

Preventing Injuries Using an Ergonomic Approach

The saying "work can be dangerous to your health" is an important phrase in the nursing profession. In hospital settings, there are several dangers that especially affect nursing personnel. Although needle-stick injuries are the most frequently reported injury among hospital nurses, the most costly for health care facilities are overexertion injuries to workers' shoulders or backs.¹ These problems have been studied, and progress has been made to decrease their prevalence.² For example, the number of needle-stick injuries has decreased significantly in hospitals that use ergonomically designed syringes.³

Ergonomics is the scientific study of human work.⁴ It involves matching the job to the worker, rather than attempting to fit the worker to the job. The goal in ergonomics is to identify aspects of the job that are particularly hazardous and redesign them to be safer. This can be accomplished by redesigning the task, product, work station, environment, or overall work organization. In the example of needle-stick injuries, the product (ie, syringe) was redesigned so that the needle is shielded or retracted into the barrel immediately after the injection. In this way, nurses

cannot self-inject themselves with a used needle, and the product now better fits the worker.

Many approaches to decreasing back and shoulder problems have been tried in general industry, as well as in health care settings. Emphasis primarily has been on education and training, with a definite focus on body mechanics.⁵ These approaches, however, have had little effect on the problem, as the aim has been to change the worker instead of the job or the task.⁶ Studies indicate that an ergonomic approach involving the assessment of stressful tasks and the development of alternative methods to decrease this stress can reduce the number of overexertion injuries.⁷ As a result, the assumption that reducing physical stress reduces injuries was true.

INJURIES INCREASE IN FREQUENCY

In 1984, nurses ranked fifth among workers in all occupations who claimed workers' compensation for back injuries; only heavy laborers (eg, sanitary engineers, laborers, warehouse workers) ranked higher.⁸ The rate of overexertion injuries among hospital nurses is almost double that of workers in private industry.⁹ In 1990, the national goal was to decrease these injuries in nursing personnel from 12.7 injuries per 100 full-time nurses annually to nine.¹⁰ According to one source, however, the rate actually had increased to 17.8 injuries per 100 nurses by 1995.¹¹

NURSES CHANGE JOBS DUE TO BACK PAIN

Since the 1980s, many nurses have changed positions or actually left the nursing profession because of overexertion injuries.¹² In one study, a questionnaire revealed that

A B S T R A C T

The risk of back injury is a continuing problem for nurses. Patient-handling tasks (eg, transferring patients on and off stretchers, repositioning patients on OR beds) are a major precipitating factor to this problem. Educating nurses about body mechanics has not been the answer to preventing back injuries; however, changing the physical demands of the job (ie, using an ergonomic approach) by using assistive devices (eg, friction reducers) has been proven to decrease perceived stress and injury rates and increase patient comfort. This article focuses on the problem of nurses' back and shoulder overexertion injuries and explores the application of ergonomics in the perioperative setting. *AORN J* 72 (Dec 2000) 1031-1036.

BERNICE D. OWEN, RN

Thirty-eight percent of respondents had suffered back pain severe enough to require leave from work.

38% of 503 nurse respondents had suffered occupation-related back pain severe enough to require leave from work.¹¹ Twenty percent of those with back pain said they had made at least one employment transfer (eg, from an intensive care to an obstetric unit; from the hospital inpatient setting to a school setting; from a staff nurse to a pharmaceutical representative) to decrease the amount of physical stress involved with lifting or moving patients. Twelve percent of respondents indicated they were considering making an employment transfer, and another 12% stated they were thinking about leaving the nursing profession because of occupation-related back pain. Another study in England found that 12% of all nurses intending to leave nursing permanently cited back pain as either a main or contributing factor.¹⁴

TRIGGERS TO BACK PAIN AND INJURY

The lifting and transferring of patients has been found to be the most frequent precipitating trigger of back and shoulder overexertion problems in nurses.¹⁵ These studies, however, do not focus on the perceived triggers of overexertion problems for nurses in the OR. To address this lack of information, this author conducted an informal discussion with eight nursing staff members who worked in the OR of a large hospital. These nurses indicated that the following triggers affected back pain or injuries in their setting:

- standing for long periods of time;
- lifting and holding patients' extremities;
- holding retractors for extended periods of time;
- transferring patients on and off OR beds;
- reaching, lifting, and moving equipment; and
- repositioning patients on OR beds.

Although all of these tasks need to be studied to determine how to decrease their physical stressfulness, this author first focused on the task of trans-

ferring patients on and off OR beds by studying the perceived physical stressfulness of the similar task of transferring patients from beds to stretchers.¹⁶

AN ERGONOMIC APPROACH TO TRANSFERRING PATIENTS

As part of this study, the author conducted a laboratory test to determine which assistive devices nurses perceived as being least stressful to use in transferring patients on and off stretchers.¹⁷ Eight nurses volunteered to perform transfers and act as patients to determine level of comfort in the transfers. The assistive devices studied included

- a roller board, which is commonly used in ORs;
- a polyethylene slider board (Figure 1); and
- a friction-reducing pad (Figure 2), which is made of two pieces of liquid-proof, surface-disinfectable material that are sealed at the edges and contain a silicone lubricant that continually coats the inside.

