

Addressing the Need for Research on Bariatric Patient Handling

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KEY WORDS

bariatric patients
ergonomics
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During the past 3 decades numerous studies have documented the high prevalence of patient handling-related musculoskeletal injuries among healthcare workers and evaluated ergonomic interventions using mechanized equipment for lifting and moving patients. A great deal of research-based evidence now demonstrates the effectiveness of ergonomic interventions to reduce injury risk among healthcare workers who handle patients of average weights and sizes. In contrast, there is a lack of evidence-based research that evaluates ergonomic interventions for handling bariatric patients, whose extreme weights and sizes necessitate specialized handling equipment. The obesity epidemic, along with special medical and therapeutic concerns regarding bariatric patients, exacerbates healthcare workers' patient handling demands. The National Institute for Occupational Safety and Health is conducting a new study to evaluate bariatric patient handling hazards and interventions and identify evidence-based best practices for handling this population.

This article provides an overview of ergonomic issues in patient handling and describes new research to identify safe practices for lifting and moving bariatric patients whose weights and sizes exceed the limit for use of standard-sized patient handling equipment.

Overexertion Injuries Among Healthcare Workers

Healthcare workers providing clinical or rehabilitative treatment who routinely lift and move patients, such as nurses, aides, therapists, and transport personnel, are at higher risk for musculoskeletal injuries than workers in most other occupations. In 2008 rates of injury due to overexertion among hospital and extended-care nursing personnel were 60.0 and 110.8 per 10,000 workers, respectively. By comparison, the average rate of work-related overexertion injuries for all U.S. industries is 26.4 per 10,000 workers. For several years, overexertion injury rates among healthcare workers have been two to five times the national rate for all industries and have exceeded rates in construction, mining, and other strenuous occupations (BLS, 1992–2008). Although rates of work-related injuries in most other occupations have been decreasing during the past decade, rates of musculoskeletal injuries among nursing personnel are epidemic (Owen, 1999) and have continued to increase (Fragala & Bailey, 2003).

Patient Handling and Injury Risk

Patient lifting and handling tasks, including patient transfers (e.g., bed to gurney, chair to bed) and patient repositioning, are consistently cited as the most frequent causes of back pain and injury

among nursing staff (Agnew, 1987; Dehlin, Hedenrud, & Horal, 1976; Garg, 1999; Jensen, 1990; Orr, 1997; Owen, 1999). Lifting and moving a patient poses many challenges that are not present when lifting and moving an object. The human body is neither uniform nor compact. The shapes and weights of the body's different parts are unevenly distributed, and there are no convenient handholds to grasp. Even under the best of circumstances, lifting a human is awkward and difficult, but most patient handling situations are far from ideal. Patients, by definition, are experiencing some type of illness or injury. They often can bear little or none of their own weight to lessen the load on caretakers, who must try to be gentle while exerting high forces to lift and move patients. Caretakers often have to cope with furniture and equipment that are in the way and take special care to not disturb tubes, catheters, and wires that are connected to patients. Patients may be uncooperative or even combative, unpredictably forcing caretakers off balance by making sudden movements or suddenly going limp. When this happens, the risk of injury increases because caretakers tend to exert sudden, high-muscle forces, often while in awkward postures, to try to maintain balance and prevent themselves and patients from falling (Garg, 1999; Nelson, Cross, & Lloyd, 1997).

Biomechanical Evidence

As pointed out by Garg (1999), nursing personnel are routinely required to lift and move patients weighing between 90 and 250 pounds. Biomechanical studies have shown that, whether performed by one person or two people, the forceful motions

