SYSTEMATIC REVIEW ON EDUCATIONAL INTERVENTIONAL STUDIES IN REDUCING WORK-RELATED INJURIES AMONG HEALTHCARE WORKERS

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ABSTRACT

Background: Globally 6,300 people die per day as a result of occupational accidents or work-related diseases and a portion of them are those working in health care sectors. Healthcare sector employ over 59 million workers who work in hazardous and high risk work environments which expose them to get work-related injury (WRI). One way of WRI prevention is by doing educational intervention which need to be tailored to their needs to ensure its effectiveness.

Materials and Methods: Articles were chosen by using a systematic search via three electronic database, namely PubMed, Scopus and ScienceDirect coupled with a combination of keywords namely “work-related injury” OR “occupational hazard” OR “healthcare workers” OR “hospital” AND “educational intervention” OR “injury prevention” OR “workplace education”. Other inclusion criteria included fully accessible, original studies in English language, published in a peer-reviewed journals from 1 January 2010 to 31 March 2018.

Result and Discussion: A number of 10 studies were included in this review. The results were categorised into type of intervention, subject population, health behaviour model used (if available) and the results of the selected studies. All 10 selected studies showed significant improvement post intervention in the research subject using education as part of their intervention strategy. Two of those studies mentioned and used specific behavioural or training model namely Health Belief Model (HBM) and Kirkpatrick’s Model. Among all the reviewed articles, three of them used components of participatory training in addition to educational intervention.

Conclusion: This review provides strong evidence that WRIs can be prevented with an educational intervention programme or module. Despite differences in methodological approaches, the studies consistently showed educational programs are effective in reducing the risk of WRIs in healthcare settings.

Keywords: Work-related injury, educational intervention, healthcare workers
1.0 Introduction

The global economy has expanded apace over the past decades, and yet the majority of the world's 3.5 billion workers remain employed in conditions that fail to meet international health and safety standards and guidelines (Worldbank, 2016). Such workers are exposed to various occupational hazards and unacceptable levels of dust, dirt, noise, toxic chemicals and biological substances. They also face other types of unkind conditions while doing their job, such as safety and ergonomic hazards, and hazards related to poor or insecure employment conditions and job-related stress (OSHA, 2012). An injury or illness is considered to be work-related if an event or exposures in the work environment are either caused or contributed to the resulting condition or significantly aggravated a pre-existing injury or illness. Work-relatedness is presumed for injuries and illnesses resulting from events or exposures occurring in the work environment (OSHA, 2014).

Health care facilities (HCFs) are institutions that provide health care services, including counselling, clinical, surgical, and/or psychiatric consultations and treatment services for the healthy, sick and the injured (Medlineplus, 2017). Globally, HCFs employ over 59 million workers and offer a variety of services to clients and patients, and are classified as hazardous and high risk work place (Aluko et al., 2016). Workers in this sector are at risk for illnesses, injuries, and fatalities because of working long hours, changing shifts, have to do physically demanding tasks, are expose to violence, and to infectious diseases and hazardous chemicals (OSHA, 2012). Injuries and illnesses in health care and social assistance accounted for 16.8 percent of the 4 million occupational injuries and illnesses in 2007 (BLS, 2015). According to the National Institute for Occupational Safety and Health (NIOSH, 2010), hospitals led the list of industries that reported 100,000 or more occupational injury and illness cases over the 4-year period from 2003 to 2006 in the US.

Hazard control refers to workplace procedures adopted to minimize injury, reduce adverse health effects and control damage to workplace (ILO, 2003). Hazard control practices are often standardized and taught to managers and safety personnel in a given industry (ACSQH, 2010). Application of the hierarchy of controls is a systematic process to identify the most effective method of risk reduction. These include elimination, substitution, engineering control, administrative control and lastly the usage of personal protective equipment (PPE).

Administrative controls do not remove hazards, but limit or prevent people's exposure to the hazards (ILO, 2003). As part of the administrative control of hazard, the essential components consist of identifying and analyzing an injury problem, selecting an appropriate intervention, implementing the intervention, and evaluating the outcomes. The most common types of preventive interventions, alone or in combination, are education, regulation, and technological changes (WHO, 2013). Educational interventions may consist of group-based instruction or other types of information delivery such as videos, leaflets, protocols and guidelines given to people to watch or read in their own time. Educational meetings can be either didactic (e.g. lecture presentations) or interactive (e.g. workshop with role play and case discussions). However, repeated, active educational interventions that promote interactivity have a higher chance of altering the behaviour of HCWs and sustaining such changes (NHMRC, 2010).

