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Evaluating repeated patient handling injuries following the implementation of a multi-factor ergonomic intervention program among health care workers

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ABSTRACT

Objective: The objective of this study was to evaluate repeated patient handling injuries following a multi-factor ergonomic intervention program among health care workers. *Methods:* This was a quasi-experimental study which had an intervention group and a non-randomized control group. Data were collected from six hospitals in Saskatchewan, Canada from September 1, 2001 to December 1, 2006. *Results:* A total of 1,480 individuals who had a previous injury were eligible for the study. Medium and small size hospitals in the intervention group had significantly fewer repeated injuries than in the control group. Multivariate analysis showed that the intervention group had 38.1% lower odds of having repeated injury compared to the control group, after adjusting for hospital size. *Conclusions:* The work-related repeated injury after a multi-factor intervention program was reduced. The synergistic relationships between components of multi-factor intervention and applicability of injury prevention programs to different settings need to be further explored. *Impact on Industry:* Implementing a multi-factor program with the right equipment and training can lower the risk of injury among health care workers.

1. Introduction

Patient handling injuries are common among health care workers and the risk of injury increases with the number of patient handling tasks performed (Concha-Barrientos et al., 2004; U.S. Department of Labor, 2005). Back pain is also prevalent among nurses and other health care workers (Bejia et al., 2005; Bos, Krol, van der Star, & Groothoff, 2007; Engkvist, Hjelm, Hagberg, Menckel, & Ekenvall, 2000; Landry, Raman, Sulway, Golightly, & Hamdan, 2008; Maul, Laubli, Klipstein, & Krueger, 2003). A meta-analysis reported that the annual incidence of low back pain among patient handling nurses was between 40% and 50% (Hignett et al., 2003). Studies of back-related workers' compensation claims reveal that nursing personnel have the highest claim rates of any occupation and are among the highest at risk for musculoskeletal disorders that require medical treatment or that produce lost workdays (Bonauto, Silverstein, & Adams, 2006). A high prevalence of musculoskeletal injuries (MSI) also contributes significantly to high patient care cost and to the shortage of nursing personnel (Bonauto et al., 2006; Concha-Barrientos et al., 2004).

In an extensive review of studies dealing with the relationship between low back disorders and ergonomic work factors, evidence for an association of low back disorders with lifting was reported and a positive dose-response relationship was found Bernard et al. (1997, July). All manual transfer and repositioning techniques pose an increased risk based on spinal loading Marras, Davis, Kirking, & Bertsche (1999); Zhuang, Stobbe, Collins, Hsiao, & Hobbs, 2000). Patient handling activities subject health workers to high biomechanical loads (Marras et al., 1999; Zhuang et al., 2000). If standard manual patient handling techniques continue to be used, possibly because they are more time efficient, then such techniques can be improved to reduce the biomechanical hazard (Nelson, Lloyd, Menzel, & Gross, 2003). Reducing the risk for MSI related to patient handling requires not only the reduction of biomechanical forces involved with each activity, but also the reduction of overall exposure to patient handling. Frequent lifting has been shown to be associated with earlier onset of back injury compared to infrequent lifting, irrespective of nursing occupation (Stobbe, Plummer, Jensen, & Attfield, 1988). Other tasks such as moving occupied beds, moving other heavy equipment, and holding patient limbs while applying anti-embolism stockings, add to the biomechanical stresses experienced by nursing personnel (Waters, Nelson, & Proctor, 2007). Studies have suggested that the implementation of ceiling lifts may reduce musculoskeletal injuries and that they may pay for themselves through a reduction of injury claims (Chhokar et al., 2005; Ronald et al., 2002; Zhuang, Stobbe, Hsiao, Collins, & Hobbs, 1999). Since an aging population has created the need for proactive injury prevention in health care workers and patients/

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residents have become heavier over time, facilities have purchased additional patient handling equipment and have implemented body mechanics training. However, the nature of the patients being transferred is not a useful predictor of shoulder and back injuries in nursing personnel (Myers, Silverstein, & Nelson, 2002). Many articles also suggest that education and training alone, without work modifications, does not decrease the number of occupational low back injuries (Edlich et al., 2005; Garg, 1999; Johnsson, Carlsson, & Lagerstrom, 2002; Videman et al., 1989). In contrast, several studies, including our previous research (Black, 2008) have shown that ergonomic interventions are effective in reducing the risk of injury.

MSI prevention interventions target four domains: (a) elimination of risk factors (exercise programs), (b) engineering controls (lift team, lifting devices and equipment), (c) administrative controls (no-lift policy), and (d) training/education (Stetler, Burns, Sander-Buscemi, Morsi, & Grunwald, 2003). Several studies have shown that the decreases in injury rates correspond to implementation of injury prevention measures, the provision of lifting equipment, MSI prevention programs, and return to work programs (Collins, Wolf, Bell, & Evanoff, 2004; Evanoff, Wolf, Aton, Canos, & Collins, 2003; Garg, 1999; Hartvigsen, Lauritzen, Lings, & Lauritzen, 2005; Li, Wolf, & Evanoff, 2004; Nelson et al., 2006; Owen, Keene, & Olson, 2002; Ronald et al., 2002; Yassi et al., 2001). It had also shown that the intervention program increases in caregiver job satisfaction and reduces workers' compensation injury rates (up to 61%), lost workday injury rates (up to 66%), restricted workdays (up to 38%), and the number of workers suffering from repeat injuries (Collins et al., 2004; Collins, Nelson, & Sublet, 2006; Garg, 1999; Nelson et al., 2003; Tiesman, Nelson, Charney, Siddharthan, & Fragala, 2003).

