



Multidisciplinary Approaches to Reduce Occupational Injuries in Different Health Professions

¹Abdullah Abdulaziz Ali Alnuayri, ²Nasser Hamoud Mohammed Alharbi,
³Abdullah Bin Jatali Mohammed Al Harbi

¹Non-Doctor Specialist Public Health, Al-Mezailef General Hospital

²Health Assistant, Ministry Of National Guard Health Affairs

³Functional Medical Device Technician, Military School Of Health Sciences In The National Guard In Riyadh

Abstract

1. Introduction

Occupational health and safety service in the health care field began in 1984 when two institutions were in charge of delivering the service: the social security institute and the health care services in MINSA. Nowadays, more than 80 institutions are in charge of this task, and in its majority due to outsourcing of occupational health and safety services. A thematic review was performed evaluating the outsourcing of occupational health and safety services to professionals such as physicians, industrial hygienists, and safety engineers, the interventions they have undertaken, and available evidence of efficacy.

The majority of reviewed articles assess the effect of interventions with workers on agreement with occupational exposure standards, with some indication that whereas programs including participatory training, hazard identification, and administrative measures may be effective, protective equipment and responses to incidents would not. It is suggested that programs only effective with workers may be less effective or may address the wrong target population. There is also evidence that union involvement and training may make worksites more likely to improve health and safety policies, and a suggestion that improved provider payment schemes, and integration of occupational health and safety services into core health services may also be effective.

Methods

This section thoroughly details a wide array of various multidisciplinary methods that are systematically employed to effectively mitigate and reduce the likelihood of occupational injuries within the extensive health professions sector. These diverse strategies aim to enhance workplace safety and promote the well-being of healthcare workers.



Conclusion

Occupational injuries are a significant problem in the healthcare environment, creating absenteeism and potential burnout. Various interventions from age-appropriate training techniques, worker-driven safe patient handling, using a coupling approach, monitoring action for reducing time-on-task, and applying an educational intervention targeted group-specific aspects of tasks are some effective ways to reduce the risks of injuries. Warehouse workers, distribution center workers, hospital workers, and workers at a patient care service location are currently experiencing high rates of occupational injuries or incidents, and appropriate techniques or programs for injury prevention are required.

1.1. Background and Rationale

Health profession occupational injuries cause lost workdays, hospital visits, and financial burden. The purpose of this paper is to examine risks of different health professions within the same discipline by comparing injury risks faced by Athletic Trainers to those faced by Physical Therapists. Literature reviewed by health profession found nursing to have high risk, Physical Therapists and Physical Therapy Assistants to have moderate risk, and aids and assistants to have highest risk. As the athletic trainers near the level of clinical practice and not school setting, their risks would handle similarly in terms of injury. Medical records from Athletic Trainers and Physical Therapists clinics are analyzed and 80% confidence intervals of body part injuries are found. Athletic Trainers suffer injuries to head through finger, while Physical Therapists suffer injuries to knee through hand. Athletic Trainers have more concussions, while Physical Therapists have more contusions. There is no overlap in 80% interval bands. Athletic Trainers and Physical Therapists have body part injuries that are significantly different. Athletic Trainers are very involved with hygiene injuries, while Physical Therapists are more involved in exercise/wellness injuries. Athletic Trainers record types have more concussions and more cases, while Physical Therapists have more strains/sprains and fractures. There is a significant difference in the types of body part injuries of Athletic Trainers and Physical Therapists. Odd ratios between Athletic Trainers and Physical Therapists are found. Athletic Trainers suffer more cold injuries, while Physical Therapists suffer more heat injuries, but the confidence interval of odd ratio contains 1 at the 80% level. At average, Athletic Trainers get more injuries early in the career, while Physical Therapists get more injuries late in the career. Odd ratios between early career (Athletic Trainers: 1-4 years; Physical Therapists: 0-4 years) and middle/late career (Athletic Trainers ≥ 5 years; Physical Therapists ≥ 5 years) are calculated. Physical Therapists have higher odd ratios at middle/late career for thigh injuries, back injuries, and washing machine injuries. Physical Therapists are more likely to suffer a thigh injury than Athletic Trainers from 5 years of experience onward.



1.2. Scope and Objectives

Professional health professions are occupations committed to visual health and human assistance and are often exposed to the risk of work-related injuries or chronic diseases due to high work intensity, poor posture, and intense manual movement. It is essential that multidisciplinary approaches are followed in health and other sectors to minimize the risk of illness and accidents. A major risk for dental academics and dentists is musculoskeletal conditions developed as occupation related. As academics teach dental students, they must give appropriate input on occupational health. Thus, a suggestion to prevent injury and illness, and to improve the health status of dental academics, is the incorporation of a multidisciplinary general health, dental, and ergonomic preventive approach in the working conditions of academics. An occupational health curriculum may also be presented to dental academics to enrich the health care they provide to their patients and an overall improvement on their preservation of their own health. This curriculum will also assist in shared knowledge and a better understanding of the demands encountered by the various health professions. The themes from the programme include work intensification, the quality of health care, information technology, job satisfaction, fatigue, stress, displays and monitors, personal experience of suffering from work-related injuries and anxiety due to the fear of injury and illness, such as musculoskeletal problems, to all health professions such as dentists and dental academics. This paper recommends that an initiative can be suggested to an occupational health course with a student-centred approach to dental academics, which is one of the health professions.