Several approaches, including ergonomic changes and near-miss accident reporting, have been implemented in healthcare industry to reduce the incidence of accidents and injuries. Among them, behaviour-based intervention is one of the promising methods. The National
Safety Council reported that human behaviour was associated with 94% of all injuries and illnesses (NIOSH, 2010). This has revealed the importance of focusing on employee behaviour as a critical element in achieving better safety standards. The aim of behaviour-based intervention is to reinforce workers to behave safely during their activities.

Because work-related health problems are common among health care workers (HCWs), the development and implementation of an intervention program to facilitate self-protective behavior is important. However, a comprehensive workplace self-protective behavior model for HCWs needs to be devised and verified to enable us to design an effective intervention program. Our aim is to review the effectiveness of an educational intervention program in reducing the cases of work-related injuries (WRI) among HCWs.

2.0 Materials and Methods

A systematic search of the literature was conducted using three electronic database, namely PubMed, Scopus, and ScienceDirect for publications from September 2017 to March 2018. The above databases were searched using the following search criteria and a combination of keywords and search terms. The first group of keywords consisted of “work-related injury” OR “occupational hazard” OR “healthcare workers” OR “hospital”. The second group of keywords consisted of “educational intervention” OR “injury prevention” OR “workplace education”. The first group of search terms were combined with the second group to identify the studies.

The inclusion criteria were original studies in English language, published in a peer-reviewed journals from 1 January 2010 to 31 March 2018, with accessible full articles, that assessed the effect of an educational intervention program on healthcare workers in relation to work-related injuries, which included either hospital-based and community-based studies. We excluded studies that were reviews or editorials, non-peer-reviewed review literature such as technical reports and web based guidelines and isolated clinical case study. The search strategy was summarised in Figure 1.

3.0 Results and Discussion

A total of 78 studies were identified through the database searching. After primary screening and checking for the eligibility, only 10 (12.8%) studies were included in this review. The results and discussion were categorised into type of intervention, subject population, health behaviour model used (if available) and the results of the selected studies.
The proportion of intervention studies in occupational epidemiology has been growing rapidly in recent years. This is a positive trend, which makes it necessary to discuss a number of theoretical, methodological, and practical issues.

Occupational intervention studies are defined as “studies in which the effects of planned activities at the worksites are measured, with the aim of improving the working conditions and/or the health of the workers are being evaluated with research methods” (Medlineplus, 2017). The goals of these activities can also be tailored to reduce work-related ill health, which can elevate the health and wellbeing of the workers, to reduce sickness absence or turnover, or to raise the level motivation and job satisfaction (Collins, Wolf, Bell and Evanoff, 2004). In some cases these goals are combined with other objectives such as to improve product quality, to increase productivity, or to enhance customer satisfaction. The main focus is put upon interventions with a behavioural, organisational, or psychosocial elements. The summary of this review on educational intervention on WRI are summarized in Table 1 below.

