading arm is positioned in approximately 30° to 45° of abduction, during the weight-bearing portion of the transfer. The patient will also avoid positions of shoulder internal rotation.

**Alternative education options:**
Knowles found that when educating adults with spinal cord injury, education was more effective if the patients had the following characteristics:

1. The patient perceived that the information was important.
2. The patient was ready to learn.
3. The patient took an active role in learning.
4. The instructor had a good insight into the individual’s past learning experiences.
5. The individual was motivated to learn.

**Module C: Dependent transfers**

Teaching your patients to instruct their caregivers on the proper way to perform a dependent transfer is a very important area of education. Studies have shown that 78% of individuals with tetraplegia experienced shoulder pain. One factor that has been associated with shoulder pain occurs when individuals are transferred incorrectly, particularly when caregivers are pulling on patients’ arms. Patients need to feel confident in their knowledge to instruct caregivers on the proper way to perform these transfers.

Your patients will experience many different types of transfers, and there is no way that you can go over every type of transfer they may encounter. However, the basic techniques of protection of the upper extremity during a dependent transfer should be mastered and then applied to other situations.

In addition to educating individuals who will perform dependent transfers, it is important that all individuals with a spinal cord injury understand the basic concepts of a good dependent transfer. They may find themselves in a situation some day that requires a dependent transfer. It is important that they understand the proper way for someone to assist them without hurting their upper extremity.

Below, a dependent supine to sit and sitting pivot transfer have been broken down into parts and key ideas listed for each stage of the transfer. Please educate your patients on how 1 and 2 people should be helping them with the transfer.

1. **Supine to sitting transfer**
   a. Preparing to move from supine to side lying
      i. Upper arm must be supported when it is crossed over their body.
ii. Raise the bed/table, if possible.

b. Rolling
i. Upper arm should be supported during rolling, and lower arm should be slightly flexed to prevent impingement.

ii. Instruct patients to be aware of their caregiver’s body mechanics, and give them feedback.

c. Upper arm should be supported while the caregiver brings the patient’s legs off the bed.

d. Moving from side lying to sitting
i. Let patients know that this will be a time that the caregiver will be very tempted to pull on their arm.
ii. At the same time, pull the upper body (with your hand under the patient’s shoulder) into a sitting position and push the patient’s hip into a sitting position (down and toward his/her feet).

e. Once sitting, the patient’s arms should be supported by pillows or on the patient’s lap.

2. Sitting pivot transfer
a. Use a gait belt if possible.
b. Place the wheelchair as close to the bed as possible at a 20° to 45° angle.

c. Try to make the chair lower than the bed.

d. Encourage your patients to again monitor their caregiver’s body mechanics and give them feedback.
e. Preparing for the transfer
i. Support the patient’s arms as much as possible before the transfer.

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Having your patient practice these skills multiple times with different people will help to improve your patient’s confidence. Before discharge, if possible, your patient’s caregiver should come in to practice performing the transfers.

**Performance Criteria:** The patient will be able to independently explain to a caregiver the proper way to perform a dependent transfer.

**Mechanical lift transfers:**
If your patients are going to be using a mechanical lift device to transfer from one surface to another, please educate them that they still must be aware of how to protect their upper extremity. Please educate your patients on the same steps for rolling to get positioned in the sling. Once your patients have the sling around them, make sure that their arms are crossed and not hanging out of the sling.

Please make sure that your patients incorporate these points into their transfers:

- Your patients should have a clear understanding that they should never allow their caregiver to pull on their arms.
- Your patients should be able to instruct their caregiver to set themselves up for the easiest transfer possible.
- Your patients should watch their arm position at all times to make sure it isn’t being put into a position that causes pain.
- Your patients should not “deal” with pain during a transfer—even if a little damage is being done to their upper extremity, it can lead to a lot of damage in the future.
- Your patients should make sure that their caregiver is always supporting their arms.
- Your patients should make sure that their caregivers are protecting themselves.

*If patients are going to a skilled nursing facility, it is extremely important that they understand that they will have to advocate for themselves!*

Here are some tips to give your patients on ways to advocate for themselves. They should:

- Become familiar with the staff members who will be assisting them, and the staff members’ job responsibilities.
- Educate the person who is transferring them on the method of transfer they would prefer.
- Pay attention to how they are being transferred. They should remember not to “deal” with being transferred incorrectly—even a little bit of damage can end up being significant over time.
- Write down specific examples of problems. This way when confronting their caregiver, they can give specific examples of what is wrong.
- If they have concerns with their caregiver, they should talk to the caregiver first. If nothing changes, they should find out who the caregiver’s supervisor is and speak with that person. They should make sure that they go through the proper chain of command.
- Be assertive, persistent, and respectful of the staff. They should remember that they are the consumer in this situation.
- Set up a meeting to discuss the problems. They should have their concerns ready and present them in an organized manner. This will show that they are serious about the situation.

