Risk factors and impacts of occupational injury in healthcare workers: A critical review

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Abstract

Introduction
The high-risk, fast-paced healthcare industry presents unique health and safety challenges for healthcare personnel, including exposure to psychological and physical demands resulting in the incidence of musculoskeletal injuries of epidemic proportions. The dynamic healthcare environment demonstrates that workers are prone to injury through a host of factors unique to them being directly involved in patient care. Just as heredity and environment interact to result in disease, no single risk factor is responsible for injury but rather a complex interaction of worker, patient, and hospital characteristics. This critical review reports the risk factors and impact of musculoskeletal injuries, with consideration for how these factors impact the worker, quality of care, and patient outcomes. The intent of this critical review is to summarize current literature, identify gaps in research, and broaden the questions that are asked as the efforts to reduce occupational injury move forward, not to provide definitive risk factors and impacts for occupational injury.

Conclusion
The risk factors of occupational injury are well documented; less understood is the impact of elevated incidence of occupational injury on patient safety. Nursing injury rates are linked to nursing shortages and less nursing time at the bedside, with both of which have been scientifically linked to negative patient outcomes. Further investigation is needed in this area not only due to the pain and suffering experienced by those directly affected, but also because of the organizational impacts that indirectly affect patient care. The benefit of this research is to reveal the integral role the individual worker plays in patient outcomes, despite the quality of care they provide, a finding that could dramatically change strategic priorities to deliver exemplary patient care and ensure the health and safety of workers, patients, and the public.

Introduction
Driven by an ageing population and longer life expectancy, healthcare is one of fastest growing sectors of the economy, employing over 18 million workers in the United States and over 59 million worldwide. This high-risk, fast-paced industry presents unique health and safety challenges for healthcare personnel, including exposure to psychological and physical demands resulting in the incidence of musculoskeletal injuries of epidemic proportions. Occupational risk factors include heavy manual lifting, repetitive movement, poor posture, and continuous work. Overexertion represents one of the most disabling work-related injuries, representing approximately 50 lost workday injuries per 10,000 full-time equivalent (FTE) employees and more than $13 billion per year in direct costs, accounting for more than one-quarter of the overall national burden of occupational injury.

More than one-third of occupational injuries in healthcare involve interaction with people other than the injured employee, most frequently with a patient (28%), indicating the risk associated with patient handling. Each day, more than 9,000 of the nation’s healthcare workers sustain a disabling injury while moving a patient. Many experts believe this figure represents significant underreporting of cases. Unfortunately, nurses accept occupational pain and injury as part of their job, with 52% to 63% of nurses reporting musculoskeletal pain that lasts for more than 14 days.

The dynamic healthcare environment demonstrates that workers are prone to injury through a host of factors unique to them being directly involved in patient care. These risk factors can be identified as characteristics of the worker, the patient, and the hospital (Figure 1). Occupational injury in healthcare workers leads to pain, disability, and lost time—all factors that contribute to decreased work effectiveness. The most obvious impacts of work injury are those that are quantifiable, such as direct and indirect costs to the hospital, high turnover and staff shortage. This critical review will summarize current literature, identify gaps in research and broaden the questions that are asked as efforts to reduce occupational injury move forward. This critical review attempted to identify all articles that examine occupational musculoskeletal injury in healthcare personnel responsible for direct patient care. Exclusion criteria for articles included methodologies utilizing symptoms and frequency of pain as determinants (rather than injury) and review of healthcare personnel that do not have direct patient contact (e.g. maintenance, food service, laboratory). All articles
were published in English anytime through December 2011. Researchers of each study acquired and documented injury data in various forms. Worker’s compensation claims are considered to be particularly useful in assessing health conditions of occupational nature during the course of employment. In this review, these claims were the most popular method, as these data are easily obtained and provides additional information including extended health benefits, long-term disability claims, outpatient medical services to physicians, specialists and other health professionals, and inpatient hospitalizations. Other occupational health researchers chose various surveillance systems that included standardized operational databases, Occupational Safety and Health Administration (OSHA) logs, insurance data and facility injury data. This critical review reports the risk factors and impact of musculoskeletal injuries, with consideration for how these factors impact the worker, quality of care and patient outcomes.

**Discussion**

**Patient risk factors**

The patients, with whom healthcare workers interact, generate unique demands based on their physical and cognitive characteristics and requirements. High patient acuity and mobility limitations create challenges for the healthcare provider; often increasing physical and mental stress. Patient demands placed upon the providers by the conditions of the patients and/or the expectations of their families, including technological care and services, increase a provider’s workload, placing increased demands on the employee contributing to high musculoskeletal injury rates.8

**Worker risk factors**

Occupational injury is the result of interaction between the affected person and a host of risk factors including those that are personal, non-occupational, occupational and psychosocial in nature. Research demonstrates that personal and non-occupational risk factors are consistent across industries and consistent in research assessing characteristics of individual healthcare workers. The most notable risk factors include age, gender, smoking, education and lifestyle habits. Advancing age represents a statistically linear distribution, as increasing age is associated with increasing risk. Additionally, younger nurses or those with less seniority experience rates of injury similar to more experienced nurses who have accumulated more time in a nursing unit, particularly units that typically require frequent lifting.

