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An ergonomic approach to reducing back stress while carrying out patient handling tasks with a hospitalized patient

B.D. Owen, K. Keene, S. Olson and A. Garg, Wisconsin*

Introduction

Health care workers, especially nursing personnel, are at great risk for occupationally related back problems. Through Worker Compensation claims in the United States, Klein, Jensen and Sanderson (1984) found nursing personnel were ranked fifth among all occupational groups for back injuries. Those groups surpassing nursing personnel are known to be involved in heavy physical labor activities including frequent lifting (miscellaneous laborers, sanitation workers, warehouse workers and mechanics). Researchers have been successful in reducing back stress and back injury rates through an ergonomic approach within a long term care/nursing home setting [2, 4].

The purpose of this study was to reduce the physical stress for *hospital* personnel while involved in carrying out patient handling tasks and to determine the impact of these ergonomic changes on patient comfort.

Methods

Setting
The experimental and control sites were both 50 bed rural hospitals located in the midwestern part of the United States. Approximately 70 percent of the bed capacity was for medical-surgical patients in both hospitals; the study took place on these medical-surgical units.

Subjects
28 registered nurses and nursing assistants volunteered to be in part I of the study from the experimental site; 24 were involved from the control hospital. They were all female and ranged in age from 21-64 years (experimental) and 20-60 years (control).
In part II of the study, there were 37 volunteers from the experimental site and 20 from the control hospital. All were female and worked on the medical-surgical units of these hospitals.

Instruments
A rating of perceived exertion likert scale was used (0=no exertion, 10=extremely heavy, maximal exertion) to determine the exertion felt to the shoulder/upper back, lower back, and whole body while carrying out a task. A Patient Comfort likert scale was used to deter-

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mine reactions from patients (0=very comfortable, 7=extremely uncomfortable). Injury reports were reviewed to collect injury, lost work day, and restricted or light duty data.

Procedure

Part I. Subjects were asked to delineate their most stressful tasks carried out in a typical day. Sixteen tasks were determined as most stressful from these data. Subjects then ranked each of these 16 patient handling tasks according to the amount of physical stress they felt while carrying out each task. (1=most stressful, 16=least stressful). The tasks were transfers such as in and out of bed, on and off the commode, lifting patients up in bed, and toileting patients in bed. All subjects ranked the tasks twice, once for the patients who could bear weight and also for patients who could not bear weight.

The subjects were also asked to rate the amount of physical exertion they felt to the shoulder/upper back, lower back, and whole body while carrying out each of the 16 patient handling tasks for weight bearing and non-weight bearing patients.

Part II. Ten of the most stressful tasks were selected for study (transferring patients in and out of bed, on and off the commode, on and off a cart/guerney, on and off a cardiac chair, lifting patients up in bed, and toileting patients in bed). Various assistive devices were studied in a laboratory setting with hospital nursing assistants as subjects. Based on the results of the laboratory findings, 6 assistive devices were selected for implementation at the experimental site. These were: the *Medi-Man* lift for transferring non-weight bearing patients in and out of bed and on and off the commode; *Sara* lift and *Posey ergonomic belt* for use with the same above mentioned tasks but with patients who could bear some weight, but needed some assistance; the *Slipp* for the horizontal transfers from bed to cart/guerney and back to bed, cardiac chair to bed and bed to cardiac chair, and lifting patients up in bed; the *Magic Sheet* for lifting patients up in bed; and the *Kimbro Pelvic Lift* for toileting in bed.

Part III. All nursing personnel, including managers, at the experimental site were trained to use the 6 devices. Each staff received 2.5 hours of training. Additional help was available.

The method of transfer for each patient was determined by the head nurses and explicit directions were placed in the patients' chart and at the patients' bedside. After each task, subjects rated perceived exertion and patients rated comfort. The "intervention" at the control site was a one hour inservice on use of body mechanics for transferring patients.

Results

Ranking stressful tasks.

Subjects recorded 16 tasks when asked to delineate the most stressful tasks of a typical day. Each subject then ranked these 16 tasks according to perceived stressfulness; ranking was done using scenarios of weight bearing and non-weight bearing patients. There was general agreement between the experimental and control groups for the following tasks (from most stressful to least stressful): lifting patients from the floor, transferring patients from chair to cart, chair to bed, bed to commode, commode to bed, bed to chair, cardiac chair to bed, assisting to stand up from chair, bed to cart, lifting/holding patient extremities, repositioning from lying to sitting, and toileting in bed. Significant differences were found in the rankings of transferring from cart to bed, bed to cardiac chair, and repositioning patients in bed (experimental site ranked more stressful). The control site subjects ranked lifting patients up in bed as more stressful than the experimental subjects.

