

Improving the Safety of Patient Turning and Repositioning Tasks for Caregivers

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Current evidence demonstrates why turning and positioning patients in bed presents a serious occupational risk of musculoskeletal disorders for caregivers. Results of the laboratory study investigating a new method of turning and positioning patients in bed are presented. The study was designed to evaluate how this new method reduced the risk of occupational musculoskeletal disorders to caregivers and may improve outcomes for patients. [*Workplace Health Saf* 2014;62(7):268-273.]

Turning and positioning in bed is essential for immobilized patients to increase comfort, maintain skin integrity, enhance healing, and achieve care outcomes. When patients are immobilized for any reason and spend extended periods of the day in bed, frequent and proper position changes are beneficial to healing (Fletcher, 2005; Metzler & Harr, 1996). Clinical experience and research have demonstrated that immobility can adversely affect all body systems. For example, immobility decreases gastrointestinal and genitourinary activity, increasing risk of constipation, urinary stasis, and

fluid retention. Lack of mobility and extended periods in bed also result in diminished muscle tone, general weakness, fatigue, and venous stasis, which may lead to thrombophlebitis, pulmonary embolism, and reduced peripheral perfusion. Reduced peripheral perfusion, in turn, contributes to loss of skin integrity, particularly over bony prominences (Metzler & Harr, 1996; Vollman, 2010).

Recognizing the need for and value of turning and positioning immobilized patients, the protocol for progressive mobility is an essential part of care plans for patients in intensive care units. Progressive mobility is defined as a series of planned sequential movements beginning at the patient's current mobility with the goal of returning to baseline (Vollman, 2010). With more than 5 million individuals experiencing intensive care unit admissions each year, the short- and long-term complications of immobility and bed rest significantly affect morbidity, mortality, health care costs, and quality of life (Graf, Koch, Dujardin, Kersten, & Janssens, 2003; Vollman, 2010).

To achieve the care objectives for progressive mobility and enhance care quality, patients require frequent repositioning; however, this necessary repositioning activity can increase both the patients' and caregivers' risk for injury. For example, when patients are grasped under the axillae and then pulled toward the head of the bed, caregivers can compress patients' arteries and damage the brachial plexus (Metzler & Harr, 1996). Similarly, caregivers are often in awkward postures and at risk for overexertion when moving patients in bed, which can contribute to work-related musculoskeletal disorders. Research and clinical experiences have demonstrated that patient repositioning is one nursing task that exposes caregivers to a high risk of occupational injury.

INJURY STATISTICS

Historically, health care workers are at risk for suffering occupational musculoskeletal injuries. According to the U.S. Bureau of Labor Statistics, health care workers consistently rank above truck drivers, laborers, assemblers, and janitors for incidence of occupational injuries. Musculoskeletal disorders, specifically back injuries associated with patient handling tasks, are a major contributor to this injury prevalence. In nursing and personal care facilities, overexertion, specifically from lifting and moving patients, has been and continues to be a major contributor to work-related injuries. Reviewing available data

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from the U.S. Department of Labor, Bureau of Labor Statistics beginning in 2000 through the most recent data available illustrates the magnitude of this problem. The incidence rates calculated for overexertion as the cause of occupational injuries in nursing and personal care facilities were four times higher than the national average for all industries (U.S. Department of Labor, Bureau of Labor Statistics, 2000). These rates rank as the fourth worst when considering the hundreds of industries reporting information to the U.S. Bureau of Labor Statistics. In 2009, health care workers suffered 252 musculoskeletal disorders per 10,000 workers, the highest rate of musculoskeletal disorders for all occupational groups and more than seven times the national musculoskeletal disorder average rate for all occupations (U.S. Department of Labor, Bureau of Labor Statistics, 2009). Direct caregivers are still the work group most likely to experience musculoskeletal injuries. In 2012, musculoskeletal disorders for health care workers were responsible for 42% of all occupational injuries and produced a rate of 55 cases per 10,000 full-time workers. This rate was 56% higher than the rate for all private industries and second only to the transportation and warehousing industry (U.S. Department of Labor, Bureau of Labor Statistics, 2013).