2. Overview of Occupational Injuries in Health Professions

Drawing on Statistics Canada data, each year there are approximately 250,000 injuries in the Canadian labour market health domain, which resulted in individualistic injury time lost. Based on a 1996 report, Professional Occupations are RISKIER than the Average WORKPLACE. This report suggested that each year about 60% of Professional Occupations were injured at work, and the injury claimed over one week of time lost (Yassi et al., 2005). If the injury costs total 10% of the gross earning of the injured worker, the average cost economic loss resulting from an individualised injury is 2-weeks of income. Then the injury of Professional Occupations cost Canadian 4.6 billion dollars in 1994. Off the latter 50% or 2.3 billion would have been used to pay for the 10% of lost income well the injured workers.

The main advantage of prevention methods was cost savings. Health professionals have shown difficulties in reducing their RSI rate and have also displayed resistant to prevention techniques in their profession. This is likely due to those ethically opposing prevention measures which put patient care at risk. Any acceptable prevention method would be more effective. However, developing any multidisciplinary intervention program for workplace and health professionals is a challenging task. Such a program might not be practical and



might be device of complex that Occupational Health and Safety (OH&S) Departments may no longer have the ability to manage it. One possible way of overcoming this challenge is to establish a collaborative mechanism among various disciplines, including Engineering and Health Sciences, through a worker station specification paradigm. The greatest emphasis is placed on eliciting those factors that influence the ergonomics of workstations, since as this review has shown, were related to RSIs problems in a great many health professions.

2.1. Types and Causes of Occupational Injuries

Health professionals are often required to work both long schedules and under stressful conditions. Every fighting environment poses threats both because of clinical hazards arising from the specifics of the profession and from unmet protective policies. As a consequence, health personnel are at risk of occupational injuries. The typology of the injuries depends fundamentally on the medical sector. On the other hand, repetitive tasks and the need to assist heavier patients, a common practice in dinners and nurses, imply a risk of sprains and strains as well as slips and falls (Amaro et al., 2018). This type of injury is typical of the extremely high rates in the sector of health assistance. However, the seriousness of the accidents suffered by a representative sample of other categories of health professionals in Portugal has been studied. On one side, heavy manual handling and inadequate lifting techniques may lead to chronic back problems, while on the other side, work in an environment with slippery or wet surfaces adds a risk of falls. In addition to these risk factors that are mostly related to the job, other personal variables such as age (both because of the growing number of years since morbidity and sick health very early on in their nursing careers) are also relevant (Yassi et al., 2005). Finally, in some countries including Portugal, the excess work being filled in nurses in hospital environments is likely to significantly raise the risk of occupational injuries.

3. Importance of Multidisciplinary Approaches

Health care professionals have the most important place in increasing health service quality and meeting the need for qualified health services. However, they are among those who are most frequently exposed to occupational injuries and their results. It is emphasized that health service providers constitute a risk group because they are frequently exposed to infectious, sharp and chemical materials during their working life. It has been stated that 3.5% or 100,000 of 3 million walking to work injuries in the USA are occupational injuries. A significant portion of the occupational injuries that have a 19% job loss occur during the 5-10 years of work of the employee. It is stated that the cost of occupational injuries in the health sector is 90 million dollars. Nurses are under high risk group for occupational injuries in terms of injury severity, accident type, incidence of accident, accident mechanism, needle sticks and body organs injured in accidents.



Occupational safety and health (OSH) professionals encounter a variety of challenges as they work to protect workers from workplace hazards. One challenge that must be addressed to ensure the well-being of all workers is the inequitable distribution of work-related risks and benefits among workers employed in different industries and job positions. Current occupational safety and health (OSH) research and practice frames and approaches work-related risks, exposures, and benefits primarily as individualistic and biomedical or safety-based phenomena. A health equity perspective presents an opportunity to see the broader, more systemic forces that interact with work to generate both wellness and injury (A. Flynn et al., 2021).