Females, representing an overwhelming proportion of the healthcare workforce, have a higher incidence of falls, low back symptoms, repetitive motion disorders and high-cost injury claims. In comparison to all industries, healthcare has the highest proportion of days-away-from-work cases of female workers (81% of all incidents). Socioeconomic status, traditionally

**Figure 1:** Characteristics of the worker, patient and hospital as risk factors and impacts of worker injury.
linked to higher injury rates, does not appear to influence those same rates for healthcare workers. Rather, rates are attenuated after adjusting for psychosocial and ergonomic workplace exposures, suggesting that workplace differences may be the true predictor.\textsuperscript{16,17}

Stress, fatigue, burnout and frustration play a crucial role in occupational injury, with job strain demonstrated to be the most important predictor of functional health status.\textsuperscript{18} Closely correlated with decreased staffing levels, increased stress and job strain are the result of workload and increased physical work and psychological demands.\textsuperscript{9,17} Obesity and poor health behaviours also contribute to increased risk of injury. Smoking cigarettes, lack of exercise and overeating (all coping mechanisms for stress) can further increase risk of injury.\textsuperscript{15} These risk factors indicate a general lack of conditioning, poor physical abilities and poor health status. Furthermore, the frequency and severity of injuries increase for nurses weighing over 200 lbs.\textsuperscript{11} Prior injury represents a significant risk factor for occupational injury, increasing frequency and severity of the outcome.\textsuperscript{15,19}

The healthcare providers schedule impacts risk of occupational injury due to the stress placed on the individual worker as well as changes in the occupational environment during certain shifts. Important determinants of occupational injury risk and severity include working rotating shifts, working more than four night shifts in a row, working more than eight hours per shift, having reduced time between shifts, and working several consecutive workdays.\textsuperscript{13} Additionally, studies indicate that working full time, over time, and evening and night shifts increases risk. Such schedules include working longer hours and as a result, there is less time to recover from strain, heightened fatigue and a loss of focus and concentration.\textsuperscript{10} These employees experience more sickness, burnout and job dissatisfaction than their part-time counterparts, further increasing their risk of injury.\textsuperscript{10}

Part-time and casual healthcare workers do not experience the same injury rates as full-time workers but may be at increased risk for different reasons including exposure to more hazardous tasks, less access to relevant training and programs, and less job security.\textsuperscript{11} Shift workers in any industry are prone to decreased levels of cognitive functioning, inferior job performance and increased feelings of stress, all contributing to a greater number of occupational accidents as a result of circadian desynchronization.\textsuperscript{22} In addition to the physical and cognitive demands of shift work, the hospital environment can be very different, with less staff available to assist in patient handling and higher patient staffing ratios, both risk indicators for musculoskeletal injury.\textsuperscript{23}

**Hospital risk factors**

The organizational climate and safety culture (employee perceptions of their organization’s commitment to safety) can significantly impact healthcare worker satisfaction and risk of occupational injury. Employee perceptions of supervisor support, work pressure, peer cohesion, autonomy, role ambiguity and conflict have been linked to occupational injury.\textsuperscript{19,24} One study identified the following features especially damaging: low nurse/physician collaboration, low nurse management, low professional practice, low opportunity for advancement and low unit decision-making.\textsuperscript{25} The workplace safety culture is of increasing importance as organizational features including lack of training and administrative support effect and influence the adoption of safety behaviours. These blunt-end characteristics directly contribute to challenges felt at the sharp end including inadequate staff and high nurse–patient ratios.

The physical work environment can affect the worker in a multitude of ways, both physically and cognitively, and has been linked to job satisfaction, work performance, productivity, and ultimately, quality of care provided.\textsuperscript{26} The physical environment is often geared towards patient satisfaction, with a focus on a ‘healing environment’. The resulting environment may not be optimal for the healthcare worker if they impose unique demands for their workspace, such as a lack of storage, dim lighting or workflow conflict. The majority of overexertion injuries are the result of cumulative trauma and can manifest as symptoms of a poorly designed workplace, particularly considering an environment not conducive to safe patient handling tasks. No places to rest, hazardous equipment and noise levels have been identified as physical environment characteristics that lead to unsafe situations and dangers.\textsuperscript{16} In one study, nurses in both high and low claim rate hospitals ranked the physical work environment as the second most important contributor of musculoskeletal injury, behind workload.\textsuperscript{10}

**Impacts**

**Hospital impacts**

Direct costs include the cost for medical care and the compensation paid to injured workers while indirect costs include replacement of injured workers, additional training time by supervision and management, loss of productivity, decreased morale and other related issues. Both direct and indirect costs associated with occupational injury present a significant burden to the healthcare industry. In addition to quantifiable costs, injuries indirectly contribute to patient safety in terms of lost productivity, change in workflow, disruptions, the loss of qualified nursing personnel and the resulting delivery of quality patient care. It has been estimated that the indirect cost can be greater than four times the direct cost.\textsuperscript{27}
Worker impacts
Prior injury is associated with increased risk for secondary injury and increased future risk for re-injury, as it raises susceptibility and changes one’s work habits. Exacerbated by healthcare demands, providers have reported proportions of persistent problems twice as high as other industries, with employees reporting persistent medical problems 2 years (39%) and 5 years (23%) after an event. The quandary is expected to persist as an aging population drives the prevalence of chronic conditions in the workforce higher.

