https://doi.org/10.48047/AFJBS.6.15.2024.1573-1583

African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper Open Access

Effect of Transfer, Lifting, and Repositioning (TLR) Injury Prevention Programon Musculoskeletal Injury among Nurses in K.K.D.T

Felecia Jane Diserali,Dr.B.Sara, Dr. Artza Sophiya

S. PhD scholar, Rani Meyyammai College of Nursing, Chitambaram, Annamalai University, Tamilnadu.
Email _ feleciajane34@gmail.com Mob.9443475004

PhD (N), Reader, HOD MSN, Government college of Nursing, Cuddalore, Chidambaram, email _ sarasrinisha@gmail.com Mob_ 9994744050

Associate professor, Christian College of Nursing, Neyyoor The Tamilnadu Dr MGR Medical University, Chennai.

Volume 6, Issue 15, Sep 2024

Received: 15 July 2024

Accepted: 25 Aug 2024

Published: 05 Sep 2024

doi: 10.48047/AFJBS.6.15.2024.1573-1583

ABSTRACT

Musculoskeletal injuries among health care workers are very high, particularly so in nurses involved in patient handling. Efforts to reduce injuries have shown mixed results, and strong evidence for intervention effectiveness is lacking. The purpose of our study was to evaluate the effectiveness of a Transfer, Lifting and Repositioning (TLR) program to re- duce musculoskeletal injuries (MSI) among direct health care workers. This study was a pre- and post-intervention design, utilizing a nonrandomized control group. Data were collected from the intervention group (3 hospitals; 411 injury cases) and the control group (3 hospitals; 355 injury cases) for periods 1 year pre- and post-intervention. Poisson regression analyses were performed. Of a total 766 TLR injury cases, the majority of injured workers were nurses, mainly with back, neck, and shoulder body parts injured. Analysis of all injuries and time-loss rates (number of injuries/100 full-time employees), rate ratios, and rate differences showed significant differences between the intervention and control groups. All-injuries rates for the intervention group dropped from 14.7 pre-intervention to 8.1 post-intervention. The control group dropped from 9.3 to 8.4. Time-loss injury rates decreased from 5.3 to 2.5 in the intervention group and increased in the control group (5.9 to 6.5). Controlling for group and hospital size, the relative rate of all-injuries and time-loss injuries for the pre- to post-period decreased by 30% (RR = 0.693; 95% CI = 0.60–0.80) and 18.6% (RR = 0.814; 95% CI = 0.677–0.955), respectively. The study provides evidence for the effectiveness of a multifactor TLR program for direct care health workers, especially in small hospitals.

Keywords: ergonomics; health care workers; injury prevention; musculoskeletal injuries; occupational health; transfer, lifting, repositioning program

INTRODUCTION

According to the total, recordable, nonfatal injury and sickness incidence rates in the United States in 2021–2022, the health care industry ranked fifth highest overall with the highest overall rate. Within the category of businesses that fall under the category of health services, the biggest number of reported incidents was found in hospitals and nursing and residential care facilities. In addition, the health care industry had the highest accident incidence rates, which are expected to account for forty percent of all occupational and work-related diseases at the time compensation was calculated.

According to estimates, the proportion of disease burden that may be attributed to occupational exposure to ergonomic stressors is approximately 37% in the case of low back pain. A comprehensive review of studies on the prevalence of back pain in nursing personnel around the world revealed a pattern of prevalence rates ranging from 47% to 75%, although comparisons need to be made with caution due to differences in measurement tools, back pain case definitions, and occupational groups that were included in the studies. A study that looked at the frequency of claims, injury incidence rates, and costs among health care workers in the United States revealed that companies in the health care industry had the highest claims incidence rate when compared to all other industries combined. There is a very high incidence of musculoskeletal injuries (MSI) among workers in the health care industry, particularly among direct care workers who are involved.

The primary objective of our research was to assess a multi-factor injury prevention program that was developed with the intention of preventing musculoskeletal injuries that were caused by patient handling. It would also provide additional justification for the cost of the program if there was evidence of its effectiveness. The achievement of favorable outcomes would serve as a motivating factor for other hospitals to initiate programs of a similar nature, in the event that they had not already done so. In conclusion, our research might uncover some shortcomings or defects that could be addressed in order to improve the efficiency of the program and, as a result, lower the number of claims filed with the Workers' Compensation Board (WCB), as well as the amount of disability and direct and indirect costs associated with patient handling injuries.