Figure 1: PRISMA flowchart for systematic search on educational intervention studies in reducing work-related injuries among healthcare workers.
<table>
<thead>
<tr>
<th>No</th>
<th>Author/s</th>
<th>Title of article</th>
<th>Year &amp; country of publication</th>
<th>Respondent</th>
<th>Type of study /Intervention</th>
<th>Theory used</th>
<th>Result</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Folami</td>
<td>Comparison of two educational methods on nurses’ adoption on safe patient handling techniques</td>
<td>2010, USA</td>
<td>Nurses</td>
<td>Educational (non randomized trial)</td>
<td>Health Belief Model</td>
<td>Reduction in injury reports were recorded at post intervention using both educational methods.</td>
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<td>2.</td>
<td>Kindblom-Rising et al.</td>
<td>Nursing staff’s movement awareness, attitudes and reported behaviour in patient transfer before and after an educational intervention</td>
<td>2011, Sweden</td>
<td>Nurses</td>
<td>Cohort analytic (two groups compared pre- and post-intervention and extra control group)</td>
<td>Not mentioned</td>
<td>At post intervention there was significant decrease in reported physical disorders in the intervention group compared with both control groups.</td>
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<td>3.</td>
<td>Salah, Mahdy &amp; Mohamed</td>
<td>Effect of educational program on performance of intensive care nurses (ICU) to decrement the low back pain</td>
<td>2012, Egypt</td>
<td>ICU nurses</td>
<td>Educational (quasi experimental)</td>
<td>Not mentioned</td>
<td>Statistically significant differences between pre and post intervention with regards to their knowledge and practices regarding back pain and body mechanics.</td>
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<td>4.</td>
<td>Esmaeilzadeh et al.</td>
<td>Effects of ergonomic intervention on work-</td>
<td>2014, Turkey</td>
<td>Computer workers</td>
<td>Ergonomic training and workstation</td>
<td>Not mentioned</td>
<td>Post intervention improvement was reported in body posture (p&lt;0.001) and workstation layout (p=0.002)</td>
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<td></td>
<td>Related upper extremity musculoskeletal disorders among computer workers – RCT</td>
<td>Evaluation</td>
<td>Intensity (p&lt;0.001), duration (p&lt;0.001) and frequency (p=0.009) of LBP decreased significantly after intervention.</td>
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<td>5.</td>
<td>Tung et al.</td>
<td>Occupational hazards education for nursing staffs through web-based learnings</td>
<td>Nurses</td>
<td>Web based learning (RCT)</td>
<td>Not mentioned</td>
<td>The experimental group had higher post-test scores than the control group in terms of knowledge, attitudes, and practices (KAP) (p&lt;0.05).</td>
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<td>6.</td>
<td>Rasmussen et al.</td>
<td>A multifaceted workplace intervention for low back pain in nurses' aides</td>
<td>Hospital cleaners</td>
<td>Participatory training (Cluster RCT)</td>
<td>Not mentioned</td>
<td>The linear mixed models yielded significant effects on low back pain intensity of -0.4 (95% confidence interval -0.60 to -0.26) and bothersomeness days of -0.5 (95% confidence interval -0.85 to -0.13) after the intervention compared to the control group.</td>
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<td>7.</td>
<td>Monnin, Courvoisier &amp; Genevay</td>
<td>Modifying beliefs about back pain: A pilot study among healthcare professionals</td>
<td>Healthcare professionals</td>
<td>Educational (RCT)</td>
<td>Not mentioned</td>
<td>Back Belief Questionnaire scores increased significantly (p = 0.04) between baseline and the beginning of the program. The scores measured at the end of the program had increased significantly (p&lt;0.05).</td>
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<td>8.</td>
<td>Lutfe et al.</td>
<td>Increasing occupational safety of the healthcare workers of Bangladesh from needle-stick injuries</td>
<td>Nurses, laboratory and cleaning staffs</td>
<td>Educational and hands-on training</td>
<td>Not mentioned</td>
<td>After the training, overall NSI decreased significantly from 47.5% to 8.27% (p &lt; 0.0001). NSI was found to be reduced remarkably from 82.1% to 20.9% among cleaning staff, 32.3% to 4.1% among nurses and</td>
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<tr>
<td>No.</td>
<td>Authors</td>
<td>Title</td>
<td>Year, Country</td>
<td>Participants</td>
<td>Intervention</td>
<td>Evaluation Method</td>
<td>Findings</td>
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<td>9.</td>
<td>Bijani et al.</td>
<td>Evaluating the effectiveness of a continuing education program for prevention of occupational exposure to needle stick injury (NSI) in nursing staffs based on Kirkpatrick’s Model</td>
<td>2017, Iran</td>
<td>Nursing staff</td>
<td>A continuing education program (RCT)</td>
<td>Kirkpatrick's Model</td>
<td>The mean score for knowledge in the experimental group improved significantly from $8.32 \pm 2.17$ to $13.98 \pm 1.2$ ($p &lt; 0.05$). The experimental group of 24 nurses (40%) were exposed to needle stick injury before education, but this number was reduced to 9 (15%) after intervention ($p = 0.013$). However in the experimental group, 15 nurses (25%) were exposed to blood and body fluids before intervention, but again it was reduced to 6 (10%) after education.</td>
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<td>10.</td>
<td>Kim, Jeong &amp; Kwon</td>
<td>Effects of hazard perception training (HPT) on nursing students' risk sensitivity to patient safety and developing safety control confidence</td>
<td>2018, South Korea</td>
<td>Nursing students</td>
<td>Hazard perception training (HPT)</td>
<td>Not mentioned</td>
<td>At post intervention the experimental group showed significantly higher (on) total risk sensitivity score ($t = 12.47$, $p &lt; 0.001$) and themes, such as fall down ($t = 19.33$, $p &lt; 0.001$), preoperative time out ($t = 3.18$, $p &lt; 0.001$), invasive treatment ($t = 12.40$, $p &lt; 0.001$), and medication ($t = 10.98$, $p &lt; 0.001$).</td>
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</table>
In this review, in all 10 selected studies (100%) the research subjects had showed significant improvement in the intended good purposes after receiving intervention using education as part of their intervention strategy (Folami, 2010; Kindblom-Rising et al., 2011; Salah et al., 2012; Esmaeilzadeh et al., 2014; Tung et al., 2014; Rasmussen et al., 2015; Monnin et al., 2016; Lutfe et al., 2015; Bijani et al., 2017; Kim et al., 2018). Kindblom-Rising et al. (2011) showed that after one year there was a significant increase in nursing staff's awareness in the intervention group compared to the control group. Reported physical disorders decreased significantly in the intervention group compared to those in the control groups. Increasing movement awareness and frequent use of instructions during transfers significantly encourage patients to move independently and thereby reduce the strain in nursing staff.

