

DECISION FACTORS IN PATIENT HANDLING

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ABSTRACT

Injuries to patient handlers are a worldwide problem and have been listed as a primary research interest by the National Institute for Occupational Safety and Health (NIOSH) since the 1980's. However, injuries still persist. The Bureau of Labor Statistics (BLS) injury data for 2002 indicates that nurses and healthcare personnel incurred 623,600 nonfatal injuries and illnesses, a 12.6/100 incident rate. In forty percent of these cases, injury to the back was the primary cause. Research on patient handling has provided valuable insights, such as Dr. Marriss's work on maximum safe spinal load limit. However, interpretation of the needed response based on research has led to a division of approaches when contemplating policy versus engineering solutions. An examination of the various approaches yields solutions that directly relate to desired secondary outcomes based on immediacy and/or the developer's job interest. Consequently, these different interests have shown to both help and/or contribute to the existing people or environmental factors, which a nurse must weigh before performing a patient lift. To better understand this, a descriptive study of people and environmental factors was done, examining and mapping their influence and interaction based on data from literature, interviews, and focus groups. People factors involve staff culture, patient characteristics, and handler characteristics. Environmental factors deal with physical space, situation/event, and administration/policy. The degree to which each of these factors influence and/or determine a nurse's decision on how to perform a particular lift can be ascertained by a series of questions. The number of questions per factor varies, but each directly relates to a primary confounding issue. During this study, a list of questions was compiled with each derived from 25 common items/variables identified to be influencers by nurses, doctors and administrators. Consequently, the future research developed and proposed here is based on this list of 25 variables and seeks to provide two things. One is to develop a hierarchy of importance for the variables that control a lift. Second is to examine existing deficits in literature beyond technique. The overall objective is to understand the effects of space restriction (one variable) on a lift and to quantify it in terms of increased risk based on the unobstructed lift.

INTRODUCTION

Nursing and healthcare workers are annually listed as having the second highest injury and severity rates among listed professions in the United States (US) by the National Institute for Occupational Safety and Health (NIOSH) and the Occupational Safety and Health Administration (OSHA) for better than five years (BLS, 2000a, 2000b, 2005), and are estimated

at 12.6 injuries per 100 full time workers (BLS, 2002, 2005). This number is considered to be a low estimate, since underreporting of injuries in nursing is common (USDHHS, 1999). The Bureau of Labor Statistics (BLS) reports show 42% of all nursing injuries were back related in 2003 (BLS, 2005), and nursing personnel rank second among all occupations filing worker's compensation claims for back injury (Arad and Ryan, 1986) accounting for 63.1% of the total workers' compensation costs across several states from 1990 to 1996 (Fuortes et al, 1994; Meyer and Muntaner, 1999), a trend that continues today. Results from over 80 studies across a number of countries indicated that back injury to nurses have a worldwide prevalence of approximately 17 percent (Engkvist et al, 1992; Hignett and Richardson, 1995; Gonge et al, 2001, Engkvist, 2006), an annual prevalence of 40 to 50 percent and a lifetime prevalence of 35 to 80 percent (Hignett, 1996). Overall, there has been a reduction in occupational injury rates (Murphy and Volinn, 1999), but when work-related injuries for caregivers were examined, no such improvement is noted (Fragala and Bailey, 2003; Nelson et al, 2006). An even greater issue that one researcher found was that only 34% of nurses with back pain actually filed incident reports (Nelson et al, 2006). Further, studies showed 12% of these nurses were contemplating leaving the profession because of occupational hazards (Nelson, 2003; CNA, 2005). Moreover, the high dropout rate of nursing students and decreasing average career life of practicing nurses has created a major shortage in the field. This, in turn, has created higher industry turnover rates and now has prompted a major concern with the 'baby boom' generation getting older. In the United Kingdom (UK), it has been reported that as many as 27% of student nurses who graduate never become registered, with some programs having nearly a 40% dropout rate (Jennings, 2000). The UK national attrition rate in 1996 was 15% (Newton, 1996), and in 2000, the Royal College of Nursing (RCN) stated the number of graduates that had failed to join the nursing register was increasing annually (Sanders, 2000). Similar numbers have been seen in the US.