MATERIALS AND METHODS

This study utilized a nonrandomized control group and utilized a retrospective approach for the intervention, which included both pre- and post-TLR program interventions. The TLR program, which included engineering and administrative ergonomic controls, was implemented in the intervention group, which consisted of three hospitals: Hospital A from September 2021 to June 2003, Hospital B from September 2022 to September 2023, and Hospital C from January 2019 to December 2021. The three hospitals that made up the control group were chosen because they were of comparable hospital kinds, such as community hospitals, long-term care facilities, tertiary care facilities, and the size of the institutions. Because the province is comprised of only two main health regions, there were no other hospitals that were comparable to the ones that were available for research.

The management of the intervention health region reported that patient handling equipment was distributed in such a way that high-needs units were brought up to an equipment level of two mechanical lifts per unit. Over the course of the research project, the hospitals that served as the control did not participate in any kind of TLR injury prevention program. In the control group, there were no other patient handling injury prevention initiatives that were found. The hospitals that were part of the intervention group and those that were part of the control group are compared in Table I with regard to the type of hospital, the services that were offered, and the number of beds. Our study made use of administrative data that was obtained from the departments of Occupational Health and Safety that are located within the Health Regions that the hospitals that were used for the intervention and control were inside. For a period of one year during the pre-intervention period and one year following the intervention, data were gathered on all patient handling injuries that occurred in the respective hospitals.

Education on anatomy, injuries, body mechanics, personal health, lifting and patient handling procedures, standardized patient handling needs assessment, and patient handling algorithms (one of which was a decision-making tree that standardized the criteria for selecting which patient handling method is required for each patient) were all components of the TLR program that were included in our research. Within the framework of the educational sessions that lasted for one day, a hands-on component for the development of patient handling skills was incorporated. This was done to facilitate skill-based learning in the utilization of equipment and to offer feedback on patient handling approaches.

The educational session consisted of a one-time training session that lasted for eight hours completely. All of the personnel were provided with a course booklet as well as other training materials. All direct care professionals were required to attend these training sessions in order to fulfill their obligations. There was a requirement for the unit to undergo follow-up for either one hour each year or four hours every three years. As of the month of August in the year 2019, there were a total of 37 trainers, some of whom also served as TLR staff members

TABLE I. Characteristics of the Intervention and Control Group Hospitals

Group	**Size**	**Type**	**Services Provided**	**No. of Beds**
	Large	Tertiary care	Trauma,MCH services, eurosurgery, cardiovascular surgery, teaching	436

Intervention	Medium	Community	MRI suite, breast health center, eye care center,	239
	Small	Long-term care facility	Heavy and specialized care, geriatric re-enablement unit, emergency and planned respite, long-term and short stay,community day program	240
Control	Large	Intensive care,	Acute care facility Ambulatory care, cardio sciences, critical care,	383
	Medium Care	Community	Orthopedics, ophthalmology, cancer care, ambulatory	216
	Small Injury	Rehab center	Functional rehabilitation, amputee services, spinal cord	306

When an injury occurs in a musculoskeletal structure, the subsequent risk of harm in that body part increases. This is especially true for injuries to the spinal column. Therefore, past injuries that occurred in the same body part and occurred in individuals over the course of the trial were not considered for inclusion in either the intervention center or the control hospital. The following are the reasons why repeated injuries were removed from the data sets: Identification numbers assigned to employees were utilized for the intervention group. When it came to the control group, the variables of date of birth, department worked, profession, body part injured, and/or previous injury were utilized wherever they were available. This was due to the fact that each individual was not identified as a distinct employee.

After sorting the data for all time periods according to date of birth, the next step was to sort the data according to profession, department, date of injury, and body part injured for all time periods. Cases that were classified as unique and unrelated were those in which the date of birth and profession were different from one another. Whenever the date of birth and the occupation were identical, but the department was different, these instances were handled as if they were completely separate and unconnected to one another. In the event that the date of birth, profession, department, and body part affected were all same, the dates of injury were analyzed.

If the dates of injury were grouped within few months, as was the pattern shown in the intervention group data where the repeat injuries were extremely evident, then we treated the subsequent injuries as repeat injuries and eliminated them. This was done since the intervention group data showed that the repeat injuries were very clear. The possibility that injuries sustained by certain workers were eliminated, on the other hand, would still be present; nevertheless, the likelihood of this happening was deemed to be moderate.