The method used with each of these devices involved turning the patient to the side, placing the assistive device under the draw sheet, placing the patient on his or her back, and using the draw sheet to pull the patient to the bed or stretcher.

Researchers found that the nurses perceived significantly less physical exertion ($P < .01$), and, as patients, the nurses were significantly more comfortable ($P < .01$) when the friction-reducing pad was used. By using this device, the nurses had to pull only lightly on the draw sheet because there was no friction impeding the process. As a result, the nurses chose the friction-reducing pad for use with actual patients.

The next step of the study took place in two hospitals, one as a control and one as an experimental site. At the control site, the nurses used their usual method of transferring patients from bed to stretcher and from stretcher to bed (ie, at least two nurses used a draw sheet to lift and pull the patient). After completing each task, the nurses rated the physical stress caused to their backs and shoulders. The perceived exertion scale ranged from zero (ie, no exertion) to 10 (ie, extremely heavy, maximum exertion). In this test, actual patients rated their comfort during the transfer using a scale of zero, meaning very comfortable, to seven, meaning extremely uncomfortable.

At the experimental site, nurses used the friction-reducing pad to transfer patients from bed to stretcher and from stretcher to bed. In this

setting, nurses again rated their perceived physical stress to the back and shoulders after each patient transfer, and patients rated their comfort.

Findings. Findings indicate that perceived physical stress can be decreased significantly by using a friction-reducing pad under the draw sheet. These findings are statistically significant ($P < .01$) in favor of the friction-reducing pad for transferring patients from bed to stretcher and from stretcher to bed. In addition, patient response is statistically significant; patients were more comfortable when they were transferred by nurses who used the friction-reducing pads under the draw sheet, as compared to when they were transferred by nurses who used only the draw sheet for transfer ($P < .01$).

Perioperative implications. These findings can be useful to perioperative nurses, as the type of horizontal transfers performed in the OR are similar to those performed on medical-surgical units. In fact, at the experimental site, the friction-reducing pads kept disappearing from the medical-surgical units where the study was conducted. Some detective work found that perioperative nurses were taking the assistive devices to use at their site for transferring patients on and off OR beds.

ERGONOMIC APPROACH TO REPOSITIONING PATIENTS

In the initial discussion, the perioperative nurses stated the task of repositioning patients on the OR bed also was stressful. Using a laboratory setting, researchers examined the task of repositioning patients in bed using the following techniques:

- grasping the patient under the arms and lifting him or her up in bed,
- grasping the patient under the thighs and shoulders and lifting him or her up in bed, and
- using the draw sheet to lift the patient up in bed.¹⁸

Researchers found all three of these tasks to be in the high-risk category for injuries; all of them surpassed the maximum safe level of compressive force to the L₅S₁ disc, as determined by the National Institute for Occupational Safety and Health.¹⁹ The amount of force produced by these tasks to the L₅S₁ disk ranged from 3,819 newtons (N) to 6,570 N; the maximum level for safety is 3,400 N.²⁰

In another laboratory study, researchers compared the use of the friction-reducing pad to the use of the draw sheet method for repositioning patients in bed.²¹ Again in this study, perceived physical stress to nurses' shoulders and backs was reduced