For the past thirty years, research focusing on various aspects of manual techniques and methods to reduce low back injury rates in nurses performing these tasks, has been shown to be ineffective in reducing long-term injury rates (Bobick, 2000, Hignett, 1996, Nelson et al, 2006). However, manual methods and techniques are still widely used and taught in schools of nursing (Nelson et al, 2006). The last ten years has seen an evolution of devices for assisting nurses and caregivers in patient handling (Charney and Hudson, 2004; Marras, 2005). A review of literature has revealed studies modeling nurses' workload and perceptions (Hignett & Richardson, 1995; Wolf, 2006), analyzing mechanical devices such as slings (Elford et al, 2000, Owen et al, 2002), proposing a comprehensive long term ergonomic program development and evaluation (Owen et al, 2002; Collins et al, 2004, Engkvist, 2006; Nelson et al, 2006), and biomechanical analysis approaches (Gagnon et al, 1987; Marras et al, 1999a, 1999b, 2000; Caboor et al, 2000; Marris, 2000; Elford et al, 2000; Skotte et al, 2002; Schibye et al, 2003). Upon analysis, the strength of these studies and others is they approach the same problem from different perspectives of methodology which yield unique solutions to the patient handling problem. The weakness is that none currently consider the more difficult variables to quantify that affect the patient lift externally, such as restriction of space.

Defining the Problem

In the United States, sprains and strains are very common injuries (Jensen, 1985, 1990a, 1990b), accounting for 85% of all injuries. Moving, lifting and transferring patients, equipment or supplies have been perceived by healthcare workers to be the most frequent cause of back injury (Janizewski & Caley, 1995; CNA, 2005) with as high as 89% of one hospital's claims

implicating this cause. Of nursing personnel, nurse assistants, or NAs, were found to be at greatest risk for back problems (Personik, 1990; CNA, 2005) with staff registered nurses, or RNs, running a close second. When examining the issue, the first and obvious solution is not to move patients until they may move themselves. However, having an industry where your product is the well-being of people eliminates this solution. From a medical standpoint, patients must often be moved frequently to prevent skin disorders, muscular contractions, lung congestion, poor blood circulation and other ailments caused by immobility. However, some patients often require assistance in moving about to accomplish routine activities such as (ANA, 2003; Nelson et al, 2003a; Hignett, 2003; CNA, 2005):

- Ambulation (walk about)
- Sitting up in bed
- Turning from side to side
- Moving from bed to chair and opposite
- Moving from bed to wheelchair and opposite
- Moving to or from the toilet (from wheelchair or walk)
- Moving to or from a shower or bathtub (from wheelchair or walk)

When considering both groups of patients needs, common transfers become apparent, Table 1 (Garg et al, 1992; Nelson et al, 2003c; Hignett and Crumpton, 2006).

Table 1
Common list of at patient transfers

Patient Transfers		
Bed to Bed	Floor to Chair	Car to Chair
Bed to Chair	Floor to Toilet	Chair to Car
Chair to Bed	Floor to Bed	Chair to Chair
Chair/Toilet to Tub	Chair to Toilet	Gurney to Ambulance
Tub to Chair/Toilet	Toilet to Chair	Ambulance to Gurney

Of these, toileting and bathing transfers are considered the worst, having been ranked in the top six tasks for perceived physical stress (CNA, 2005). The manual lifting on and off toilets and into and out of baths are highly stressful tasks since they require awkward body postures and introduce the possibility of slipping and because they are usually performed in the confined space of a lavatory or bathroom (CNA, 2005). However, the best description of the variables present when bathing a patient was given by Larese and Fiorito (1994) as twisting-turning, lowering, pushing-pulling, prolonged standing, heavy lifting, frequent lifting, slipping, bending, and lifting (normal). From this list, one can then understand why Caley and Janizewski (1995) stated, “Most back injuries are not the result of a one-time incident but of cumulative trauma caused by three primary categories of factors: general health, organization, and personal factors.” However, these individual categories do not stand alone. Factors interact with multiple others across categories, influencing and ultimately defining the complex tasks known as Patient Handling Operations. Some common factors are (Hignett and Richardson, 1995; ANA, 2003; Lloyd, 2004):