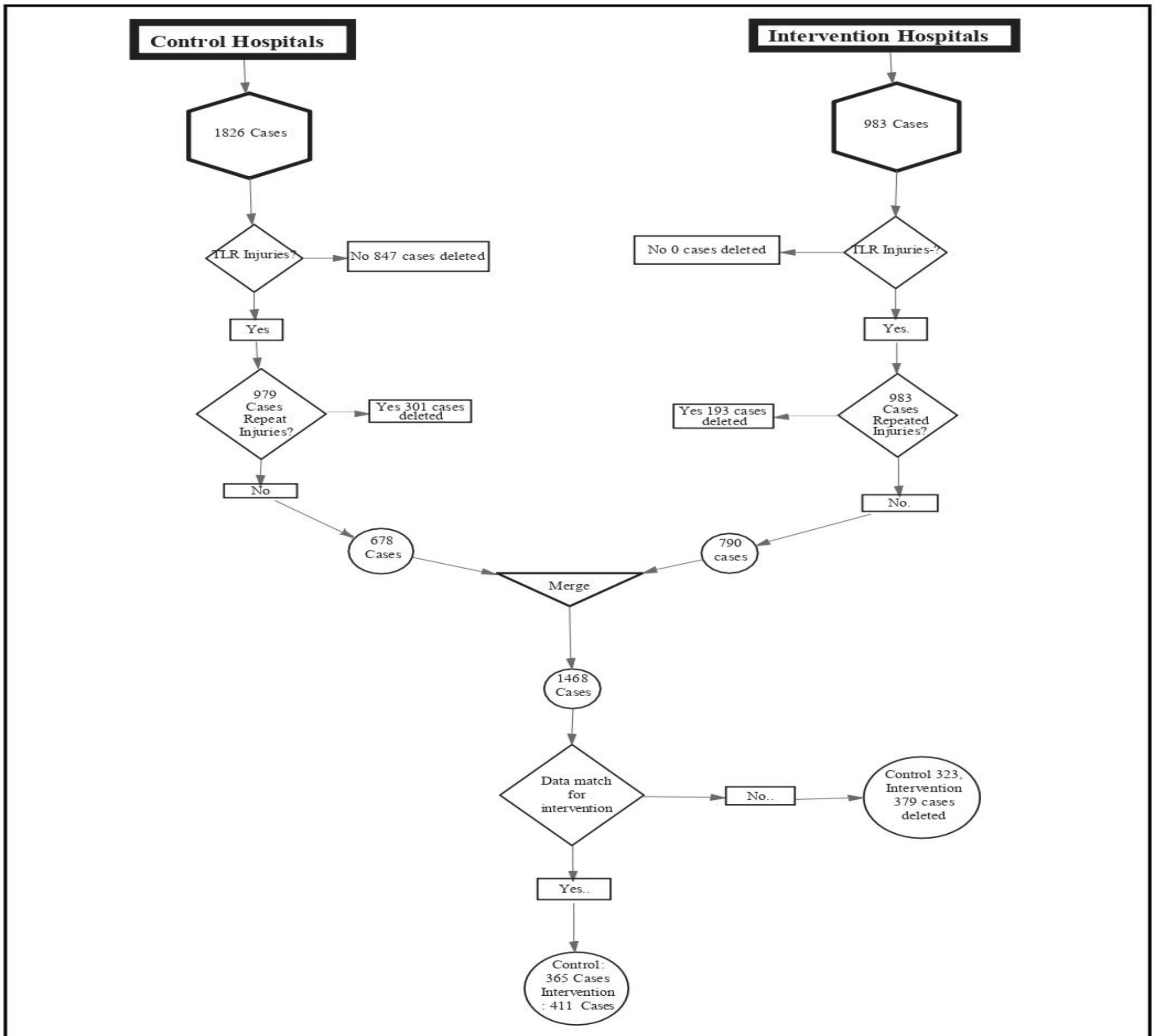

FIGURE 1. The data extraction flowchart.

Flowchart of the data extraction process is shown in Figure 1. The data set for the intervention group was full for the following variables: age, gender, length of service, classification of injuries according to TLR cause, and length of service.

Non-time-loss injuries, time-loss injuries, body part injured, kind of maneuver causing injury (TLR injury), number of days wasted due to injury, and claim cost per injury are all factors that are taken into consideration. The data set for the control group was lacking in categories such as age, gender, length of service, classification of injuries according to TLR cause, number of days lost due to injury, and claim cost. During the matching one-year pre-intervention and one-year post-intervention time periods, data were collected from both groups about time-loss and non-time-loss injuries, lost time days, and claims expenses associated with those injuries.