3.1. Definition and Principles of Multidisciplinary Approaches

Since its introduction, sport and exercise science has positively impacted the health and well-being of the general public, athletes, and warfighters. Currently, the field is inundated with students graduating from both campus and online programs, yet a paucity of accredited internships exists for graduates to enter the field. This deep Dive is important to discover novel and unique methods to enhance the quality of experiential training opportunities on a global level, which would allow hundreds of future professionals to meet current industry standards (Tee & Rongen, 2019). Since creation in the United Kingdom in 1994, programs have rapidly expanded, with over 6.7million total graduates were produced through 2014. A recent survey demonstrated 93% of graduates were employed following graduation, yet only 55% of employers believed graduates were industry ready. The foundation of experiential learning in sport and exercise science occurs through internships, yet no formal guidelines or processes are in place regarding this essential academic component. Additionally, there are no guidelines in place surrounding the proper qualifications of prospective internship supervisors (Tee et al., 2018). Most of the literature currently available focuses on the reflection of individual intern, rather than examining the exp of the supervisors who oversee the intern. Finally, little knowledge exists regarding the views of aspiring internship sites and interns on what would enhance the internship experience. A majority of national-level sports medicine organizations have formal internship programs in place. The survey found that 95% of facilities hire students from these programs, which highlights the perceived value of internship completion by industry professionals.

The broadened understanding of biomechanics has greatly expanded the purview and applications of this “new” science. On the one hand, it encompasses the precise measurement of human body motion using digital means, which has ushered in parts of medicine and health care, but also observation of motion to optimize training, aid the rehabilitation of patients recovering from illness or accidents, and prevent the recurring of pathologies. At the societal level, healthcare policy in different countries needs to be considered in the context of home health care and the obtaining, processing, and security of health data, but also more



widely, as this article investigates discrete ways in which the numerical data used in health-monitoring procedures can be employed and their impacts, whether in sports participants, clinical consultations, or embraced viewpoints illustrated in the media.

5. Collaborative Strategies Among Health Professions

Despite the fact in Central America there has been a substantial expansion during the past years of medical, nursing, technical and generalist health-care training programs; through planning and survey a qualitative method was found in the main hospital of Honduras as basis for the development of interprofessional instructional strategies. Three projects were carried out in conjunction with hospital staff to determine its function situation, to improve communication processes and to develop equipment that would facilitate knowledge exchange between the health professions. One outcome of these projects has been the development of equipment that analyzes how hospital staff performs and how to develop instructional diversification strategies.

Although the information presented comes from the health sector in Honduras the results may be useful for developing instructional strategies in resource limited settings as is the case in most developing countries. While doctors possess expert understanding of the causes of illness and are engaged with diagnostic practices, nurses have expert understanding about the emotional and physical well-being of the patient (N. Nyoni et al., 2021). Knowledge of these contexts can be effectively mobilized to prevent unnecessary diagnostic procedures and promote faster recovery. For instance, if the surgeons knew that their colleagues had extensive knowledge about the patient's welfare and that this knowledge had been effectively employed to encourage heightened recovery processes, then the management of patients might be shifted somewhat. In this case, acting on the expert knowledge of nurses and paramedics could have encouraged a focus on interventions that facilitate comfort and ease, optimizing the likelihood of a fast recovery post-operatively.

5.1. Teamwork and Communication

Substantial evidence suggests that well-coordinated teamwork and communication are important for patients' well-being. Moreover teamwork in multidisciplinary groups fosters creativity and innovation. Recognizing the need, there have been various attempts to improve teamwork and communication in healthcare settings (Stephens et al., 2016). A number of tools to measure the performance of teamwork have been developed. Crew Resource Management (CRM) is one of the major methodologies. CRM-based training focuses on these key elements: 1) situational awareness; 2) leadership; 3) decision-making; 4) task management; 5) teamwork; and 6) communication. Recent studies suggest that CRM training improves not only surgical, but also anesthetic, performance. However, effects on patient outcomes are not well studied. Owing to differences in the professional norms and standards,



there is a potential for compatibility issues. Up to 7% of complications can occur from incompatibility during teamwork in operating rooms. For example, if a nurse speaks an indirect wish, surgeons may not understand it. Typically, CRM training is conducted in one's own discipline, which may not be effective. It is essential to demonstrate the paradox that other professions communicate less as a demonstration of its important aspect. Offering opportunities to communicate in each domain will be more beneficial and refutable. Including a wider variety of health professionals may also capitalize on other safety aspects.

6. Training and Education Programs

Training the future occupational health workforce is critical for the sustainable practice of safety and health for the current working generation and for generations to come. In their respective countries, safety professionals, working in the field of Occupational Safety and Health (OSH), currently outnumber other OSH trained professionals. However, it is widely recognized that professionals in industrialized countries who have received OSH training beyond that of short-courses have made a significant impact in practice by using a broader, deepened knowledge base. Likewise, there are industrial sites located in industrialized countries where all aspects and professionals trained in the core curriculum of OSH collaborate to the end effect of the efficacious creation and implementation of safety and health practices. It follows that safety professionals in developing countries will have a direct gain in knowledge, expertise, and capacity to affect safety and health practices in the workplace by collaborating on projects with OSH trained professionals (G. Lucchini et al., 2018). Introducing educational systems that train current professional students in the OSH field would offer the latter the much-needed holistic view to approach the safety and health practices in the workplace.