- Physical Space
- Management Support
- Time/Urgency
- Assistance (sought/available)
- Patient (Load) compliance, mobility, size
- Equipment (design, availability)
- Furniture (design, maintenance)
- Caregiver (attitude, experience, training)

Additionally, groups like the Back Action Cooperative (BAC) found that there was no standardization of work environments, especially in home healthcare, and that the lack of room and maneuverability often interferes with attempts to use good body mechanics and equipment (Janizewski and Caley, 1995; CNA, 2005). Other problems resulting from organizational issues can be characterized as mechanical stress of little control over work performed, low status, and anxiety about being held accountable for outcomes not within their control (Janizewski and Caley, 1995). However since 1996, agencies both international and domestic have published guidelines addressing some of these issues. Table 2 shows guidelines by agency, by year.

Table 2
Guidelines relating to patient handling issues

Guideline	Agency	Year
RCN code of practice for patient handling	* Royal College of Nursing (UK)	1996
No Lift, No Injury (Policy)	* Australian Nursing Federation (ANF)	1998
Guidelines for Nursing Homes: Ergonomics for the prevention of musculoskeletal disorders	Occupational Safety and Health Administration (OSHA)	2003
Patient Handling Solutions (2 nd Ed.)	Occupational Safety and Health Department of the New York State Public Employees Federation (PEF)	2003
Work techniques in lifting and patient transfers (by Kjellberg)	* National Institute for Working Life (Sweden)	2003
How to Evaluate Safety and Health Changes in the Workplace	National Institute of Occupational Safety and Health (NIOSH)	2004
Designing workplaces for safer handling of patients/residents. In: Back Injury among healthcare workers	* Victorian WorkCover Authority (Canada)	2004
Overtime and Extended Work Shifts: Recent findings on illnesses, injuries, and health behaviors	National Institute for Occupational Safety and Health (NIOSH)	2004
Back Injury Risk Control for Healthcare Facilities	CNA (commercial insurer)	2005
Safe Lifting and Movement of Nursing Home Residents	National Institute for Occupational Safety and Health (NIOSH)	2006

* International Agency

Finally, when looking at the patient handling problem as a whole, even with all the efforts, research, collaboration, and developed guidelines, it is still a major problem. Many reasons can be given for this, but one of the most obvious is that we still do not understand all of the factors that directly and/or indirectly influence a patient handling lift.

METHODOLOGY

A methodology was chosen to incorporate as much of the complexity and variability of the patient handling setting as possible (Richardson and Hignett, 1994) in an effort to address all factors affecting a patient lift as part of a descriptive study. Using the modified grounded theory method, a model was developed. This model utilized a systematic research approach for the allocation and analysis of qualitative data for the purpose of generating exploratory theory (Chenitz and Swanson, 1986; Morgan, 1997; Bader and Rossi, 2002) and subsequent future research. This was achieved by systematically and intensively analyzing data, often sentence by sentence and phase by phrase (Strauss, 1987, Morgan, 1997). It relies on structured and unstructured interviews, focus groups, observations and other sources of primary data (Morgan, 1997; Bader and Rossi, 2002), which were obtained by questioning, diagramming and other techniques that have been suggested for participatory ergonomics projects and evaluations (Wilson, 1991, Holman et al, 2006). Additional information included data generated from nurses own perceptions of manual handling operations (Hignett and Richardson, 1995) such as lifting, transferring, and/or repositioning patients relative to personal bodily stress (Nelson, 2003), environmental factors (Hignett and Richardson, 1995; CNA, 2005; Gimeno et al, 2006), and psychosocial risk factors (Devereux et al, 1999, Engkvist, 2006; Hignett and Richardson, 1995). Figure 1 shows the conceptual model for progression of the study, which is similar to the Hignett and Richardson (1995) model:

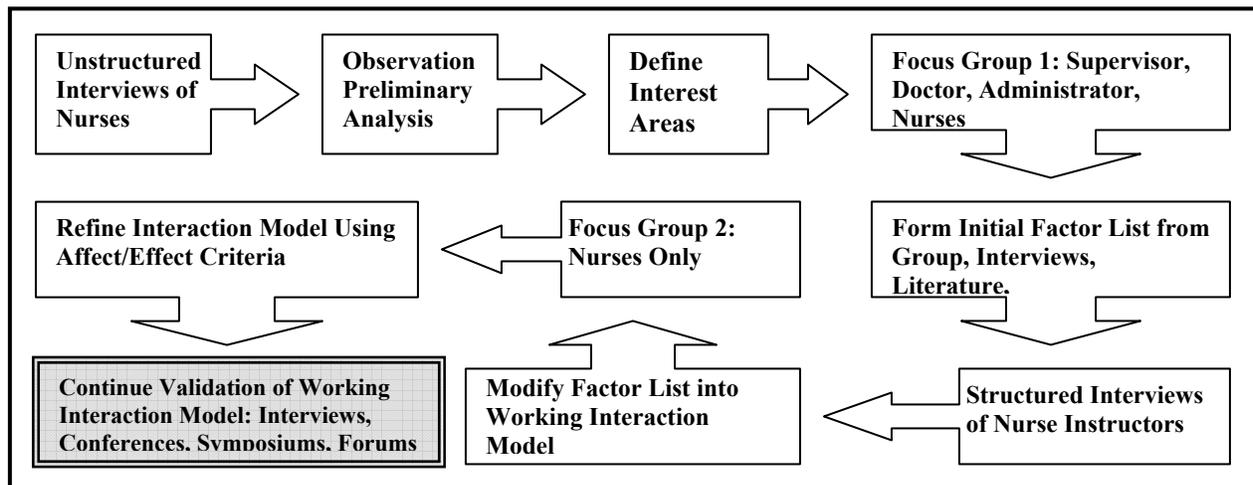


Figure 1: Conceptual model of study progression.

From the model, unstructured interviews were done with currently practicing staff nurses, retired nurses, and individuals who were once practicing staff nurses but have completed an advanced degree and since have taken another position within healthcare. Next, observations of two hospitals, a clinic, and a nursing home were performed and assimilated into a series of interest areas for which literature was collected. The first focus group was then conducted with six people, all from different medical organizations: one doctor, one administrator, one nurse administrator (supervisor), and three staff nurses. This group was selected for the specific purpose of open conversation without potential retribution. Therefore, no one within the group had met before or experienced organizational overlap except for meeting the exam or educational

requirements of the Alabama Board of Nursing. All personal information was kept confidential, first names and generic position were used during the discussion of general topic areas relating to patient handling. From this session, an initial factor list was formed and compared against the existing literature for completeness. Structured short interviews were then performed with college nursing instructors from Auburn University and University of Alabama Birmingham regarding current methods taught and soliciting their views concerning influential factors. From this information, the list was modified into an interaction model and Focus Group Two was held using the same criteria as before except all five participants were staff nurses. The purpose of this group was primarily to answer two questions: (1) Is this a valid model; (2) How could continued validation and subsequent quantification of the influencing factors be accomplished. All information was then combined into the current working interaction model, which is still evolving as more information becomes available about the relationship of individual factors to patient handling and each other.

RESULTS

The areas of interest defined early in this process directed this descriptive study. This is because many of the areas have not been previously quantified in literature; and therefore, there was no definite understanding of their true relationship to the patient handling problem. Interestingly, these variables are all openly discussed about as major to minor confounders in both general conversation and in journals. Table 3 presents a listing of 16 general areas of interest with brief information focusing on the area's history and multiple factors of influence on patient handling (Hignett and Richardson, 1995; ANA, 2003; Lloyd, 2004, CNA, 2005; Wolf, 2006).