Both the total number of injuries and the rate of injuries were also evaluated. In this context, the term "all injuries" refers to injuries that do not result in time loss as well as injuries that do result in time loss. All cases of musculoskeletal injuries (MSIs) that occurred during a patient handling maneuver in direct care staff are considered to meet the inclusion criteria for both non-time-loss and time-loss injuries. We then proceeded to conduct a second analysis of time-loss injuries because these injuries are of greater concern and represent a greater cost to the company. To provide a concise summary of the data, descriptive statistics were utilized. The two groups were compared using a Student's t-test, which was specifically designed for continuous variables.

A Chi-square test or Fisher's exact test was utilized in order to compare the groups when categorical variables were being considered. After determining that the outcome data, which included claim cost and time-loss days, did not follow a normal distribution, the nonparametric Mann-Whitney U test was utilized to examine the data. It was not possible to do an analysis for the variables of occupation, gender, age, and duration of service because there were no data available for workers who had not been harmed. Therefore, it was not possible to identify the demographic risk variables that constitute the total population of workers who are at risk.

In order to calculate injury rates, the numerator is comprised of the number of workers who were injured, and the denominator is comprised of the total number of hours worked by all TLR trained employees or their counterparts in the control group, converted to full-time equivalents (FTE). In order to account for the disparities in exposure that exist across and within groups, the denominator was standardized to full-time equivalents (FTEs), with one FTE equaling 1950 hours of work. In spite of our best efforts, we were unable to acquire individual exposure data for each and every worker (person-time). Following the completion of the analysis of the count and rate data, both univariate and multivariate Poisson regression were carried out. In the beginning, the variables were analyzed individually using univariate analysis in order to determine which ones could be viable predictors for the final model. The variables that were shown to be significant in the univariate model were incorporated into the final model. The alpha level used in the model was 0.1. A 0.05 alpha level was utilized for the purpose of determining statistical significance for the final multivariable model.

Both the rate ratio and the confidence intervals for 95% were computed for each of the effects that were derived from the models. In the final model, the interactions were examined and analyzed. The Hosmer-Lemeshow statistic was utilized in order to evaluate the degree of goodness of fit. The statistical software STATA (version 10; Stata Corp., College Station, Texas) was utilized for each and every analysis that was carried out in this investigation.

RESULTS

The research was able to include a total of 766 cases of TLR injuries, with 411 cases including the intervention and 355 cases involving the control. There were more than ninety percent of wounded health care workers who were female. The average age of the injured workers was approximately forty years old. Injuries were primarily sustained in the shoulder, back, and neck of the victim. A significant number of the injured personnel were registered nurses. The distribution of injuries experienced by the control group remained the same, with the exception of therapists (physical therapists, occupational therapists, and respiratory therapists), where a considerable rise was observed. The number of injuries sustained by occupation revealed that the distribution remained consistent. Additionally, this pattern was observed, albeit to a lesser degree, in the intervention group. The intervention group experienced the most significant reduction in the number of injuries sustained by attendants, which decreased from 25.4% to 0%, whereas the number of injuries sustained by nurse aides increased from 1.1% to 11.3% throughout the course of the study. Both the intervention group and the control group did not experience any changes in age or gender between the pre- and post-period evaluations. The characteristics of the people who participated in the study are detailed out in Table II.

When compared with the control group, the results of our study indicated that there was a large and considerable improvement in injury rates in the intervention group, both before and after the period of time . Within the intervention group, there was a drop in injury rates for both all injuries (no-time-loss and time-loss combined) and time-loss injuries. On the other hand, injury rates decreased to a lesser degree for all injuries or increased for time-loss injuries in the control groups. It was shown that the injury reduction rate varied depending on the size of the hospital within the intervention group. When compared with pre- and post-intervention periods, Figure 3 demonstrated that there was a considerable reduction in the number of injuries sustained by patients in the small intervention hospital, but there was a less significant drop in the medium and large intervention hospitals.

According to the results of the multivariate Poisson regression analysis, the group, the pre- and post-period, and the size of the hospital were significant factors for all injuries that resulted in considerable time loss (Tables III and IV). Once all the injuries rate ratios were analyzed using multivariate Poisson regression, it was shown that the relative rate of medical-surgical injuries (MSI) for patient handling personnel was reduced by 30.7% in the intervention group after the intervention (relative risk = 0.69; 95% confidence interval = 0.6–0.8; $p < 0.0001$). This reduction was observed after controlling for the size of the institution. The positive rate ratio that was obtained for the group variable indicated that there was an increased risk of injury in the intervention group in comparison to the control group.