OSH can be very difficult to understand as it is an amalgam of many fields, including support disciplines such as occupational psychology. OSH is typically approached by all disciplines from the worker and workplace focuses. Hence, exposure scientists aim to control chemical exposure and ensure its safety to the worker within the PEL by getting an understanding of how a particular worker – task plays a critical role in acutely over-exposing to a given chemical. On the other hand, the occupational nurse would be more concerned about the long-term exposure effects on worker health linked to the same PEL, advocating for a different exposure assessment method, or alternately tighter controls to reduce the PEL. Such disagreement may arise between professionals working towards the same goal, upon (re)evaluation of the same worker exposure site. Such opportunity is usually absent during the training years. By taking an interdisciplinary view, working professionals can be trained to understand the rationale of their “competitors” practicing in an adjacent field. By using the extensive knowledge-base accumulated during the years in practice, as well as reviewing the same incident or case study, the different treatment approaches given to the worker or



workplace can be agreed and potentially optimized. There exists indisputable need for the development of new training programs for professional that wish to gain knowledge from assortment of OSH disciplines, beyond what is currently offered. It is recommended that these training programs incorporate experiential learning as the basis. There is a very real benefit of such approach. By bridging the gap between the OSH disciplines, the focus of the OSH practice will be refined into the worker health and safety, and successful case studies will be seen of the hazards present in the workplace, leading to a successful control.

6.1. Curriculum Development

Various strategies were proposed to prevent and reduce work-related injuries in health professionals, among which training and education are crucial to improve safety competencies. The curriculum development process can be based on a step-by-step approach. Additionally, a successful longitudinal curriculum for occupational health in medical education was presented.

Twelve strategies were elaborated and are relevant to various health professions to prevent and reduce work-related injuries. Training and education programs may increase safety competencies in occupational settings. One such approach is the systematic safety training, where educational content, learning goals, teaching materials, and methods of evaluation are planned in advance. However, it is well known that curriculum development is a complex process and that there are many ways of doing it. A step-by-step approach is proposed here for the development of a longitudinal curriculum for work safety competence in health professions. The curriculum development process consists of the following steps: analysis, design, development, evaluation, and implementation of a training program. Finally, a successful longitudinal curriculum for occupational health in medical education is presented and further described as an example of curriculum development.

7. Legislative and Policy Frameworks

A plethora of literature has been developed over the last decade that emphasizes new understandings of how research can better inform the practice of occupational health and safety in healthcare by challenging traditional perspectives that understand research utilization primarily as the dissemination of a static body of knowledge. Legislative and policy frameworks impact the day-to-day operations of most health organizations, and are examined to determine how best to shape them to facilitate the implementation of optimal occupational health and safety (Yassi et al., 2005).

The authors have been involved in a myriad of research projects over the past decade with multiple healthcare worker groups, ranging from acute care RNs in various units, to long-term care workers, to dental care workers, to community health workers, to healthcare waste handlers, and most recently laboratory and home care workers. These research projects have



included a very broad spectrum of research methodologies, addressing topics varying from ergonomics, to effects of ultraviolet germicidal air disinfection on fomite contaminations, to ethics, and the health economic effectiveness of interventions designed to reduce occupational infection risks.

7.1. Occupational Safety and Health Regulations

In the interest of ensuring protection of workers from work-related injuries and illnesses as well as preventing accidents in the industry, legal instruments have been introduced in almost every sector of the developing and industrialized worlds to control employers and employees on the health and safety of the people at work place. In this regard the mining industry is not an exception. Hand injuries, work-related musculoskeletal disorders, slip-falls, winding and surface related trauma are widely known as major injury problems in this industry. A multi-million dollar study on traumatic injuries in the South African mining industry identified the relative frequencies of the potentials like fall of ground, hand injuries, and puncture wounds (Annan et al., 2015). Many non-governmental organizations and the mining corporations at the international level, and governmental agencies and regulatory bodies like the Ghana Minerals Commission at the national level ensure the introduction and implementation of safe systems work in this hazardous industry. Thus, it is often believed by the people that trauma on surface or underground or other injuries in the health services sector are of the same nature.

Work-related traumatic events with sharp instruments referred to as percutaneous injuries which includes such acts within the health sector such as needle-stick, scalpels or other sharp instruments cuts or punctures as injection or blood extraction are also of basic concern in this regard. Millions of health care professionals in different parts of the world are daily at risk to such occupational injuries. Regardless of their knowledge and their practical experience, over one third of health care workers in the United States reported they had at least a needle stick injury once a year. Reduced dexterity of feeling, overwork, lack of knowledge or care on the side of the hospital managers on such occupational injuries are often mentioned as major contributing factors in this regard. Similar predisposing factors to their occurrence within the health sector have also been discovered. About 18% of all nurses in Turkey had at least one needle-stick and 13.5% had at least a cutting instrument injury due to their professional life. In Ghana, health care workers observed a 25-30% needle-stick injury rate and a 10-12% rate of cutting instrument injury was reported. The serious impacts due to percutaneous injuries are also of great concern globally.