Table 3
General influence areas relating to the patient handling problem with description

Influence Areas	Description
Patient Characteristics	Patient characteristics such as patient height, weight, and body shape become significant factors in the context of patient handling (ANA, 2003; CNA, 2005). Also, the human body has an asymmetric distribution of weight and does not provide stable “handles” to grip its load (Nelson et al, 2003a; Marras, 2005). In some circumstances, a patient can offer limited levels of assistance in moving themselves, i.e. degree of dependence, but depending on their current cognitive state some may have limited or no communication ability causing them to become agitated or combative, ceasing to cooperate (ANA, 2003; CNA, 2005)
Caregiver Characteristics	Sociodemographic variables including age, gender, education, nursing experience, ward experience, history of prior back injury, and nature or cause of the injury were considered (Gimeno et al, 2006). Age and nursing/ward experience have not been found to be significant factors in predicting injury (Fuortes et al, 1994; Engkvist et al, 2000; Engkvist, 2006; Gimeno et al, 2006). Personal risk factors are known to be poor body mechanics, alcohol abuse, smoking, pregnancy, obesity, previous back injury, osteoporosis, poor nutrition, lack of exercise, severe job stress, and emotional home stress (Caley and Jenizewski, 1995).

Quality of Care	The quality of patient care is a topic of great concern with the ‘baby boom’ generation getting older. Further research is needed to see if the presence of musculoskeletal discomfort in nurses affects quality of patient care (Menzel et al, 2004).
Training	Training should involve learning proper techniques for evaluation and decision making of patient handling situations, proper lifting techniques, and how to utilize patient handling equipment appropriately based on the factors present (Myers et al, 1993, Spratt et al, 1997).
Equipment	Nelson and associates (2006) reported that patient handling equipment was subject rated 96% effective for the applicable situation. There are 11 categories of Patient handling technology (Nelson et al, 2003b; CNA, 2005).
Environmental Characteristics (Physical)	Physical and environmental hazards commonly found in hospitals include slippery floors, electrical hazards, noise, poor lighting, and inadequate ventilation (Triolo, 1989; Hignett and Richardson, 1995). Physical environment such as room dimensions and fixed architectural fittings can pose restrictions on movement and positioning while performing a patient lift (Hignett and Richardson, 1995; CNA, 2005).
Environmental Characteristics (Event/Task)	Several individual patient handling tasks are considered high-risk for producing disorders, such as turning, bathing, or dressing a patient; pulling a patient up in bed; and transferring a patient to a stretcher, bed, chair, or toilet and back (Garg et al, 1992; Nelson et al, 2003c).
Insurance and Accrediting Agencies	Insurance companies, accrediting agencies, federal organizations, and legislative bodies have all started to take roles in patient handling. Consequently, insurance companies have been taking a vested interest in healthcare injuries for years by promoting research and interest in the field and endorsing technology, which can potentially benefit the industry as a whole. They have even, in some cases, tried to dictate healthcare facility policy by requiring the purchase and use of a selected patient handling device for those having policies with them.
Workload and Staffing	A typical nurse’s has a patient ratio depending on the care setting ranging from 12 to 1 down to 4 to 1, patients to caregiver (Menzel et al, 2004). This means that on average, the RN was required to refocus attention from one patient to another every 6 to 7 minutes based on workload while being interrupted 3.4 times per hour (Wolf et al, 2006). Routinely, a hospital staff nurse lifts 20 patients in bed and assist 5 to 10 patients with transfer from bed to chair in a single shift (McAbee, 1988).
Work Schedule	Work Schedule in healthcare was described by one group of nurses as ‘organized chaos.’ Normal schedules have nurses rotating to meet the demand of a 24 hour a day, seven day a week business.