PREVIOUS RESEARCH

Previous research has demonstrated the severity of the occupational risk to caregivers when positioning patients in bed. Manual repositioning of patients in bed puts caregivers at high risk for musculoskeletal injuries (Bartnik & Rice, 2013; Coggan, Norton, Roberts, & Hope, 1994; Collins, Nelson, & Sublet, 2006; Engkvist, Hagberg, Linden, & Malker, 1992; Enos, 2003; Fragala, Fragala, & Pontaini-Bailey, 2005; Harber et al., 1985; Hignett, 1996; Jensen, Nestor, Myers, & Rattner, 1988; Karahan, Kav, Abbasoglu, & Dogan, 2009; Khuder, Schaub, Bisesi, & Krabill, 1999; Knibbe & Friele, 1996; Ljungberg, Kilbom, & Hagg, 1989; Pheasant & Stubbs, 1992; Pompeii,

Lipscomb, Schoenfisch, & Dement, 2009; Skotte & Fallentin, 2008; Trinkoff, Lipscombe, Geiger-Brown, & Brady, 2002). During repositioning tasks, excessive forces are imposed on the caregiver's musculoskeletal structure due to the external load of the patient and the worker's form and position during the task.

Laboratory-controlled studies have assessed the risks of specific tasks performed by patient handlers. One study compared risk for lower back injury from various repositioning tasks (Marras, Davis, Kirking, & Bertsche, 1999). Repositioning techniques such as the manual two-person draw sheet method, the manual two-person hook method, and the manual two-person thigh and shoulder method were found to result in a high probability of low back injury to caregivers (Marras et al., 1999). Of the repositioning tasks examined, the single person hook method, where a single caregiver must reach over the bed and grasp the patient under the axillae for repositioning, was found to have the highest predicted risk for low back injury. The study concluded that traditional repositioning techniques applied within the health care industry present one of the highest occupational risks to caregivers in hospitals (Marras et al., 1999).

Another study evaluated the load on the caregiver's lower back during repositioning of patients. In this study, health care workers repositioned patients using simple, low-tech assistance devices (draw and sliding sheets). The researchers found that the peak low back compression experienced by caregivers during the repositioning task exceeded the National Institute for Occupational Safety and Health (NIOSH) action level of 3,400 Newtons in 25% of all trials (418) (Skotte & Fallentin, 2008).

Beyond these laboratory studies, field investigations examining the causes of low back pain in nurses have further demonstrated that repositioning patients in bed was one of the highest risk activities expected of health care workers. At a large tertiary care hospital, the task of lifting or pulling patients up in bed was the most reported cause

of back pain (Harber et al., 1985). Results demonstrated that 48% of nurses reported that lifting or pulling patients up in bed caused back pain. Lifting or pulling patients up in bed was also reported to be a commonly required activity for nurses working on medical/surgical and critical care units. Forty percent of critical care unit nurses, 34% of medical unit nurses, and 27% of surgical unit nurses reported lifting or pulling patients up in bed more than six times per shift. A similar study conducted at a large tertiary care hospital in Athens, Greece, used the same questionnaire by Harber et al. Similar results were reported; lifting or pulling a patient up in bed caused back pain for 29% of the respondents (Vasiliadou, Karvountzis, Soumilas, Roumenliotis, & Theodosopoulou, 1995) and was listed by the nurses as the second leading cause of back pain. This Greek study also found that moving patients up in bed was a high frequency activity; in fact, when heavy, physically demanding tasks were considered, lifting or pulling patients up in bed was reported to have the highest task frequency among the nurses questioned in this study.

Manually moving patients in bed resulted in one of the highest risk estimates for back pain among 2,405 nurses working in a group of English teaching hospitals surveyed in a cross-sectional survey. Of those nurses responding to the survey, 51% of the nurses required to reposition patients 10 or more times during a work shift reported back pain (270 of 530). For those nurses who reported five to nine repositionings per work shift, 49% reported low back pain was caused by this task (Smedley, Egger, Cooper, & Coggan, 1995). Those nurses who were required to more frequently reposition patients were more likely to report back pain.