8. Technological Innovations for Injury Prevention

Introduction to injury prevention for health professionals – the need for multidisciplinary interventions



Goal: To ensure that workers do not sustain injuries while helping them maintain and develop good health. In recent decades, efforts to prevent injury have increased. Nine articles describe injury prevention efforts within a cohort of people working in health professions, including: accident and consumption of antidepressants, supplements and alternative medications as a result of workplace injury in the nursing profession; intervention of healthy movement LP28CP among nurses to promote spine mobility and functional capacity; identifying barriers and enablers to implementing interventions to prevent workplace injuries in the nursing profession (Li et al., 2020). Clinical outcomes for cognitive behavioral therapy and educational intervention a combination of educational interventions and cognitive behavioral therapy can reduce days off sick in leading to acute occupational injuries; examination of the effect of educational interventions to encourage knowledge and behavioral changes in the prevention of acute injury; an injury prevention effort in the form of physical exercise to increase physical capacity, health education about the prevention of over-strain and appreciation of relaxation among health care workers in hospitals; prognosis of expected lifetime FD and RL4 and permanent medical expenses for workers injured in occupational accidents; an evaluation of a multifactorial actions to prevent farm injuries; a multifactorial intervention to reduce stress and work demands among pre-school teachers in Denmark. Seven articles report on the outcomes of randomized controlled trials, a comparison of the accident and pharmaceutical use with the effect of a control group; the effect of physical education to prevent injury is compared with the occurrence of injury in a control group. Of six, four more reports were made subsequent and prospective studies.

Articles often report simultaneous efforts to increase the level of knowledge and try to change the behavior of the workers who are at risk of being injured in certain actions, utilizing e.g. work reports of different participatory training; examining the usefulness of participatory training composed of interviews with worksite inspection and statistical analysis of the data collected. The annual number of occupational injuries in the US is 104,000. On injuries due to overload and/or effort, about 60% concern non-fatal injuries. A major strategy used to prevent work injuries is increasing employee training. Other interventions include better access to information, trying to change worker behavior, changing work demands by better planning, regulations or machinery adjustments. Work injuries, which are a growing phenomenon in a developing country, have important social and economic consequences.

8.1. Wearable Technologies

Manual material handling (MMH) still remains one of the most crucial risk factors for various professions. Recently, occupational risk factors for different health professions that have not been addressed until now were investigated. As a result, a critical review was made on novel wearable devices and solutions for effective control and analysis of risks related to occupational activities. The target health professions are hand therapists, midwives,



hairdressers, and dental hygienists. In parallel to these professions, the novel wearable devices and solutions that might be applied to any of the health professions were also evaluated. A comprehensive list of risk factors of each profession and related wearable solutions is provided. Randomized controlled trials are conducted to investigate the effectiveness of these solutions on injury prevention in different health professions. Assistance via wearable technologies for weight management and MMH training is examined for midwives, hairdressers, and dental hygienists. Evidence for the effective reduction of risk factors and cumulative musculoskeletal joint effort of MMH determined with the use of these technologies is provided in the same table. Although wearable devices have been mostly used for physical activity tracking and health monitoring until now, their use for monitoring and control of occupational risks is exceedingly increasing in several professions. In this context, the development of sensor-based wearable technologies is highlighted to grasp risks and design effective risk prevention strategies from workers' working behaviours. In addition, a selection of wearable glove-like technologies for hand injury prevention is introduced as a novel approach. In this respect, a state-of-art is presented for wearable glove technologies and then possible approaches and future studies are highlighted. Two different wearable glove devices are introduced to demonstrate these novel approaches.

9. Psychosocial Factors in Occupational Injury Prevention

There is growing scientific literature on non-physical factors potentially associated with traumatic occupational injury. Worker characteristics, work organization and workplace factors are reviewed with particular attention given to applications for injury prevention policy, practice and research in the field of occupational health (Souza et al., 2014). Workers in occupations that interact with the public or patients may have higher rates of fatalities due to assaults as well as increased non-fatal injuries and illnesses due to overexertion or bodily reaction. Workers with additional job responsibilities involving managing other workers, relationships with patients or clients, driving, selling or repairing equipment commonly have an elevated risk of occupational injuries. Organizations should create practices and policy to be expanded, in intervention and research development in this area and implications for professional education and study are considered. These investigations may capture specific time-of-day excess risk or measure ability for recovery time between shifts, more accurately describing injury risk inherent to alternative work schedules. Computational tools may develop for use in outlook evaluation to help workplaces staff schedules with "safer" average roster risk exposures. Independently, techniques currently available to reduce extended work hours, increase breaks or improve shift scheduling to minimize injury risk due to long workdays. Flex and compressed workweeks, permanently exchanging shift durations and beginning or ending each workday with night shifts might create a rationale for additional health and safety practices during hot daytime work performed by relatively inexperienced outdoor workers. Firms may be interested in providing employee transport to work sites with



high travel risks similar to the free car service of this research preventative approach. From a scientific perspective, it is a first study of occupational injury to examine the relationship between cumulative workplace noise exposure and noise-induced hearing loss with the relevant auditory injury. Such analyses and the described noise dosimetry approach might be replicated for various occupations in high-noise settings, enabling assessment of occupational injury risk for workers exposed to noise arising reported here, together with information available in published reviews, similar studies can set the starting noise dose and age group for analyzing ear damage, making between-study comparisons more straightforward.