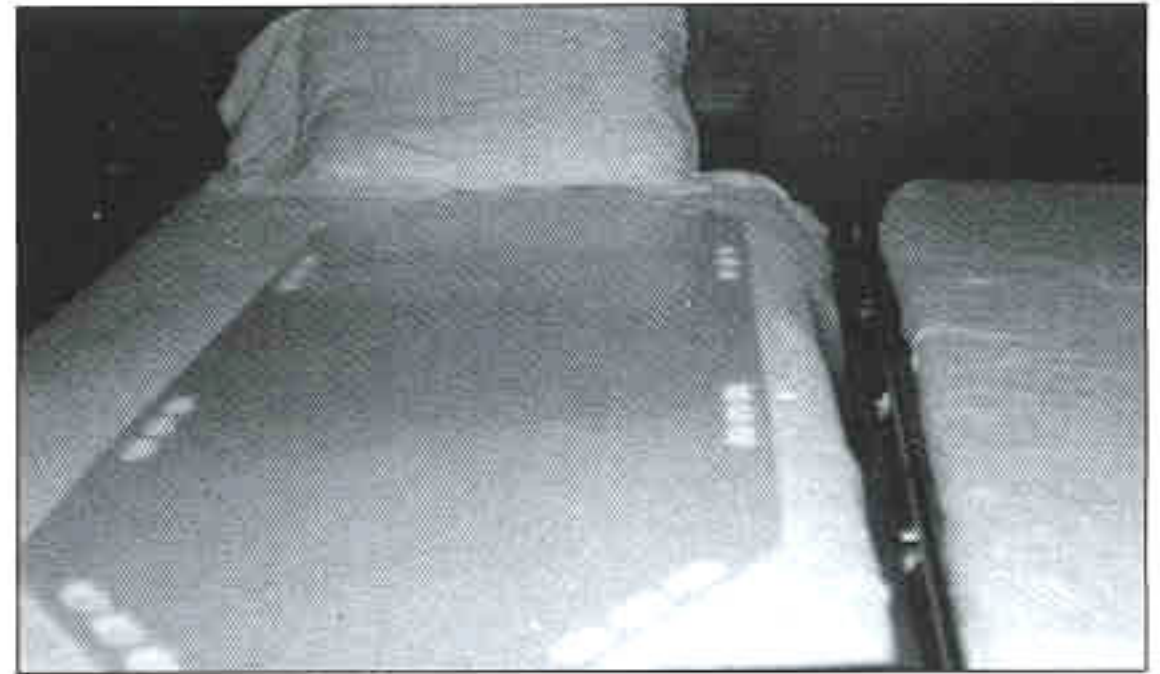


Figure 1 • A polyethylene slider board can be used to transfer patients on and off OR beds.



Figure 2 • Most nurses and patients favor the use of the friction-reducing pad.

significantly ($P < .01$) when using the friction-reducing pad, and patients rated their comfort significantly higher when the pad was used, compared to when the draw sheet was used ($P < .01$).

WHY ARE ASSISTIVE DEVICES NOT USED?

Nurses often have been reluctant to use assistive devices and have had negative attitudes toward their use.²² This remains true, even though today's devices are sturdier and more stable. The reasons most frequently given for not using devices include

- devices were not available,
- they took too much time,
- they were unstable,
- they tipped over or were otherwise unsafe, and
- patients did not like them.

Other studies, however, indicate that nurses use and have positive comments about the devices when the nurses

- are trained in the use of the assistive devices,

- have the appropriate number of devices on each unit,
- are involved in the selection of devices that are less stressful and more comfortable, and
- receive support from management for the use of these devices.²³

In the Netherlands, researchers found that nurses actually ranked assistive devices as their number one choice—over increased staffing, additional lifting and transferring courses, and sports or physical fitness classes—for the prevention of back and shoulder problems.²⁴ Many assistive devices (eg, transfer belts, stand-up mechanical lifts, full-body mechanical lifts) are available today for the majority of patient-handling tasks performed in health care settings (Figure 3).

WILL ERGONOMIC APPROACHES BE MANDATED?

In England, lawmakers have passed legislation to implement ergonomic programs in all health care settings to decrease the stressfulness of patient-handling tasks and, thus, the number of back and shoulder injuries to health care personnel.²⁵ Such programs may become legislated in the United States, as well, because a draft of an ergonomic standard has been written by the Occupational Safety and Health Administration.²⁶ Major components of the program include management leadership and employee participation, hazard information and reporting, job hazard analysis and control, training, medical management of injuries, and program evaluation. If the proposed standard becomes a reality, it is likely that health care settings will be mandated to establish ergonomic programs to prevent overexertion injuries.

SUMMARY

Back and shoulder injuries to nurses occur frequently. The precipitating trigger for these injuries seems to be the lifting and transferring of patients. Using an ergonomic approach can decrease the perceived physical stress and the injury rate; however,



Figure 3 • Assistive devices include the stand-up mechanical lift (above, left); the full-body mechanical lift (above); and the transfer belt with handles (left).

additional precipitating factors to this problem in the OR need to be studied.

Nurses must remember that the majority of overexertion injuries are the result of cumulative trauma. Nurses must develop and share an attitude of making workplaces as safe and healthy as possible for health care workers, as well as patients. It is important to determine which tasks are physically stressful and experiment with different approaches to decrease that stress. Nurses must be encouraged to solve problems and work with managers to make changes that could alleviate overexertion problems. All nurses should take responsibility to protect themselves from injury by implementing improved techniques for performing patient-handling tasks. ▲

Bernice D. Owen, RN, PhD, is a professor at the University of Wisconsin-Madison School of Nursing, Madison, Wis.