**Performance Criteria:** Patients will be able to correctly direct their care in an assertive and polite manner.
Patient education materials:

- Dependent transfers (dependent patients only)


Appendix 2 Patient Education Materials

Transfer education

Setup phase

- Try to make the transfer as easy as possible.
  - Your chair should be as close to the surface you are transferring to as possible. (Ideally, the chair should be touching the surface.)
    - This will decrease the distance you have to travel.
  - Position your chair on a 20° to 45° angle (between your chair and the surface you are transferring to).
    - This position will help to:
      - Put your shoulder in the best alignment for the correct transfer position.
      - Decrease the distance and amount of time you have a significant amount of weight on your shoulders.
  - Position your chair so that you do not have to go over the rear wheel (ie, transfer in front of the rear wheel).
    - This will decrease the height you must lift yourself during the transfer.
  - If you have an armrest on your chair, take it out of the way before you transfer.
  - Place your feet in the most stable position (on the floor if possible) before you transfer.
    - Even if you do not have control of your legs, putting them in the proper alignment will provide a small amount of support and stability. Ultimately, this will decrease the amount of stress you put on your shoulders.
  - Sit on the front two thirds of your chair (or close to the edge of the surface you are transferring from).
    - This will decrease the amount of distance and work you have to do to move from one surface to another.
  - Place your hands in a stable position before the start of the transfer.
    - The hand that you will be pushing from is close to your body and holding onto a stable object.
    - Your other hand should be positioned close to where you intend to land.

- By this point, you should feel that you have positioned yourself to perform a transfer that will be safe and easy. If you do not feel this way, discuss alternative ways to set up your chair with your therapist.

- During the transfer, limit the amount of time that your shoulder is in an internally rotated/abducted/flexed position.
  - Your therapist will spend a significant amount of time teaching you the correct way to position your upper arm so that you do not damage your shoulder. Limit the amount of time that you spend during your transfer with either one of your arms lifted up and to the side along with being twisted inward. It is okay to position your arm in this manner, as long as you do not have a significant amount of weight on that arm.

- By this point, you should be able to describe the position of your arm that you want to avoid during transfers. In addition, you should ask your friends and family members to make sure that you are not placing your arm in this position when you transfer.

It is very important to have a good surface to push off of when performing a transfer. It is best for your wrist to use some type of a handgrip (if one is available).

- You can use the armrest on your wheelchair, the edge of a mat table/bed, chairs with armrests, the edge of a tub bench, or arm of a bedside commode.
- If no handgrip is available, place your hand flat on the surface you are transferring from.
- It is very important to maintain the proper shoulder position, compared to reaching for an armrest further away.

Try to Avoid

Using the head-hips relationship will make the transfer easier and thus decrease the amount of stress you are placing on your shoulders.

- Your flight should be smooth and well controlled.

End

- When you finish your transfer, you should feel that it was very smooth and well controlled.
  - Both of your hands should be in contact with both surfaces at the end of the transfer.

General

- Perform level transfers whenever possible.
  - Look for alternative surfaces to transfer to (not just the easiest place), or adjust the surface (if possible). Example: Adjust the height of your tub seat or bedside commode so you do not need to perform an uphill transfer.

- By this point, you should be able to make educated choices to perform level or downhill transfers whenever possible.
- Alternate your leading and trailing arm (ie, Don’t always transfer with the same arm leading the transfer. A lot of force is put on the trailing arm during a transfer. You want to make sure to alternate which arm is exposed to these higher forces).

- By this time, you should be making a conscious effort to alternate the direction you transfer. Ask your friends and family to remind you of this during your daily activities.
- Use transfer devices to decrease forces placed on the shoulder.
  - Even if you are able to do a transfer independently, it is still a good idea to use a transfer device for transfers that may be more difficult for you. In addition, if you are in a place that you can conveniently use a transfer device, it is a good idea to use one to give your shoulders and upper arms a break.
Dependent transfers

Learning how to tell someone how to transfer you is a very important part of preventing upper extremity pain. Even if you have a caregiver who has a good understanding of the proper way to perform a transfer or you can do most of the work yourself, you can still run into a situation where you need to be transferred by someone who does not know the proper techniques. You need to have the ability to easily explain to anyone how to transfer you in a manner that will protect you and the person who is transferring you.

Transfer techniques play a large role in the amount of upper extremity pain you experience. Studies have shown that 78% of individuals with tetraplegia experienced shoulder pain. One factor that has been associated with shoulder pain is when individuals are transferred incorrectly, particularly when caregivers are pulling on the individual’s arms.