9.1. Mental Health Support

Health professionals are much in demand and expected to work under pressure. A study has shown that 43% of doctors report high to very high emotional exhaustion, and 86% rate their job as stressful. Mental health and workplace stress can have serious long-term effects on the health of individual practitioners and organizations. Harmful stress has a direct impact through physical and psychological disorders. It also has an indirect impact on long-term health through an increased reliance on unhealthy coping strategies such as smoking, consuming excessive amounts of alcohol and food, drug abuse, and social isolation. Health care organisations contribute to the problem by indirectly increasing stress levels through job stressors such as paperwork, poor teamwork, lack of control, overwork, role conflict and ambiguity. They are more pessimistic about their ability to cope and more likely to try to avoid stressors through excessive use of mechanisms such as drugs and alcohol. The level of stress that the organisation is able to moderate also increases adaptability to change and acceptance of legitimisation of previously inappropriate behaviour. Emotional exhaustion is associated with depersonalisation and decreased personal achievement. Burnout has been associated with somatic symptoms such as headache, insomnia, colds, chest pain, hypertension, irritable bowel syndrome, exhaustion, nausea, and trembling. It also has psychological effects such as reactive depression, anger, irritability, frustration, boredom, and impaired attention, concentration, and job performance. Furthermore, stress reduces the quality of care provided as it affects diagnostic accuracy, intuition, memory, openness, caring, and treatment compliance.

10. Economic Impact of Occupational Injuries

Chiropractors use various musculoskeletal therapies but are at high risk of sustaining musculoskeletal injuries, traumatic injuries, and other health and safety risks. Our brief comment is organized under 5 subheadings: occupational injuries among health professionals, coping strategies to reduce occupational injuries, multidisciplinary approaches to reduce occupational injuries in other health professions, manufacturers' perspectives, and future research. Chiropractors are a group at high risk of work-related musculoskeletal disorders (MSDs). The profession is responsible for the prevention, diagnosis, and treatment



of temporary and chronic disorders of the neuro-musculoskeletal system by manual therapies. Recent studies have pointed out the importance of prevention and control strategies in this regard. The prevalence of musculoskeletal pain and bodily discomfort in clinic-based Australian chiropractors indicated that practicing in conditions like tight deadlines, the need to work quickly, monotony, or working with poor ergonomics, were important factors associated with chiropractors reporting increased number and severity of episodes of pain.

Our study analyzed additional coping strategies other than those presented. We investigated the health and safety risk factors in chiropractic therapists in Istanbul, Turkey, and their coping mechanisms, using the Ottawa Charter adapted to the health promotion for social context. There are 3 main categories of coping strategies: (1) not having ('attitude', 'feeling'), (2) recently initiated ('learning a new hobby, volunteering and keeping myself busy'), and (3) already initiated strategies ('accepted the situation and let it go', 'doing sport regularly'). It was stated that there is no statistically significant difference between chiropractic therapists' risk levels encountered with health and safety and their coping strategies. There is a knowledge gap about multidisciplinary approaches to reduce occupational injuries in other health professions. Chiropractors are considered one of the high-risk professions for the health and safety of healthcare workers. A significantly higher prevalence of MSDs in chiropractic therapists than other healthcare workers was reported. Also, the prevalence of occupational injuries was found to be high in chiropractic therapists in the European Survey of Musculoskeletal Disorder among Health Care Workers. Finally, injuries and back pain are common due to the physical nature of care provision and the high number of awkward postures, extremely high annualized rates of spinal and musculoskeletal disorders, and workers' compensation claims among chiropractic care providers were suggested.

10.1. Cost-Benefit Analysis

Introduction

Previous research by the authors was a scoping review of review articles about educational interventions in the work setting—specifically focusing on the effectiveness of such interventions to reduce incidences of acutely incurred occupational injuries (Li et al., 2020). The previous review did not find any reviews that specifically considered educational interventions. While the implementation of post-secondary education was assessed as an intervention in the meta-analysis, there is insufficient information about post-secondary education in the workplace because a program description was not provided, and it is appropriate to include it as an outcome measure because there is no mention of long-term effectiveness. Additionally, the review did not consider the gradual introduction of free educational materials. The goals of this current systematic review are to identify all existing controlled (non-randomized and randomized) trials that have evaluated the effectiveness of



any educational intervention that is implemented within the occupational context and directly aimed at a paid workforce. The authors are also interested in identifying any concrete effects that result from the consumption of free training and education pertaining exclusively to occupational health and safety. A scoping review was not considered appropriate since the review question is designed to directly inform policy decisions for an occupational safety and health (OSH) organization developing education-based recommendations.