Safety Culture	Safety culture is believed to be a key predictor of safety performance and practice of an organization relative to incident and injury outcomes (Gershon et al, 1995; Gershon et al, 1999; Harvey et al, 2002).
Administration Policy/Program	The international nursing community has long recognized manual patient handling as a significant occupational hazard with the United Kingdom and Australia, having published official stances (ANA, 2003). Reinforcing, the cost-benefit ideology stating that it is much less expensive to implement a comprehensive back injury prevention program than to pay for an employee's rehabilitation from work-related back injuries (Smith, 1995).
Psychosocial	Known psychosocial factors related to nursing are rotational shift work of varying lengths (Triolo, 1989), fatigue (Hignett and Richardson, 1995), physical and/or mental abuse by patients, their family members or the doctors (Estry-Behar et al, 1990; Hignett and Richardson, 1995), family support (Damkot et al, 1984), cultural differences (Damkot et al, 1984), and caregiver role (Damkot et al, 1984; Estry-Behar et al, 1990).
Musculoskeletal Injury, Incidence, Disorder	Most work-related musculoskeletal disorders among nursing personnel are back injuries, although they also include neck, shoulder, arm, wrist and knee disorders (Daraiseh et al, 2003, Menzel et al, 2004). Subsequently, 62 to 66 percent of nurses frequently experienced discomfort at or above a moderate severity level in at least one body part (Meyer and Muntaner 1999; Menzel et al, 2004).
Lost Time	Days lost from work due to injury of a specific body part were as follows: shoulders 94 days, knee 76 days, and back 90 days (Meyer and Muntaner, 1999). Overall, 60-70% recover by 6 weeks, and 80-90% by 12 weeks. Recovery after 12 weeks is slow and uncertain. Fewer than half of those individuals disabled for longer than 6 months return to work, with the rate going to zero after 2 years (Helming, 1997; Andersson, 1999; Lewis, 2002, Menzel et al, 2004). Canadian data shows injury recurrence rates of 20% in 1 year and 36% over 3 years (van Doorn TWC, 1995)
Budgets and Injury Economics	From 1990 to 1996, comparing claims originating from nursing service across several states accounted for 63.1% of the total workers' compensation costs (Fuortes et al, 1994; Meyer and Muntaner, 1999).

Interaction Model

The current working model for interactions includes 25 direct variables shown in Figure 2. This model is condensed for overlapping areas, which was fundamentally reduced to two primary groups, e.g. environment and people, with three areas each. However, indirect variables, which are numerous, have not been entered into the model and are expected to at least double its complexity. Upon completion, the new model should yield a better understanding of the decision process a nurse must go through each time a patient handling activity is performed.