This risk was significant for all injuries, and it occurred both before and after the intervention began. A p-value of 0.08 indicates that the multivariate analysis did not find any evidence of an interaction between the size of the hospital and the intervention period. Additionally, the research demonstrated that the intervention group saw significant reductions in time-loss injuries from the pre-period to the post-period period, in contrast to the control group, which experienced changes that were not statistically significant

Additionally, time-loss injuries showed varying degrees of reductions across the many hospitals of varying sizes that were included in the intervention group. As shown in Figure 5, the TLR program intervention appeared to be more successful in reducing the amount of time lost due to injuries in the smaller hospital as compared to the medium- or large-sized hospital.

The results of the multivariate Poisson regression analysis showed that the intervention group saw a reduction in time-loss injuries of 18.6% between the pre-intervention and post-intervention periods (relative risk = 0.81, 95% confidence interval = 0.68–0.96, p-value = 0.044; Table II).

TABLE II. Characteristics of Injured Workers

	Intervention		**Control**	
Variables	**Pre-**	**Post-**	**Pre-**	**Post-**
Gender				
Female	236 (91%)	142 (94%)	127 (91%)	161 (94%)
Male	24 (9%)	9(6%)	12 (9%)	4 (2%)
Age Length of service (year) Occupation	40.5 (± 10.4) 10.7 (± 8.1)	40.97 (± 10.2) 11.4 (± 9.4)	39.2 (± 10.1) NA	39.1 (± 10.7)
Nursing RN	138 (53.1%)	94 (62.2%)	84 (47.7%)	63 38.2%)
LPN	31 (11.9%)	23 (15.2%)	44 (25.0%)	47 28.5%)
RPN	0 (0%)	0 (0%)	2 (1.1%)	2 (1.2%)
Nurse aides	3 (1.1%)	17 (11.3%)	32 (18.2%)	32 19.4%)
Attendants	66 (25.4%)	0 (0%)	3 (1.7%)	4 (2.4%)
Physical/occupational/recreational	1 (0.4%)	2 (1.3%)	2 (1.1%)	10 6.1%)
therapists Clerks/unit assistants	7 (2.7%)	7 (4.6%)	1 (0.6%)	1 (0.1%)
Other	14 (5.4%)	8 (5.3%)	8 (4.5%)	6 (3.6%)
Body Part Injured All back (except neck)	112 (43.1%)	67 (44.4%)	120 (63.2%)	90 (54.5%)
Neck	12 (4.6%)	10 (6.6%)	16 (8.4%)	24 (14.5%)
Shoulder	31 (11.9%)	21 (13.9%)	36 (18.9%)	4 (26.7%)
Upper extremity	24 (9.2%)	22 (14.6%)	2 (1.1%)	4 (2.4%)
Multiple sites	40 (15.4%)	15 (9.9%)	9 (4.5%)	2 (1.2%)
Other body parts	41 (15.8%)	16 (10.6%)	7 (3.8%)	1 (0.6%)

DISCUSSION

The enormous, widespread, and expensive burden of patient handling injuries among those who work in the health care industry is a burden. Interventions that involve several factors, including as engineering and administrative controls, are becoming increasingly recognized as the most effective method for reducing injuries of this nature. The purpose of our research was to investigate the efficacy of an administrative and engineering intervention for patient handling in three different types of hospitals: small, medium, and large. The research provided evidence that a multifactor TLR program is successful for direct care health workers and provides support for the introduction of such programs, particularly in institutions with a smaller patient population. This study was one of a kind since it was able to investigate the efficacy of a multifactor ergonomic intervention in relation to the size of the hospital by employing a quasi-experimental design with injury rates, time-related variables, and other variables.

The majority of the research that has been conducted in this area to investigate the effectiveness of interventions has been conducted using pre-post designs, either with or without a control group, in a range of contexts, and using a number of end measures. Our findings are comparable to those of other studies that are conducted with interventions that are roughly comparable to ours in terms of the outcome measures, the intervention that was administered, the study population, and the location.21, 23, and 25 The size of the decreases in injury rates that we found in our study is comparable to that of Collins et al.(21) In comparison to our investigation, other studies shown that the reduction in injury rate was comparable in terms of direction but not in terms of overall amount.15, 16, 20, and 24 When comparing a control group to a training intervention group that received three hours of training at a large hospital, Yassi et al. (20) discovered that there was no statistically significant improvement in injury rates.(20) The outcome may have been the consequence of a restricted capacity for improvement at a huge facility, or it may have been the result of their interventions not being effective enough. The findings of our study, which compared the ratios of time-loss injuries to total injuries, revealed a similar pattern across all three sizes of hospitals: small, medium, and big. On the other hand, the effect was more pronounced for time-loss

CONCLUSION

We conducted an investigation into the efficacy of an administrative and engineering intervention for the purpose of patient handling in three different healthcare facilities. According to the findings of the study, the implementation of a multi-factorial injury prevention program has the potential to drastically cut down on injuries that result in no time loss as well as injuries that result in impairment.