10.1. Cost-benefit analysis

Until the results from this study are widely disseminated, translated, and fully adopted in the workplace, costs will be incurred. Due to the disperse nature of such costs, a full breakdown is unavailable, but it is estimated they will total around 5,200 CAD annually or 26,000 CAD over five years. The processes to control these costs were comprehensive and included a review of over 45,000 sources, two dissemination channels of multiple languages, research available in seven months, and the involvement of personnel at every stage of the review. Additionally, 100 CAD per month was spent on a detailed logistical analysis. The cost to implement these processes included time spent reading, screening, analyzing, verifying, writing, translating, and formatting all included articles, as well as hosting and maintaining a website and publishing results in a peer-reviewed journal. Said expenditures took 200 hours per month at a rate of 24.25 CAD/hour plus an additional 20% overhead fee for inputs. After full implementation, it is conservatively expected that incidence rates of spillage will decrease by 2.00% and costs by 0.50% annually. This will be assessed over a minimum of five years as the partnership digs in, familiarizes itself with the programmatic content, navigates social relationships and negotiations with superintendents, develops, refines and executes the then-regional policy re: wet floors.

11. Global Perspectives on Occupational Injury Reduction

A systems approach is necessary. So far, the prevention of occupational injuries has been tackled to quite an extent in isolation from the prevention of occupational ill health, and vice versa. Likewise, the prevention measures applicable at different levels have been seen as separate interventions, whereas it has become evident that an intervention at one level may not be effective, unless it is supported by similar other interventions at the same level or at another level. To be effective and successful, measures must address the major causes and mechanisms of injuries and ill health. Measures must be suitable and effective at the macro-level (national/institutional), at the meso-level (industry/job/perceived), and at the micro-level (organization/individual). Cooperation between levels is also essential, and well-designed steps at one level must be supported by similar measures at the other levels. For example, the implementation of safety and health activities at the company level must be supported by a national infrastructure providing the necessary advice, training, and/or



services (Takala et al., 2014). From the Sentinel Events List it is evident that work-related processes and conditions may cause both work accidents and work-related ill health, and some activities or circumstances in the work environment may reduce the concentration on the relevant task. Such ‘background’ factors are present in all workplaces and industries and cannot be seen as the direct causes of incidents, yet may so prolong the time required to perform the relevant task that despite all the attention, the evaluation and taking corrective action may end up being too slow.

11.1. Comparison of Strategies Across Countries

The effectiveness of different strategies to reduce the risk of occupational injuries among healthcare workers was assessed. Strategies including ergonomic change, safety awareness training, lifting techniques, and psychosocial interventions all reduced injury risk to some degree. However, there were variations in training outcomes between countries. Healthcare staff in the United States and in other countries demonstrated improvements in FHM implementation, but some differences could be seen. Canadian staff had the largest improvements, with an average increase in the total test score of 21.1 from baseline, followed by Australian staff with an average increase of 16.9. Increase was lowest in the UK with a mean improvement of only 11. Staff in the UK and the United States demonstrated similar large improvements in “problem solving”, with average increases from baseline of 15.9 and 16.5, respectively (Li et al., 2020).

12. Challenges and Barriers in Implementation

Action Points 10–11: Use readily understandable language; Demonstrate safety and quality of service provision; Keep accurate records; Collaboratively answer contentious inquiries and provide evidence-based literature; Alert when emergencies are suspected; Politely refuse to answer outside the scope of expertise; Report any new concerns to the supervisor; Inform patients about all their rights; In interprofessional capacity, help protect the safety and health of all stakeholders (Morris et al., 2014).

Health professionals who form interdisciplinary teams should schedule collaborative workshops before the implementation date; Raise awareness among colleagues in various specialty areas; Prepare safety protocols and ensure that all members are aware of their roles; Implement case-specific error prevention tailor-made plans, which occur during the patient's admission; Use confidential communication to discuss delicate issues in the treatment quality of a specific health facility and the provided health care services; Collaboratively secure the necessary equipment for the initiative's success; Address common myths and illicit stigma about a relevant initiative; Play an active role in primary prevention strategies raised during health promotion workshops relevant to the facility's most common admissions; Be prepared to reevaluate the workflows and written protocols required for safe and legal patient transfers;



Provide unbiased treatment regardless of the patient's lifestyle threatening issues, while simultaneously ensuring the personal safety of the health provider (A Rababah et al., 2024).

12.1. Resource Constraints

Intra- and interprofessional research teams are studying similar issues in different health professions, which can improve the efficacy of interventions. For example, research teams from nursing, occupational therapy, and health promotion are studying safety training programs in nursing homes, hospitals, and home health settings. Teams of nursing, customer service, and physical therapy researchers are examining the effectiveness of improving and standardizing workplace ergonomics and training in hospitals, outpatient clinics, and private practices. Interuniversity research teams of athletic trainers, chiropractors, and nursing researchers are studying injury prevention programs for school nurses and athletic trainers, who are exposed to similar environmental stresses (Manuel Machado et al., 2011). Moreover, interuniversity research teams of nursing and speech therapy researchers are evaluating safety training in healthcare settings to identify meaningful changes that can be implemented throughout the profession.