exerted during transfer and repositioning tasks result in compressive forces on the spine that exceed safety limits specified by the National Institute for Occupational Safety and Health (NIOSH) Lifting Equation (Gagnon, Sicard, & Sirois, 1986; Garg & Owen, 1992; Garg, Owen, Beller, & Banaag, 1991a, 1991b; Marras, Davis, Kirkling, & Bertsche, 1999; Owen & Garg, 1991; Waters, Putz-Anderson, Garg, & Fine, 1993; Zelenka, Floren, & Jordan, 1995; Zhuang, Stobbe, Hsiao, Collins, & Hobbs, 1999). Recent biomechanical analyses using the NIOSH equation indicate that even under ideal circumstances in which a patient is cooperative and unlikely to make sudden movements, the maximum recommended weight limit for manual lifting of a patient or a part of a patient's body (e.g., a leg or an arm) is 35 pounds (Waters, 2007). The large majority of patient handling tasks exceed that limit, placing nursing and therapy personnel at significant risk for injury each time they manually lift more than 35 pounds during patient care. The potential cumulative effects of these tasks also are alarming, considering that under average conditions, nursing personnel lift an estimated 1.8 tons per work shift (Tuohy-Main, 1997).

Special Concerns for Physical Therapists and Rehabilitation Nurses

As described in detail by Waters and Rockefeller (2010), most patient handling tasks performed by rehabilitative personnel during physical therapy are of longer duration than typical transfer tasks, which increases these workers' exposure to excessive spinal loads. Consequently, risk of injury from manual patient handling is likely to be even higher for these specialists than for general patient care personnel. Nelson, Harwood, Tracey, and Dunn (2008) also noted the high risk for musculoskeletal injuries among physical therapists and rehabilitation nurses. Moreover, they cited research in which a significant percentage of injured therapists stopped performing or altered treatments that aggravated their symptoms, raising concerns about the impact of patient handling injuries on the quality of rehabilitative treatment (Cromie, Robertson, & Best, 2000).

Patient Weight and Size

Patient weight clearly is a major factor in spinal compressive forces during patient handling (Zhuang et al., 1999), and healthcare workers' risk for patient handling injuries is greatly exacerbated by the increasing numbers of overweight and obese patients. Increases in body mass index (BMI; BMI = weight in kg/height in m²) values over time in the United States have been documented by Flegal, Carroll, Ogden, and Johnson (2002) and Ogden,

Carroll, and Curtin (2006) using data from the National Health and Nutrition Examination Survey. As of 2004, approximately 66% of adult Americans were overweight or obese (BMI > 25). Between 1988 and 2004, the average prevalence of obesity (BMI > 30) rose from 22.9% to 32.2%, and the average prevalence of morbid (extreme) obesity (BMI > 40) rose from 2.9% to 4.8%. Rates of adult morbid obesity recorded in 2004 ranged from 2.8% of men (all racial/ethnic groups) to as high as 14.7% of non-Hispanic black women.

Bariatric Patients

In healthcare settings, *bariatric* refers to patients whose weights exceed the safety capacity of standard patient lifting equipment (typically approximately 300 pounds) or who otherwise have limitations in health, mobility, or environmental access due to their weights and sizes (Bushard, 2002). Healthcare personnel are encountering hospitalized and critical care bariatric patients with increasing frequency (Pieracci, Baric, & Pomp, 2006; Reto, 2003; Tizer, 2007). In extreme cases, such patients weigh more than 1,200 pounds (Harrell & Miller, 2004).

Special Concerns and Challenges for Bariatric Patients

Obese people require more frequent and extensive health care than people who are not obese due to obesity-related problems such as diabetes, gastric reflux, heart disease, hypertension, incontinence, joint disease, pressure ulcers, respiratory problems, sleep apnea, soft-tissue infections, and some cancers (Bray, 1996; Carek, Sherer, & Carson, 1997; Davidson, Kruse, Cox, & Duncan, 2003; Gallagher, 1999; Sturm, 2003). Approximately 75% of morbidly obese people have at least one comorbid condition that significantly increases the risk of premature death (Must et al., 1999). El-Solh, Sikka, and Bozkant (2001) found that up to 24% of bariatric surgery patients were admitted to intensive care units (ICUs). Mortality risk for obese ICU patients is twice that for patients of normal weight (Tremblay & Banu, 2003). ICUs are experiencing increased admissions of bariatric patients as a result of postoperative complications, comorbid conditions, and delayed access to care due to lack of bariatric accommodations and diagnostic equipment at many medical facilities (El-Solh et al.; Muir, Heese, McLean, Bodnar, & Rock, 2007; Pieracci et al., 2006).