When it comes to patient care. The reductions in claim expenses and injuries represented a significant advantage to the hospitals that participated in the intervention strategy. We found that our findings are particularly applicable to smaller facilities, and this fact gives an additional powerful push for the adoption of this kind of program in settings where the rates of patient handling injuries are high. In the future, it might be conceivable to conduct a study with the objective of monitoring the progression of injury rates and extending the post-intervention follow-up time in order to investigate the intervention's effectiveness over the long term. In the event that injury rates continue to decrease, this would add to the evidence that the treatment is successful. If this is not the case, then it may be an indication that the program requires additional retraining and reinforcement in the future.

Additionally, the data on the baseline injury rate may be expanded if sufficient resources were available. This would be helpful in elucidating any pre-existing patterns in injury rates, which would offer an alternate explanation for the changes that were observed after the completion of this study. In addition, it would be beneficial to conduct an investigation into the preventive efficacy of this kind of intervention by doing an analysis of the frequency of repeated injuries as well as an analysis based on profession.

REFERENCES

- "2005 Survey of Occupational Injuries & Illnesses, Summary Esti- mates Charts Package". [Online] Available at http://www.bls.gov/iif/ oshwc/osh/os/osch0032.pdf. (Accessed July 1, 2008).
- Takala, J.: *Introductory Report of the International Labor Office*. Geneva: Occupational Safety and Health Branch, International Labor Organization 1999.
- Concha-Barrientos, M., T. Driscoll, N. Steenland, et al.: Selected occupational risk factors. In *Comparative Quantification of Health Risks: Global and Regional Burden of Disease Attributable to Selected Major Risk Factors* (M. Ezzati, A. Lopez, A. Rodgers et al. (eds.). Geneva: World Health Organization, 2004.
- Maul, I., T. Laubli, A. Klipstein, and H. Kroeger: Course of low back pain among nurses: A longitudinal study across eight years. *Occup. Environ. Med. 60*:497–503 (2003).
- Trinkoff, A.M., J.A. Lipscomb, J. Geiger-Brown, and B. Brady: Musculoskeletal problems of the neck, shoulder, and back and functional consequences in nurses. *Am. J. Ind. Med. 41*:170–178 (2002).
- Turnbull, N., J. Dornan, B. Fletcher, and S. Wilson: Prevalence of spinal pain among the staff of a district health authority. *Occup. Med. (Lond.) 42*(*3*):143–148 (1992).
- Heap, D.C.: Low-back injuries in nursing staff. *J. Soc. Occup. Med. 37*(*2*):66–69 (1987). Cunningham, C., T. Flynn, and C. Blake: Low back pain and occupation among Irish health service workers. *Occup. Med. (Lond.) 56*(*7*):447–454 (2006).
- Menzel, N.N.: Back pain prevalence in nursing personnel: Measurement issues. *AAOHN J. 52*(*2*):54–65 (2004).
- Silverstein, B., D. Lee, and R. Goggins: "Lifting Pa- tients/Residents/Clients in Health Care Washington State 2005. [Online] Available at

http://www.lni.wa.gov/Safety/Research/Files/Health CareExecSumm.pdf (Accessed Jan. 30, 2008).

- Bonauto, D., B. Silverstein, and D. Adams: Prioritizing industries for occupational injury and illness prevention and research, Washington state workers' compensation claims, 1999–2003. *J. Occup. Environ. Med. 48*(*8*):840–851 (2006).
- Vender, M., M. Kasdan, and K. Truppa: Upper extremity disorders: A literature review to determine work-relatedness. *J. Hand Surg. 20A*(*4*):534–541(1995).
- National Institute for Occupational Safety and Health (NIOSH): *Long-Term Effectiveness of "Zero-Lift Program" in Seven Nursing Homes and One Hospital*, by A. Garg. Cincinnati, Ohio: NIOSH, 1999.