NOTES

1. US Department of Health and Human Services, *Preventing Needlestick Injuries in Health Care Settings*, publ no 2000-108 (Cincinnati: Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, 1999) 2; G Fragala, *Ergonomics: How to Contain On-the-job Injuries in Health Care* (Oakbrook Terrace, Ill: Joint Commission on Accreditation of Healthcare Organizations, 1996) 7.
2. US Department of Health and Human Services, *Preventing Needlestick Injuries in Health Care Settings*, 12-13; A Garg, B D Owen, "Reducing back stress to nursing personnel: An ergonomic intervention in a nursing home," *Ergonomics* 35 (November 1992) 1353-1375; B D Owen et al, "An ergonomic approach to reducing back stress while carrying out patient handling tasks with a hospitalized patient," in *Occupational Health for Health Care Workers*, M Hagberg et al, eds (Landsberg, Germany: Ecomed, 1995) 298-301.
3. US Department of Health and Human Services, *Preventing Needlestick Injuries in Health Care Settings*, 12-13.
4. S Pheasant, *Ergonomics, Work, and Health* (Gaithersburg, Md: Aspen Publishers, Inc, 1991).
5. Fragala, *Ergonomics: How to Contain On-the-job Injuries in Health Care*, 15-18.
6. Pheasant, *Ergonomics, Work, and Health*, 295.
7. Garg, Owen, "Reducing back stress to nursing personnel: An ergonomic intervention in a nursing home," 1353-1375; Owen et al, "An ergonomic approach to reducing back stress while carrying out patient handling tasks with a hospitalized patient," 298-301.
8. B P Klein, R C Jensen, L M Sanderson, "Assessment of workers' compensation claims for back strains/sprains," *Journal of Occupational Medicine* 26 (June 1984) 443-448.
9. US Department of Labor, Bureau of Labor Statistics, "Injuries to caregivers working in patients' homes," *Issues in Labor Statistics* 97 (February 1997) 1.
10. US Department of Health and Human Services, Public Health Service, *Healthy People 2000: National Health Promotion and Disease Prevention Objectives*, publ no 91-50213 (Washington, DC: US Department of Health and Human Services, Public Health Service, 1990) 298-299.
11. US National Center for Health Statistics, *Healthy People 2000 Review 1997*, publ no 98-1256 (Hyattsville, Md: US Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Health Statistics, 1997) 103.
12. B D Owen, "The magnitude of low-back problems in nursing," *Western Journal of Nursing Research* 11 (April 1989) 234-242.
13. *Ibid.*
14. D Stubbs et al, "Backing out: Nurse wastage associated with back pain," *International Journal of Nursing Studies* 23 no 4 (1986) 325-336.
15. M E Personick, "Nursing home aids experience increase in serious injuries," *Monthly Labor Review* 113 (February 1990) 113-137; J J Knibbe, R D Friele, "Prevalence of back pain and characteristics of the physical load of community nurses," *Ergonomics* 39 (February 1996) 186-198; J Smedley et al, "Manual handling activities and risk of low back pain in nurses," *Occupational and Environmental Medicine* 51 no 3 (1995) 160-163; Owen et al, "An ergonomic approach to reducing back stress while carrying out patient handling tasks with a hospitalized patient," 298-301.
16. Owen et al, "An ergonomic approach to reducing back stress while carrying out patient handling tasks with a hospitalized patient," 298-301.
17. *Ibid.*
18. W S Marres et al, "A comprehensive analysis of low-back disorder risk and spinal loading during the transferring and repositioning of patients using different techniques," *Ergonomics* 42 (July 1999) 904-926.
19. D W Badger, *Work Practices Guide for Manual Lifting*, publ no 81-122 (Cincinnati: US Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute of Occupational Safety and Health, Division of Biomedical and Behavioral Science, 1981) 124-125.
20. *Ibid.*
21. B D Owen, C Hasler-Hanson, "A study comparing three methods for repositioning 'patients' up in bed," *Journal of Healthcare Safety Compliance and Infection Control* 3 (October 1999) 362-367.
22. B D Owen, "Patient handling devices: An ergonomic approach to lifting patients," in *Trends in Ergonomics-Human Factors V*, F Aghazadeh, ed (North Holland: Elsevier Science Publishers, 1988) 721-728; F Bell, *Patient Lifting Devices in Hospitals* (London: Croom Helm, 1984) 87-120; Knibbe, Friele, "Prevalence of back pain and characteristics of the physical load of community nurses," 186-198.
23. Owen et al, "An ergonomic approach to reducing back stress while carrying out patient handling tasks with a hospitalized patient," 298-301; Pheasant, *Ergonomics, Work, and Health*, 20-21.
24. J J Knibbe, N Knibbe, "The workload on the back during the transfer from the wheelchair to the toilet," *Locomotion* 10 (January 1990) 1-10.
25. Royal College of Nursing, *RCN Code of Practice for Patient Handling* (London: Royal College of Nursing, 1996) 3-6.
26. Occupational Safety and Health Administration, "Ergonomics program; proposed rule," *Federal Register* 29 (Nov 23, 1999) 66068-66074.