An investigation conducted in the Netherlands used a different questionnaire that asked nurses if they could describe activities they considered to be physically demanding. A high percentage answered in the affirmative and 89.9% of respondents described physically demanding situations. The activities most often cited as physical-



Figure 1. Two caregivers using the new Turning and Positioning System (TAP) to turn a patient in bed.

ly demanding included repositioning patients in bed, specifically up in bed, sideways, or turning (31.3%) (Knibbe & Friele, 1996).

A study conducted by one of the authors further confirmed repositioning of patients to be one of the highest risk occupational activities of caregivers working in the health care industry. Workers' compensation records for seven hospitals were reviewed over a 2-year period. Repositioning patients, including turning and lifting or pulling patients up in bed, was ranked as the most likely activity to result in compensable injuries (Fragala & Pontaini-Bailey, 2003).

SEEKING AN EFFECTIVE SOLUTION

The traditional and most widely used method for turning patients in bed uses a draw sheet and pillows to hold the patient in place once turned. Although this method is widely used, caregivers are at risk for occupational injuries. Attempts have been made to reduce occupational injury risk associated with turning and positioning tasks by using friction-reducing sheets in place of traditional draw sheets. Friction-reducing devices may decrease the injury risk for caregivers by reducing the force required to turn patients. However, a drawback to using friction-reducing devices is the need to insert and remove the device each time it is used.

Practitioners have stated that the use of friction-reducing aids, although helpful, would be more effective if the devices could remain under patients (Safe Patient Handling Discussion Group, 2013).

The Turning and Positioning System (TAP) was developed to keep friction-reducing devices under patients. The TAP design also incorporates caregivers' posture while performing the task and encourages optimum posture. Handle extension straps are attached to the repositioning sheet, which allow caregivers to gain a better grip while in a more upright posture with less bending of the trunk. An additional benefit of TAP is specially designed foam wedges that are easily inserted under patients once they are turned, effectively maintaining the proper position. **Figure 1** demonstrates two caregivers using the TAP to turn and position a patient in bed. Because the TAP functions similarly to a friction-reducing slide sheet, the system also assists the nurse when it is necessary to pull a patient up in bed. The study reported in this article looked specifically at the task of turning patients; evaluation of risk reduction when pulling a patient up in bed was beyond the scope of this study. However, it would be expected that application of the TAP would provide the same positive benefits reported when using slide sheets to assist in pulling

a patient up in bed (Bartnik & Rice, 2013). The TAP also provides the additional benefit of the slide sheet always being under the patient.

Research Hypothesis

The authors established the following hypothesis: The task of turning and positioning a patient in bed would require less perceived physical exertion on the part of the caregiver using the TAP versus the traditional draw sheet method. A reduction in caregiver-perceived physical exertion may translate into less force exerted on the musculoskeletal structure and a lower risk of subsequent injury.

METHODOLOGY

Experienced caregivers used two different repositioning methods on a 235-pound volunteer. The total number of recorded trials was 23; each repositioning task was performed with two caregivers and 12 caregiver volunteers participated. Each team performed each task twice, switching position and roles in the task in the second trial. One of the 24 trials had incomplete data and was not included in the analysis. Method one employed turning and positioning a patient in bed using the conventional draw sheet method of reaching across and rolling patients on their sides and then inserting a pillow to hold the patients in place. Method two employed turning and positioning a patient in bed by applying the new TAP. Immediately after performing each repositioning task, caregiver participants reported perceived exertion on the validated Borg Scale. A repositioning event was defined as the complete sequence of boosting plus turning the volunteer patient to a 30 degree angle. Prior to performing each task, caregivers were given instructions on how to perform the activity and were allowed to practice each repositioning method prior to data collection to ensure that participants were comfortable with and understood each repositioning method.