Increased Work Demands Involving Bariatric Patients

Obesity and the increased acuity associated with comorbid conditions necessitate increased caretaking

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staff and increased time and physical exertion per staff member, especially for tasks requiring physical repositioning of bariatric patients (Davidson et al., 2003; Reto, 2003; Rose, 2006). Repositioning patients who are not obese in bed poses a high risk of injury for staff members under normal circumstances (Marras et al., 1999; Nelson & Baptiste, 2004). Bariatric patients are far more difficult to handle and require careful and frequent positioning and repositioning to prevent potential medical crises such as respiratory distress, impaired circulation, nerve damage, and cardiopulmonary decompensation, which is also referred to as Obesity Supine Death Syndrome (Brodsky, 2002; Hunt, 2007). Physical therapist and rehabilitation nurse work demands also are greatly increased with bariatric patients because heavier and larger body parts require more forceful exertions and awkward postures during therapeutic maneuvers.

Skin complications such as yeast infections in skin folds, pressure ulcers, and impaired wound healing are common for bariatric patients, and frequent repositioning and strenuous handling maneuvers are involved in cleaning and treatment (Davidson et al., 2003; Gallagher, 1997, 1999). Because pressure ulcers are considered preventable, hospitals often are not compensated for their treatment. This preventable cost compounds the higher physical demands on nursing personnel who are responsible for preventing pressure ulcers in bariatric patients.

Reducing Manual Patient Handling Through Ergonomic Interventions

Ergonomics refers to the concept of designing a work environment to optimally suit human capabilities. In the healthcare context, ergonomics provides an approach to circumvent the strength limitations of healthcare workers using mechanized lifts and other devices to assist in lifting and moving patients.

Many assistive devices for lifting and moving patients have been developed during the past several decades. For example, low-friction draw sheets and air-assisted transfer mats can reduce physical exertion by reducing or eliminating friction while staff members manually pull patients across bed surfaces. Gait belts can provide handles and improve leverage and stability while manually maneuvering patients. Hydraulic hoists reduce exertion by allowing caregivers to lift patients using hand- or foot-operated pumps or levers. Electronic hoists permit nonmanual lifting and transferring. Technological innovations have led to an increasingly wide variety of these and other devices.

Implementing an effective ergonomics program for safe patient handling entails far more than purchasing assistive devices, however. Staff members must use

the devices if they are to be effective, and, unfortunately, noncompliance in use of mechanized hoists for patient lifting has been noted as a common problem (Bell, 1987; Evanoff, Wolf, Aton, Canos, & Collins, 2003; Garg, Owen, & Carlson, 1992; Jensen, 1987; Nelson, Lloyd, Menzel, & Gross, 2003; Yassi et al., 2001). Factors contributing to nonuse of hoists have included patient aversion, lack of availability or inconvenient storage, time and space constraints, inadequate training, and unsuitability of hoist slings for the patient's condition, weight, or size (Nelson & Baptiste, 2004). In addition, there has been reluctance to use mechanized equipment in physical therapy and rehabilitation due to concerns that it may impede therapeutic progress and reduce patients' functional status and independence (Nelson et al., 2008). Nelson and colleagues point to a lack of evidence upon which to base such concerns. They encourage further development of mechanized methods to simultaneously administer physical therapy while reducing exertion and injury risk for therapy and rehabilitation personnel. Examples of such methods and ongoing research to evaluate their effectiveness are described by Baptiste, McCleerey, Matz, and Evitt (2008) and Rockefeller (2008).