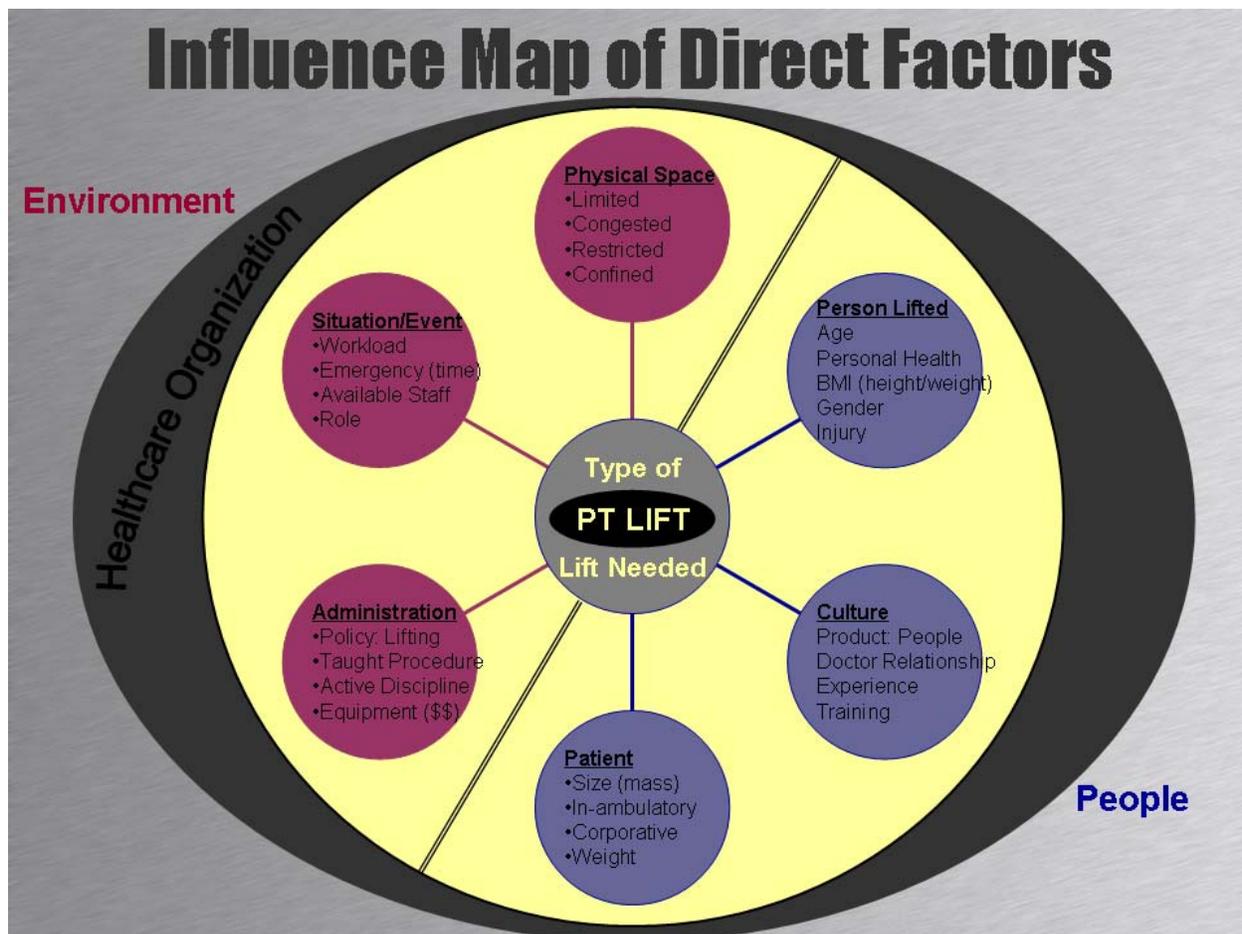


Figure 2: Interaction model of direct variables (Influence Map of Factors)

DISCUSSION

Over the last 30 years, most efforts to reduce work-related musculoskeletal disorders in nursing have focused on body mechanics and lifting techniques. However, these efforts have consistently failed to reduce the risk associated with patient handling and movement (Nelson et al, 2006). Overall there is little to substantiate the continued practice of training in single person manual lifting and handling techniques as it has been the case for many years (Hignett, 1996, Marras et al, 1999b). Consequently, some experts believe that training in proper body mechanics and patient handling procedures should not be relied upon as the only component of a back injury prevention program (Owen, 1987; Buckle et al., 1992; Corlette et al., 1992, Hignett, 1996). The best currently available solution is patient handling equipment, being widely accepted by both staff and patients. Current studies show that Patient handling equipment was rated by caregivers as the most effective aspect of a comprehensive ergonomics program, but it still does not cover all situations (Hignett, 1996; Nelson et al, 2006), leaving manual handling the only options in some circumstances. An example is that there are no viable technology solutions for a high-risk, high volume patient handling task such as repositioning a patient in a bed or chair (Nelson et al, 2006), emphasizing the need for ergonomically designed workplaces and practices (Andersson et al, 1999).

In 2003, Stetler et al. determined that no simple solution or single intervention would be effective in solving the patient handling problem. Consequently, the complex, contextual aspect of the work environment cannot be ignored and has not yet been completely assessed due to a lack of full understanding of all problem variables. Confounding issues, which limit researchers, are (Stetler, 2003; Nelson et al, 2006):

1. Nurses notoriously under-report injuries
2. End points in data collection are difficult to determine due to the length and nature of the injuries
3. Nursing turnover rates impede data collection and skew results
4. Self-reporting is known to allow for under-reporting, omission, and selection bias
5. Rotational floating and schedule change make data collection difficult
6. Exposure in previous jobs (pre-existing injury/ailment) is difficult to assess.