Occupational injury, illness, burnout and disability contribute to absenteeism among healthcare providers with a significant proportion related to musculoskeletal injury. Studies demonstrate a dose–response relationship between multi-morbidity and increased work absence but often the durations are not temporary. Those suffering lifting-related injuries and/or chronic pain found their return to work so physically demanding they considered leaving patient care. The economic implications of these rates are staggering, but the impacts of occupational injury affect the individual worker as well, contributing to burnout, frustration and perceived lack of social support from management and peers.

Patient impacts
The economic cost of occupational injury is well documented and often the major focus for healthcare institutions. Less understood is the impact of elevated incidence of occupational injury on patient safety. In addition to the pain and suffering experienced by those directly affected, healthcare workers who recently suffered an injury, experience lost time and decreased work effectiveness leading to absenteeism and high turnover. Research suggests that worker injury changes not only the individual worker’s style but on a larger scale, the workflow of the hospital contributing to poor patient outcomes. Due to reduced staffing levels, workers are expected to perform more physical activities within a given shift. In addition, the intensity of work has increased and there are fewer personnel to support the activities. Unrealistic workloads prevent nurses from delivering a high quality of care to patients, creating more job stress, frustration and burnout.

Nursing injury rates are linked to nursing shortages and less nursing time at the bedside, both of which have been scientifically linked to negative patient outcomes. Staff shortages have been linked to specific patient outcomes including nosocomial infection rates, urinary tract infections, postoperative infections and pressure ulcers; patient dissatisfaction with overall care and with pain management; and medication errors and patient injury rates (specifically falls). It is estimated that the risk of death for surgical patients increases 7% for each additional patient over four in a registered nurses workload, and 31% where nurse–patient ratios are extremely high (eight patients per nurse). Staff shortages then increase the risk of occupational injury, creating a vicious cycle in the healthcare industry. Additionally, the industry must deal with unintended consequences of hiring temporary per diem nurses who may be less familiar with standard operating procedures and equipment, further contributing to an unsafe work environment and creating concerns regarding competency, fatigue, and teamwork among nurses, doctors and support staff.

Conclusion
The application of human factors and the establishment of patient safety initiatives over the past decade indicate progress is shifting the public discourse to systems thinking. These concepts highlight the need to reduce the risk of injury from the structure and process of care for both the healthcare provider and the patient. In industry, it is well known that an ergonomically designed workplace correlates with increased quantity and quality of work and is accompanied by simultaneous health benefits. It benefits the medical community to encourage and support ergonomic research in medicine, to ascertain new technology and innovations and to integrate these developments into the daily routine of the hospital. The current lack of ergonomically designed workplaces not only leads to musculoskeletal injury but disturbances in workflow and patient safety hazards. The medical community, academia and industry all should have a vested interest in this research and in future studies that are successful in meeting goals to reduce musculoskeletal injury.

An increasing number of studies indicate a strong correlation between patient safety and occupational safety in healthcare. Despite this research, hospitals continue to consider them in isolation. Employee health and safety and patient safety are two initiatives with a common goal, the improvement of healthcare quality and safety. As such, they should be incorporated into a single initiative that utilizes novel techniques to improve both physical and cognitive aspects of healthcare. Interventions to help reduce work-related claims, including appropriate nurse-staffing levels, proper equipment and training, and reasonable job demands and workload will by their very nature improve patient safety. Organizational and structural factors such as leadership vision and communication create a positive work environment. Changes to the physical environment range from costly restructuring and work area redesign to relatively inexpensive strategies including implementing safe lifting practices, offering educational programs, providing quiet rooms where nurses can relax, having adequate and functioning equipment available.
Critical review

for patient care and offering wellne-
ss programs at the work site. In doi-
ng so, there are additional downstr-
eam benefits including increasing t-
he length of clinicians’ careers, re-
ducing staff shortages, adverse events and improving team morale.

Further investigation is needed in this area not only due to the pain and suffering experienced by those directly affected, but because of the organizational impacts that indirect-
ly affect patient care. Future research should provide quantitative and qualitative insight into how the physi-
cal work environment contributes to healthcare provider and patient safety. In addition to subjective review, as noted in previous safety studies, research should also take into ac-
count objective records and physical assessments, allowing for analysis of individual risk factors as well as analysing the interplay of multiple program initiatives and worker char-
acteristics. Just as heredity and envi-
rionment interact to result in disease, no single risk factor is responsible for injury but rather a complex in-
teraction of worker, patient and hospital characteristics. The benefit of this research is to reveal the integral role the individual worker plays in patient outcomes, despite the qual-
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tient care and ensure the health and safety of workers, patients and the public.

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