Empirical Support for Ergonomic Interventions

Despite the challenges involved in implementing patient handling interventions, most studies conducted to evaluate their effectiveness have demonstrated cost-effective reductions in injuries and lost work time with the use of mechanized patient lifts and other assistive devices (Chhokar et al., 2005; Collins, Nelson, & Sublet, 2006; Collins, Wolf, Bell, & Evanoff, 2004; Engst, Chhokar, Miller, Tate, & Yassi, 2005; Evanoff et al., 2003; Evanoff, Bohr, & Wolf, 1999; Fujishiro, Weaver, Heaney, Hamrick, & Marras, 2005; Hignett, 2003; Nelson et al., 2006, 2008; Nyran, 1991; Santaguida, Pierrynowski, Goldsmith, & Fernie, 2005; Spiegel et al., 2002). These studies, however, have focused on the use of standard-sized equipment for nonbariatric patients. Empirical research on ergonomic interventions for bariatric patient handling is still lacking.

The Need for Research

Most healthcare facilities do not have specific units dedicated to bariatric patient care, and most lack equipment and protocols for lifting and moving bariatric patients (Gallagher, 1999; Harrell & Miller, 2004; Reto, 2003). Consequently, lifts are improvised using manual methods or unsuitable equipment, posing high injury risk to workers and patients alike. Worker injuries specifically attributed to bariatric patient handling—some serious and disabling—

have been reported ad hoc (Muir & Gerlach, 2003; Warner, 1993). Data addressing these specific types of injuries are not yet available.

Despite the lack of research addressing bariatric patient handling, some recommendations for safe practices, primarily based on personal clinical experience and general knowledge of commercially available assistive devices for bariatric patient handling, have been published by knowledgeable professionals (Gallagher, 1999; Harrell & Miller, 2004; Hunt, 2007; Muir et al., 2007; Muir & Gerlach, 2003; Tizer, 2007; United States Department of Veterans Affairs (VA) VISN 8 Patient Safety Center of Inquiry, 2007; Whittemore et al., 2005; Wilson, 2006). The most comprehensive set of recommendations was developed by Nelson and colleagues at the VA VISN 8 Patient Safety Center of Inquiry, who are well-known for their research-based expertise in nonbariatric patient handling. The *VISN 8 Safe Bariatric Patient Handling Toolkit* (2007) includes information on assessment criteria and medical conditions affecting bariatric patients; a technology and equipment resource guide; a patient handling policy template; and algorithms to guide decisions about equipment, staff needs, and methods for various patient transfers and repositioning tasks. An article providing practical suggestions for using the VISN 8 bariatric algorithms has been published by Muir and Heese (2008). These authors note that their suggestions are based on opinions formed through experience with the algorithms; their article concludes that there is a need for evidence-based research on bariatric patient handling programs.

Overview of Planned Research

Additional research is needed to quantify bariatric patient handling hazards and related injuries and assess the effectiveness of bariatric-specific ergonomic interventions such as the VISN 8 toolkit. Our research group is initiating such a study, with the ultimate goal of specifying evidence-based practices for safe bariatric patient handling that can be used by workers in diverse healthcare settings.

A new study, "Best Practices for Bariatric Patient Handling," is anticipated to begin in 2011. Approximately 10 hospitals will be recruited to participate in the study. Subsamples of hospitals using the *VISN 8 Safe Bariatric Patient Handling Toolkit*, as well as hospitals without formal safe bariatric patient handling programs, will be included. Analyses of retrospective and current data from hospital records, interviews, and worker surveys will be used to quantify bariatric-related hazards and intervention effectiveness. Attempts will be made to obtain data pertaining to bariatric patient handling in surgical, medical, diagnostic, and therapeutic settings. In addition to analyses of exposures (e.g., bariatric patient handling frequency), intervention factors (e.g., patient handling algorithms,

equipment, barriers to using equipment, worker training), and health-related outcomes (e.g., perceived exertion, injuries to workers and patients), economic analyses also will be conducted to assess program costs and patient handling injury-related costs.

Results of the study will be used to develop recommendations for hospital-based bariatric patient handling that can be disseminated via training curricula, publications, websites, and conferences and workshops through partnerships with the American Society for Metabolic and Bariatric Surgery, VA Patient Safety Center, National Association of Bariatric Nurses, American Nurses Association, Service Employees' International Union, and the Work Injured Nurses' Group. Efforts also will be made to develop modified recommendations suitable for nursing homes and home healthcare settings.

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