Rating of Perceived Exertion (Pre Intervention)
In general, there was agreement between the experimental and control sites for rating of perceived exertion to shoulder/upper back, lower back and whole body while carrying out 12 patient handling tasks. Significant differences were found with lifting/holding the extremities of patients, repositioning patients from lying to sitting, lifting patients up from the floor, and transferring from chair to cart, the control site subjects rated these tasks higher for all body parts.

Rating of Perceived Exertion (Post Intervention)
There were 303 data collection forms completed after carrying out patient handling tasks. Nearly 50% (n=147) involved transferring patients from bed to chair and chair to bed. During data collection, the tasks of transferring patients from cardiac chair to bed and bed to cardiac chair were not performed at the control site. For the remaining 8 tasks, the subjects in the experimental site rated perceived exertion significantly lower than the control site subjects for all body parts. *(Table 1)*. The mean of perceived exertion ranged from .6 to 1.0 for the shoulder by experimental site subjects and from 1.5 to 5.2 for control site nursing personnel. Data from experimental ranged from an average of .4 to .7 for the lower back and 2.0 to 5.0 for control data. The ratings for the whole body were the lowest ($\bar{x}$ = .1 to .7; 1.5 to 4.8). Overall, the task perceived to require the least exertion was transferring the patient from bed to commode; requiring the most was lifting a patient up in bed.

Table 1: Rating of Perceived Exertion for Selected Tasks (Post Intervention)1

Task	Devices	Site	# Observations	Shoulder/Upper Back	Lower Back	Whole Body
Transfer from bed to chair	Mediman Sara Lift Posey Belt	Experimental	59	.6 (.8)*	.5 (.8)*	.3(.8)*
	None	Control	16	3.6(1.7)	3.8(1.2)	3.2(1.1)
Transfer from chair to bed	Mediman SaraLift Posey Belt	Experimental	53	.9(1.1)*	.7(1.0)*	.4(.7)*
	None	Control	19	3.7(1.2)	3.6(1.2)	3.3(1.0)
Transfer from bed to commode	Sara Lift Posey Belt	Experimental	15	.7 (.9)*	.4 (.7)*	.1(.3)*
	None	Control	4	1.5(1.0)	2.2 (.9)	1.5(1.0)
Transfer from commode to bed	Sara Lift Posey Belt	Experimental	12	.9 (.9)*	.6 (.7)*	.4(.6)*
	None	Control	2	3.0 (.0)	2.0 (.0)	2.5 (.7)
Transfer from cart to bed	Slipp	Experimental	13	.6 (.7)*	.5 (.5)*	.3(.4)*
	Draw Sheet	Control	9	4.6(1.2)	3.6 (.5)	3.7 (.8)
Transfer from bed to cart	Slipp	Experimental	9	.6 (.6)*	.5 (.8)*	.1(.3)*
	Draw Sheet	Control	10	4.5 (.8)	4.4 (.6)	4.3 (.9)
Lift patient up in bed	Magic Sheet Slipp	Experimental	27	1.0(1.7)*	.7(1.7)*	.7(1.6)*
	Draw Sheet	Control	30	5.2(2.4)	5.0(2.3)	4.8(2.2)
Toileting in bed	Kimbro Pelvic Lift	Experimental	12	.6 (.6)*	.7 (.8)*	.4(.6)*
	None	Control	13	3.9(1.3)	3.3(1.3)	2.9(1.1)

[1] Rating of Perceived Exertion (0 = no exertion, 10 = extremely heavy, maximal exertion)
* Significant at p <.000

Patient Comfort

There were 241 patients who responded to feelings of comfort after experiencing a patient handling task. On a scale of 0 (extremely comfortable) to 7 (extremely uncomfortable) the mean for patient comfort at the experimental site ranged from .2 to 1.2; the average was 2.0 to 5.0 for control site patients. All devices with all tasks (experimental site) were very comfortable.

Injury Data

In the 18 months pre intervention, 20 back injuries (lower back and/or upper back/shoulder) were reported on the medical-surgical units of the experimental hospital; all indicated one of the 10 tasks studied to be important to the occurrence of back injury. Also, during these 18 months there were 64 lost work days and 15 restricted or light work days. On the same hospital units and involving the same tasks, the 18 month post intervention investigation showed 12 injuries, 3 lost workdays, and 12 restricted days.

Discussion

The findings of this study reinforce those reported earlier [2, 4]; in these studies the back stress and back injuries were reduced by changing the physical demands of the job. The major strategy was through the introduction of assistive devices. In this study, the stressful tasks were determined by those involved in patient handling and various assistive devices were selected and used. The perceived physical exertion was reduced for all tasks studied. The number of back injuries, lost work and restricted days were decreased. In addition, patients felt more comfortable when assistive devices were used. It is important to gather patient feedback data because BELL [1] and OWEN [3] found nursing personnel were reluctant to use assistive devices because they thought patients would react negatively.

Management support was found to be an important part of success in carrying out this study.

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