Data Collection Instrument

The validated Borg Scale for Perceived Exertion was used to evalu-

Table 1
Comparison of Perceived Exertion (Mean ± SD) for Patient Repositioning Tasks Using the Traditional Draw Sheet Method and the Turning and Positioning System (TAP) Method by Body Area (n = 23)

Body Area	TAP	Draw Sheet	p	% Difference
Shoulder	1.6 ± 1.2	3.5 ± 1.1	.000	119%
Upper back	1.7 ± 1.0	3.2 ± 1.6	.001	116%
Lower back	1.4 ± 1.0	3.7 ± 1.5	.000	173%
Whole body	1.5 ± 0.9	3.4 ± 2.0	.000	126%

ate caregivers' subjective assessment of the physical exertion required to complete the task of turning and positioning a patient in bed. This instrument uses a 10-point scale ranging from 0 (no exertion) to 10 (extremely hard exertion) (Borg, 1978, 1982). Reliability and validity of the Borg Scale have been previously published (Borg, 1982). Additionally, subjective ratings were deemed appropriate for this study for several reasons. First, prior research found no significant differences in findings using the Borg Scale for perceived exertion and the more complicated, time-consuming, and labor-intensive biomechanical model methods (Owen, Garg, & Jensen, 1992; Winkelmolten, Landeweerd, & Drost, 1994). Second, biomechanical models are rarely feasible in actual clinical settings where the primary objective of the setting is to provide patient care (Owen & Fraga, 1999). Finally, because a main objective of improving repositioning task safety is to protect caregivers from overexertion, their personal perception of exertion may provide more useful data than objective assessments. The Borg Scale for Perceived Exertion instrument is frequently used by ergonomists and has been widely accepted in the ergonomics field (Dawes et al., 2005).

Data Analysis

Differences in caregiver mean perceived exertion between methods of repositioning were evaluated using paired samples *t* tests for each body part (shoulder, upper back, lower back, and whole body). Analyses were run on SPSS version 19 software (SPSS, Inc.,

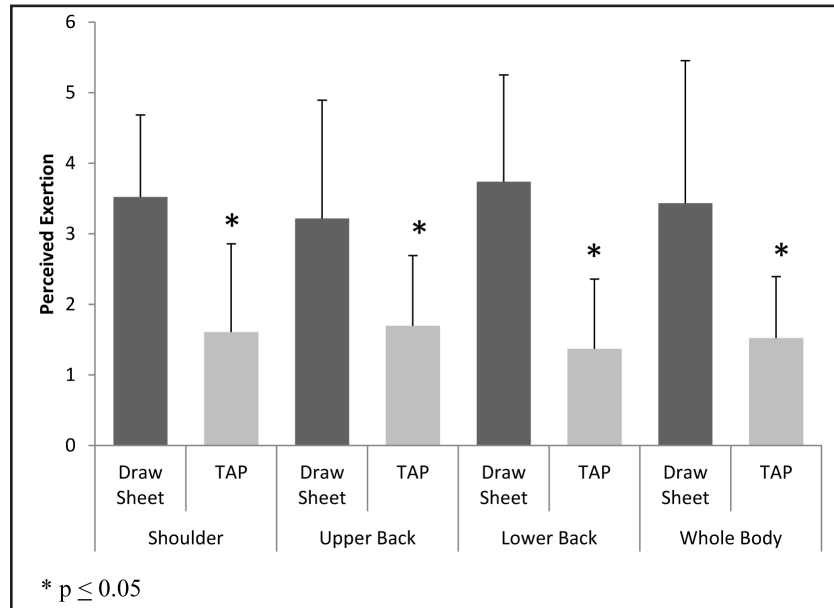


Figure 2. Perceived exertion of patient repositioning tasks using the traditional draw sheet method vs. the Turning and Positioning System (TAP) method.

Chicago, IL) and a *p* value of less than .05 was considered significant. Data are presented as means ± standard deviation and percent differences.