A Transfer, Lifting and Repositioning (TLR) program may prevent injuries while performing one type of maneuver and not another depending on the emphasis of the intervention. Also, some patient handling maneuvers may be more stressful, pose a higher risk of injury and thus have a greater potential for improvement. Ronald et al. (2002) found no significant change in overall MSI rates or repositioning MSI injury rates, but did see a significant reduction in injury rates related to transferring and lifting injuries. The lack of improvement in overall MSI rates in the Ronald et al. study may have been due to the mild changes that their intervention made, that is, changes in mechanical lift type, the implementation of a new policy encouraging the use of transfer belts, and a "no manual lifting" policy. Collins et al. (2004) reported a more detailed analysis of patient handling tasks associated with injuries. Post intervention reductions were observed for injuries associated with unclassified transfers, bed to chair and chair to bed transfers and turning/rolling, toileting or lifting a patient off the floor, breaking a resident's fall and repositioning in bed. Garg, Milholland, Deckow-Schaefer, and Kapellusch (1999) studied the long-term effect of "zero-lift program" adopting participatory-team approach with modern, battery operated, portable hoists and other patient transfer assistive devices. The Garg, Milholland, Deckow-Schaefer, & Kapellusch (2007) and Garg (1999) studies showed improvements in patient comfort and safety, and less soreness and tiredness at the end of their shifts among nursing personnel.

Although research suggests the effectiveness of multi-factor injury prevention interventions on reduction of MSIs among health care workers, little is known about the risk of repeated injury after a multi-factor TLR intervention program among health care workers. Therefore, the present study investigated the risk of repeated patient handling injuries following the implementation of a multi-factor injury prevention program on musculoskeletal disorders among health care workers. The result of this study will contribute to our understanding of potential sustainability of a multi-factor TLR intervention on reducing MSI injuries, to tracking whether TLR program are working in the long-term, and enhancing subsequent intervention program for continuous improvement. Evidence of the effectiveness would also provide further justification for the cost of the multi-factor injury prevention program.

2. Materials And Methods

This was a quasi-experimental study that had a TLR intervention group and a non-randomized control group. This study was conducted in two Health Regions (six hospitals) in Saskatchewan, Canada, from September 1, 2002 to December 1, 2006. The TLR program was implemented in the intervention group (3 hospitals: *A, B,* and *C*). *Hospital A* was a large, tertiary hospital having 436 beds. The intervention period for *Hospital A* was from September 2002 to June 2004. *Hospital B* was a medium sized community hospital having 239 beds. The intervention period for *Hospital B* was from September 2002 to September 2004. *Hospital C* was a small hospital with long-term care facility having 240 residents. The intervention period for *Hospital C* was from January 2005 to December 2005. The control group (3 hospitals: *D, E, and F*) were matched to the intervention hospitals by hospital types (i.e., community hospital, long-term care, and tertiary care) and hospital size. The descriptors of the type of hospital, large tertiary care, community hospital, and rehabilitation/long term care were based on the general types of services provided by the Occupational Health & Safety (OH&S) Department of each Health Region as to which hospitals would be comparable from an injury potential standpoint. For example, the hospitals classified as large both had trauma centers where the risk of injury is considered high as well as large general medical and surgical wards. The small hospitals both had long term care and rehab programs where the high risk of patient handling injuries is well known. The best measure of exposure to risk of injury is Full Time Equivalents (FTE). Hence, in our study, the hospitals were matched on hospital type and size based on FTEs. Table 1a provides the study hospital characteristics in detail. Table 1b provides the number of all injuries and FTE for one year pre-intervention period by the study hospital.

The intervention Health Region management indicated the patient handling equipment was distributed so that high needs units were brought up to equipment level of two mechanical lifts/unit. The control hospitals had not received any form of injury prevention program during the study period other than standard occupational health and safety practice. Our study used administrative data extracted from Departments of Occupational Health and Safety in the Health Regions to which the intervention and control hospitals belong. Each intervention and control hospital was followed for two years after completion of the intervention program. Individuals were identified using birth date and work department, and information was obtained about his/her repeated injury.

In our study, the TLR intervention consisted of an injury prevention program that was ergonomic in nature. This included engineering and administrative controls. The TLR intervention program component consisted of staff education on anatomy, injuries, body mechanics, personal health, lifting and patient handling procedures, standardized patient handling needs assessment, and patient handling algorithms. In addition, as part of the one-day educational sessions, a patient-handling skills development ("hands-on") component was included to allow for skills based learning in equipment usage and to provide feedback on patient-handling techniques. The educational component consisted of a one-time eight hour training session with a one hour refresher course mandated on a yearly basis. A course booklet and training materials were given to the workers for their later reference. Participation in these training sessions was mandatory for all direct care workers. All direct health care workers, who were employed as such in the study time periods, were eligible for inclusion into the study. Injuries occurred in lower and upper back, shoulder, neck, extremity, and other body parts were included. All Back in our study indicates neck, mid back, and low back injuries.

Gender, age, occupation type, work department, and hospital size were also obtained from the database. The primary outcome was the event of TLR related "repeated" injury (yes/no) occurring in individuals within the study time. "Repeated" injury in our study means patient