There is no way that your therapist will be able to teach you how to transfer in every situation you will run into. However, once you are comfortable with the basic techniques, you can apply those techniques to other situations.

Below, a script has been prepared with key words you should say to your caregiver during transfers.

1. Lying on back to sitting transfer
   a. Raise the bed/table up as high as possible.
   b. To prepare to roll me onto my side, bend my legs up and cross my arm that is furthest from the edge over my body.
   c. Put one of your hands behind my knees and the other on my back (behind my shoulder). Your caregiver should NOT be pulling on your arm.
   d. Roll me onto my side in one fluid motion.
   e. If there are 2 people helping you, the second person should be behind you with 1 hand on your back (near your shoulder) and 1 hand by your hip. He/she can do the majority of the work to help roll you, while the person in front can protect your shoulder.
   f. Tell your caregiver: Please don’t pull on my arm.
   g. Scoot me over to the edge of the bed as much as possible, without making me feel that I am going to fall off the bed. When scooting me over, please get as close to me as possible. This position is best for your caregiver’s back. When reaching toward me, make sure that you bend your knees instead of bending at your waist.
   h. Your caregiver should move one section of your body at a time. (For example, move your shoulders, then move your hips and then your legs, then back to your shoulders, etc.) He/she should just move each section a little bit at a time.
   i. If 2 people are helping you, they should be working together to move each segment of your body.
   j. Bend my legs up to my chest. My knees should be bent at a 90° angle.
   k. Place 1 hand under my shoulder and your other hand under my knees.
   l. Move my knees so that the bottom part of my legs fall off the side of the bed.
   m. Move the hand that was under my knees to my hip bone.
n. At the same time, pull my upper body (with your hand under my shoulder) up to a sitting position, and push my hip into a sitting position (down and toward my feet). This will be the point when your caregiver will be most tempted to pull on your arm; don’t let him/her!
o. If 2 people are helping you, 1 person should be in front of you and the other person behind you, working together (with the same technique stated above) to sit you up.

p. Once I am in a sitting position, make sure you hold onto me!
  i. Position my arms in my lap so that they are not hanging down at my side.
  q. Move my legs into a stable position so that I can help as much as possible to remain sitting.

2. Moving from the bed to your wheelchair
a. Please use a gait belt on me! If you do not have a gait belt, you can put a sheet under my buttock.
b. Place the wheelchair that you are transferring me to as close to the bed as possible at a 20° to 45° angle to the bed.
c. Try to make sure the chair is lower than the bed.
d. Make sure that my feet are positioned on the floor, just slightly less than shoulder-width apart.

i. If 2 people are helping you, 1 person should be in front of you and the other person will position himself/herself between the bed and the surface you are transferring to. They will either hold onto the gait belt or under your buttock.
j. Once you have a good hold, shift your weight backwards and lift me up.
k. Once my buttock is off the bed, pivot to the chair.
l. When 2 people are helping you, the person behind you will assist the person in front to lift you up and pivot you to the chair.
m. Do not pivot more than 90°.

Practice these skills multiple times with different people to improve your confidence. Before you leave, make sure that you have practiced this transfer with your primary caregiver (if known!)

**Mechanical Lift Transfers**

If you are going to be using a mechanical lift device to transfer from one surface to another, you and your therapist should go over the steps for the specific device you will be using at home. In relation to protection of your upper extremity, you should follow the same steps for rolling to allow your caregiver to position your sling. Once you have the sling around you, you need to make sure that your arms are crossed and not hanging out of the sling.

**Summary:**
- Don’t let your caregiver pull on your arms.
- Have your caregiver set you up for the easiest transfer possible.
- Watch your arm position at all times to make sure it isn’t being put into a position that causes pain.
- Don’t “deal” with the pain during the transfer—even if a little damage is being done to your upper extremity, it can lead to a lot of damage in the future.
- Make sure your caregiver is always supporting your arms.
- Make sure your caregiver is protecting him/herself.

You NEED to feel comfortable being able to advocate for yourself!

**Here are some tips to effectively advocate for yourself:**
- Become familiar with staff members who will be assisting you and their job responsibilities.
- Educate the person who is transferring you on the method of transfer you would prefer.
- Pay attention to how you are being transferred. Remember, don’t “deal” with being transferred incorrectly—even a little bit of damage can end up being significant over time.
- Write down specific examples of problems. This way, when confronting your caregiver, you can give specific examples of what is wrong.
- If you have concerns with your caregiver, talk to your caregiver first. If nothing changes, find out who the caregiver’s supervisor is and speak with that person. Make sure you go through the proper chain of command.
- Be assertive, persistent, and respectful of the staff. Remember that you are the consumer in this situation.
- Set up a meeting to discuss the problems. Have your concerns ready and present them in an organized manner. This will show that you are serious about the situation.

**References**