RESULTS

Comparing mean perceived exertion reported by caregivers when turning and positioning patients in bed using a traditional draw sheet method versus the TAP yielded the following results.

Shoulder exertion differed significantly (*t* = 5.265, *p* < .000) between the traditional draw sheet method (3.5 ± 1.2) and application of TAP (1.6 ± 1.3). The mean perceived exertion using the traditional draw sheet method was 119% greater compared to the TAP method.

Upper back exertion differed significantly (*t* = 3.928, *p* = .001) between the traditional draw sheet (3.2 ± 1.7) method and application of TAP (1.7 ± 1.0). The mean perceived exertion using the traditional draw sheet method was 116% greater compared to the TAP method.

Lower back exertion differed significantly (*t* = 6.395, *p* < .000) between the traditional draw sheet (3.7 ± 1.5) method and application of TAP (1.4 ± 1.0). The mean perceived exertion using the traditional draw sheet method was 173% greater compared to the TAP method.

Whole body exertion differed significantly (*t* = 4.157, *p* < .000) between the traditional draw sheet method (3.4 ± 2.0) and application

of TAP (1.5 ± 0.9). The mean perceived exertion using the traditional draw sheet method was 126% greater compared to the TAP method.

Results of paired sample statistics are presented in **Table 1**, which compares the mean of perceived physical exertion reported for the 23 trials for each body area. These results are further displayed in **Figure 2**, which provides a graphic display of the comparison of the reported means.

STUDY LIMITATIONS AND CONSIDERATIONS FOR FURTHER RESEARCH

This study was an initial pilot study using a convenience sample of participants, with a relatively small number of trials. However, the number of trials was adequate to demonstrate a statistically significant difference in perceived physical exertion between the two patient turning and positioning methods tested. Although the methodology employed in this study, using perceived physical exertion as an indicator of occupational risk, has been shown to be a valid and appropriate method, other methods for evaluating risk might be considered for additional laboratory studies. For example, biomechanical modeling methods could be applied to compare forces on musculoskeletal structure while caregivers are turning and positioning patients. Comparing different forces generated on the musculoskeletal structure using two turning and positioning methods could provide additional information about the risk of occupational injury when working with patients.

Laboratory studies can provide information about relative risk of injury. However, these studies do not demonstrate whether an implemented solution actually results in less injury experience for caregivers working in patient care settings. A logical next step for further research to evaluate the effectiveness of safe patient handling solutions to reduce caregiver injury is the design and implementation of clinical studies. Clinical studies could be designed to evaluate the impact of specific equipment so-

lutions on occupational injury rates by comparing rates before and after initiation of the intervention.

As new safe patient handling and mobility solutions are developed, laboratory studies can measure the risk reduction for a specific device or technology. Information from laboratory studies can guide selected equipment solutions for implementation in the clinical setting. As new safe patient handling technology and equipment become more available in the clinical setting, research can be conducted to actually demonstrate the effectiveness of these solutions in reducing occupational injuries. Through this study and future research, the evidence supporting the value of and need for safe patient handling and mobility technology will be strengthened and application of effective solutions will grow.

CONCLUSIONS

Results from this pilot study indicate that through the application of the TAP, frequent turning and positioning of patients in bed can be made safer and easier for caregivers to perform. Caregivers reported significantly lower perceived physical exertion during turning and positioning tasks with the TAP. Caregivers' greater perceived physical exertion equates to greater stress on musculoskeletal structures and increased risk for injury (Fragala & Fragala, 2013; Owen et al., 1992; Winkelmolen et al., 1994). This reduction in perceived physical exertion translates into less force exerted on musculoskeletal structures and a lower risk of injury to the caregiver.

As a result of facilitating turning and positioning patients in bed, caregivers may be more likely to comply with turning protocols as specified in care plans. This change in care quality may translate to more positive outcomes for patients, including less risk of developing pressure wounds and other adverse consequences of immobility. This study demonstrates how implementation of simple and effective safe patient handling and mobility solutions can yield better outcomes for both patients and caregivers.

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