An educational intervention study done by Salah et al. in 2012 on performance of intensive care nurses to decrease lower back pain found that the educational program was helpful to improve the knowledge and practices of the nurses with back pain, but it did not decrease intensity of back pain and disability. However this study had a low number of respondents (35) and therefore might restrict conclusions. Monnin et al. in 2015 did a study aimed to explore whether a preventive intervention based on the non-injury model and the biopsychosocial model of back pain succeeded in shifting beliefs toward less negative representations and in decreasing fear-avoidance beliefs related to back pain. They found that there was no significant changes observed between baseline values and values measured at the beginning of the intervention, but participants' beliefs about LBP changed significantly after the program. The benefit remained at 6 months follow-up. However, there are high chance that there is confounder bias in view of the absence of a control group and no randomization.

Kim et al. (2018) used hazard perception training (HPT) program on nursing students and had significantly increased students' risk sensitivity, but did not raise their safety control confidence far enough.

Two of those studies mentioned above used specific behavioural or training model, namely Health Belief Model (Folami, 2010) and Kirkpatrick’s Model (Bijani et al., 2017). Folami (2010) in her study which used two educational intervention methods on nurses adoption on safe patient handling showed significant reduction in injury reports with both self regulated learning (SRL) and interactive workshop (IW). Nevertheless, the study had few limitations which include the use of convenient sampling and data depended heavily on cases reporting by nurses. Bijani et al. (2017) had shown that by using continuous training education programs in raising awareness in nursing personnel, the occurrence of needle stick injuries had been reduced. However, even though behavioural models were not mentioned specifically in the other eight studies, there are a significant amount of behavioural model elements found in each of the studies. This shows that behavioural model is an important element that can change behaviour for the better.

Among all the reviewed articles, three of them used components of participatory training in addition to educational intervention (Esmaeilzadeh et al., 2014; Rasmussen et al., 2015; Lutfe et al., 2015). These might be the reasons why they can achieve better outcomes in their research. Esmaeilzadeh et al. (2014) showed in their RCT that ergonomic intervention programs was effective in reducing ergonomic risk factors among computer workers and consequently in the secondary prevention of work-related upper extremity musculoskeletal diseases (WUEMSD). The major limitation of this study was the self-reported nature of all outcome measures. This study had also relatively small sample size and the research was
conducted in researcher’s own workplace. This may have attributed to the positive impact of their intervention.

Rasmussen et al. (2015) showed that a multifaceted intervention consisting of participatory ergonomics, physical training, and cognitive behavioural therapy (CBT) can reduce LBP among workers in elderly care centre. Thus, multifaceted interventions may be relevant for reducing LBP in a working population. However, this study had high dropouts among the interventions group. In addition to that, the results of the study cannot be generalized to bigger population as it was conducted only among health care provider in the elderly care industry.

Lutfe et al., 2015 did a study on NSI among nurses, laboratory staffs and cleaners in a Bangladeshi tertiary hospital. The findings of this study have emphasized the significance of education and training of HCWs in reducing NSI as it occurs mostly due to lack of knowledge and awareness about the consequences of NSI. This study also demonstrates that implementation of NSI reporting system, with proper segregation and disposal of sharps, had facilitated quality improvement initiatives as well as safeguarding HCWs from NSI, which ultimately will improve patient outcomes and quality of care.

In the review only one study was found to have used a web based educational method where information and awareness is given out through e-mails and messages directly to respondents (Tung et al., 2014). In their study it was reported that after completing the web-based learning program, the subjects of the experimental group had higher post-test scores than those of the control group. However, the experimental group and the control group did not show significant differences in their attitudes and practices toward the prevention of occupational hazards. A possible explanation for this result may be that the education website lacked an online discussion forum which could offer solutions to the problems encountered by the nursing staff in the prevention of occupational hazards.

4.0 Conclusion and Recommendation

In conclusion, the studies summarized here have provided strong evidence that WRIs can be prevented with an educational intervention programme or module if given to workers, especially if it is given continuously or at regular intervals. Despite differences in methodological approaches, the studies consistently showed significant effectiveness in reducing the risk of WRIs in healthcare settings. Even though the type of WRI is different, the intervention methods can still be used in various types of WRI.

This systematic review had showed evidence that interventions designed to reduce pain, musculoskeletal injuries and associated injuries among HCWs need improvement in terms of its quality of study especially in the methodology. The relative lack of research on WRI prevention may be partly attributed to barriers to epidemiologic research done so far. Researchers might not be interested in this topic because they may have perceived that healthcare settings are a relatively safe place to work and that there are more important issues to be tackled upon. However one must remember that every single issues is equally as important as another.
Declaration
The authors have no conflict of interest for declaration

Authors’ contribution
Author 1: Literature search, analysing, and writing the manuscript.
Author 2: Idea and concept as well as reviewing and editing the manuscript.

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