These findings suggest that nurses need additional training to fully understand and participate in ergonomics assessment of their work and environment. Consequently, if any progress is going to be made in the near future, it will be this type of collaboration which allows us to understand the controlling variables associated with restrictions and conditions of patient handling tasks.

Potential limitations

This study was based on a limited population cross-section of healthcare professionals within the state of Alabama. Gender and ethnic representation was not proportional to current U.S. population (according to census.gov). However, representation was proportional to the current gender and ethnic population in healthcare (BLS, 2002) in the state of Alabama (Alabama Board of Nursing, 2005). Additionally, all results were examined against known literature including books, peer-review publications, conference proceedings, and practitioners' magazine and news articles.

CONCLUSION

Occupational injuries entail great costs for society, employers, and employees (Bigos et al, 1991, Seferlis, 1999, Wolf, 2006). For nurses, injury can be debilitating physically, mentally, and socially, because in 42 percent of the cases, it involves injury to the back, directly attributed to patient handling. In the USA, back pain is the most common cause of activity limitation in people younger than 45 years (Caley and Janizewski, 1995; Andersson, 1999), the second most frequent reason for physician visits behind respiratory infection (Janizewski and Caley, 1995), the fifth-ranking cause of admission to the hospital, and the third most common cause of surgical procedure (Cherkin et al, 1994; Hart, 1995). It is the third leading cause of physical limitations and disability, and annually, back injuries account for approximately 27 million lost workdays (Janizewski and Caley, 1995) with about 2% of the US workforce being compensated for back injuries each year.

In this descriptive study, 25 direct influencers of patient handling have been mapped through literature, interviews, and focus groups in an effort to understand the magnitude of the problem from a nurse's perspective (Owen, 2004). However, this list is incomplete. Findings suggest that nurses need additional training to fully understand and participate in ergonomics assessment of their work and environment. Consequently, the unique work environment of nurses, combined with high levels of risk and environmental hazards, warrants closer collaboration between ergonomists and direct care providers (Nelson et al, 2006) with the goal of

preventing occupational back strain (Fuortes et al, 1994) through better understanding of the variables controlling the restrictions and conditions of patient handling tasks.

Proposed Research

The research proposed here is based on this list of 25 direct variables and seeks to provide two things. One is to develop a hierarchy of importance for the variables, which control a lift. Second is to examine existing deficits in literature beyond technique. Specifically, to understand the effects of space restriction (one variable) on a lift and quantify it in terms of increased risk based on the unobstructed lift. This study was a section of part one of a two part study looking at the restriction and conditions which influence patient handling. The goal was to determine by setting, the specific conditions or restrictions that confound a patient's lift. From this, a questionnaire was developed and distributed to determine characteristics, attributes, and weight of these confounders as well as determine the general health of the nurses taking the survey. These characteristics included both dependent and independent variables for analysis. Independent variables were medical setting, safety aversion, previous on-the-job injury, and availability of patient handling equipment. Dependent variables were location and type of lift, distribution of time, physical restrictions, and influencing factors. The approach used was similar to a Delphi study where known experts are used to develop and guide the study (Last & Fulbrook, 2003). Currently, questionnaire results are pending. The second step in this study is to examine existing deficits in literature beyond technique. Specifically, the goal is to understand the effects of space restriction (one variable) on a lift and quantify it in terms of increased risk based on the unobstructed lift through a biomechanical laboratory study. This variable was chosen due to its prevalence in interviews and focus groups and its absence in literature. The research is postulated on the belief that quantification of this variable will yield some possible guidance for settings that currently are inappropriate for mechanical assistance when performing a patient lift. Currently, step two is on-going.

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