13. Future Directions and Research Needs

The multiple social determinants of health are generally divided into broad categories including 1) built environment, 2) neighborhood environment, 3) biological and genetic factors, 4) social environment (i.e., influence of family, peer norms), 5) economic environment, 6) education access and quality, 7) cultural norms, 8) health services which include the available access to health care, 9) quality of health care, and 10) overall healthcare affordability. Occupational safety and health (OSH) determinants or job-related factors are not generally included. This overlooks how work influences the health of individuals. Occupations can simultaneously affect many social determinants of health. Similarly, how work impacts individuals falls under the scope of OSH. The field of OSH can contribute greatly to the understanding of the relationships between jobs and the many social determinants of work (A. Schulte et al., 2022). Unfortunately, there is a limited understanding of the role of the job in health inequalities research, and the reciprocal roles of unemployment and underemployment in health inequalities research are similarly unclear.

Occupations and their associated hazards simultaneously influence many of the social determinants of health in both positive and negative ways. These include, but are not limited to, income, social status, and psychological distress. Since jobs are a principal social determinant of health, OSH could play an important role in addressing social determinants of health as a whole. Research on the social determinants of health are largely absent in this area with broad implications in the field of OSH. OSH science and practice rooted in the critical theory has long employed an understanding of the ways in which labor and the workplace



replicate and reinforce social inequalities of wealth and power (e.g. class, race, and gender), as well as other forms of inequality.

13.1. Emerging Technologies

Emerging Technologies - Working Definition and Examples

Introduction

Emerging technologies can create or transform industries and processes that significantly affect the economy or the delivery of societal benefits. Emerging technologies development, often triggered by advances in basic sciences or by innovative productive enhancements, has far outstripped its understanding of its implications for occupational safety and health (OSH).

Examples of Emerging Technologies

The applications of emerging technologies are manifold. These can include a new process, work method, or equipment, as well as a new material, product, or service featuring innovative and/or breakthrough scientific and technological underpinnings that introduce new hazards or intensify known, but still inadequately controllable, safety and health risks at work in their design, production, use or disposal. On the other hand, emerging technologies may also hold the promise of a safer technological future. In this latter case, emerging technologies can offer innovative tools, resources and solutions to eliminate or reduce existing risks at work. However, applications of these new technologies may still present unknown safety and health risks.

So far, there is a lack of agreement and understanding of what emerging technologies actually are and of a corresponding system to assess their developing impact on working conditions. A working definition of 'emerging technologies' is proposed and discussed, including its restrictions in time and rapid advancement provision. It is also suggested to move a step beyond the mere observation and collection of data and knowledge. A two-tier approach is then proposed to help fill the current gap in the identification and surveillance of emerging technologies and their impact on OSH. This approach may be developed by a multi-stakeholder platform including governmental, research, industry, trade unions and other stakeholders, and may be regarded as within a comprehensive strategy for the protection of the safety and health of working people (Institute for Occupational Safety and Health, 1970).

14. Conclusion and Key Takeaways

Worksites present hazards that healthcare professionals must manage to protect their health and the health of others. There is a significant need to further explore, develop, and evaluate ways to address hazards in healthcare sectors. It is expected that if carriers shift a load on its own axis, they are likewise capable of exerting the same amount of translation. The present



study affirms that under laboratory conditions a carrier/trolley of proper design reduces the TLI of pushing a load. Future research on carts needs to pay specific attention to all results gravitating around their design rather than on the effect of any fixing wheel conversion.

14.1. Summary of Findings

In this diverse health professional participation study, Group 1 participants with 643 first-year registered nursing students participated in a revised online educational program; Group 2 (104) participants were perioperative nurses within the first 2 years of practice who did a Training Beyond Traditional program; Group 3 participants were 9 interdisciplinary professionals in the operating room department who participated in Occupational Safety and Health Administration-certified training; Group 4 (98) participants were physical therapists who attended a PT Safe Patient Handling continuing education link. All programs educated participants regarding job safety preparedness, prevention of workplace violence, back injury prevention, bloodborne pathogen exposure prevention, and electronic medical record data retrieval (Li et al., 2020). With the increasing demand for more nuanced strategies to each unique discipline, further understanding and cross-adaptation between various healthcare professions are deemed essential as an integral part of a more holistic approach in reducing workplace injuries. The above programs for the diverse profession group addressed the specific workplace injuries of: needless injuries; slip, trip and falls; workplace violence; and back lifting injuries suffered in their workplaces. This study explored diverse healthcare professions effectiveness post intervention in decreasing of occupational injury and with evidence on assessment education programs that work best to decrease acute job injury.

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