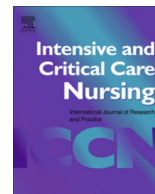Contents lists available at ScienceDirect

Intensive & Critical Care Nursing

journal homepage: www.elsevier.com/iccn

Research article

Effects of a PRECEDE-PROCEED model based ergonomic risk management programme to reduce musculoskeletal symptoms of ICU nurses

Duygu Sezgin [a,*], M. Nihal Esin [b]

[a] University of Limerick, Faculty of Education & Health Sciences, Department of Nursing & Midwifery, Castletroy, Limerick, Ireland[1]
[b] Istanbul University, Florence Nightingale Nursing Faculty, Public Health Nursing Department, Abide-i Hurriyet Caddesi, Istanbul, Turkey

ARTICLE INFO

ABSTRACT

Objectives: To evaluate effects of a PRECEDE-PROCEED Model based, nurse-delivered Ergonomic Risk Management Program (ERMP) in the aim of reducing musculoskeletal symptoms of intensive care unit (ICU) nurses.

Methods: This pre-test post-test design for non-equivalent control groups study comprised 72 ICU nurses from two hospitals. A randomised sampling was done through the study population. The ERMP was delivered as an intervention including 26 weeks of follow-up. Data was collected by "Descriptives of Nurses and Ergonomic Risk Reporting Form", "Rapid Upper Risk Assessment Form (RULA)", "ICU Environment Assessment Form" and "Personal interviews form".

Results: There was no difference between sociodemographic characteristics, work and general health conditions within intervention and control group. One month after the intervention, nurses had significant decrease in their total RULA scores during bending down and patient repositioning movements as 1.40 and 0.82, respectively. Six months after the ERMP, the mean total RULA scores of nurses during the patient repositioning was 4.39 ± 1.49 which meant "immediate further analyses and modifications recommended". After all, pain intensity scores, medication use due to pain, and RULA ergonomic risk scores were significantly decreased, while exercise frequency was increased.

Conclusions: The ERMP was effective to increase exercise frequency and to decrease musculoskeletal pain and ergonomic risk levels of ICU nurses.

© 2018 Elsevier Ltd. All rights reserved.

Implications for Clinical Practice

- Intensive care nurses are known to be exposed to high ergonomic risks in terms of their working environment and working conditions. Ergonomic risks and related MSS can be managed by a nurse delivered, model based programme.
- The PRECEDE-PROCEED model can be used as a road map to plan and implement interventions, and to manage intensive care nurses' ergonomic risks.
- Model-based, on-site ergonomic risk management programmes including continuous risk assessment in the intensive care unit are recommended for further studies.

* Corresponding author at: University of Limerick, Faculty Education & Health Sciences, Health Sciences Building, Castletroy, V94 X5K6 Limerick, Ireland.
  E-mail addresses: dusezgin@gmail.com (D. Sezgin), mnesin@istanbul.edu.tr (M.N. Esin).
[1] Present address.

Introduction

Intensive care unit (ICU) nurses are exposed to the highest ergonomic risks and they are more likely to have musculoskeletal system symptoms (MSS) in relation to musculoskeletal injuries (Freimann et al., 2015; Galletta et al., 2016). In working environments where MSS are mostly seen, nurses may have decreased work satisfaction, increased sick leave and burnout leading them to leave the profession (Abedini et al., 2015; Thinkhamrop and Laohasiriwong, 2015).

Musculoskeletal system symptoms (MSS) related ergonomic risks may be prevented by ergonomic risk management programmes. An ergonomic risk management programme might include body mechanics training, ergonomic guides, exercise programmes, cognitive-behavioural interventions, social support and workplace related interventions (Black et al., 2011; Côté et al., 2013; Rasmussen et al., 2013; Rivilis et al., 2008; Roelofs et al., 2010; Sato et al., 2012; Stigmar et al., 2013). As MSS is linked to multiple factors, those programmes comprising of client-participated multiple interventions, are found to be more efficient compared to body mechanics only training or exercise related programmes (Lim et al., 2011; Rasmussen et al., 2013). Moreover, on-site risk management programmes in clinical settings, focusing on direct care givers such as ICU nurses are found to be more effective if different factors affecting MSS are measured and the interventions are planned by the group (Baumann et al., 2012; Black et al., 2011; Rasmussen et al., 2013). Those programmes are more successful and evidence-based when they are planned and implemented on a model-based approach (Baumann et al., 2012).

The PRECEDE-PROCEED model enables its users to perform an assessment on social, epidemiologic, behavioural and environmental areas of the community, to plan and evaluate programmes in a systematic approach. It was developed by Green et al. in the 1970s as depicting a road map to design and implement health promotion programmes through eight phases (Green and Kreuter, 2005). The model can be used as a guide to plan and implement ergonomic risk management programmes with the aim of reducing ergonomic risks and related MSS symptoms of ICU nurses.

Background

The ergonomic risks and related MSS of the ICU nurses were reported to be high in previous research. Prevalence of MSS in nurses working in clinical settings is reported as being between 51 and 77% (Barkhordari et al., 2013; Kumalo, 2015; Samaei et al., 2015). Indeed, other studies emphasise that the MSS prevalence of nurses working in different settings might be even reaching 88.2% (Abedini et al., 2015; Ganiyu et al., 2015). In a previous study in 51 ICUs in Turkey with the aim of identifying the MSS frequency of ICU nurses, it was shown that 95% of nurses had MSS within the four weeks (Sezgin and Esin, 2015). According to the literature, MSS are mostly seen in the lower back, legs, shoulders, neck (Abedini et al., 2015; Barkhordari et al., 2013; Ganiyu et al., 2015; Kumalo, 2015). It has been illustrated that standing for more than three hours during a work day or spending over 80% of a shift for tasks require walking and standing can cause lower back and leg pain (Reid et al., 2010; Waters and Dick, 2015). Dutch ergonomics guides suggest that standing for more than four hours during a shift is considered to be an increased risk for

MSS and immediate improvement to working conditions are required (Werner et al., 2010).

Methods

Objectives

The aim of this study was to evaluate the effects of a PRECEDE-PROCEED Model based ergonomic risk management programme in terms of reducing the MSS of ICU nurses. This study was designed as a "pre-test post-test design for non-equivalent control groups study". The hypotheses we intended to test in the study were:

Nurses who participate in ERMP will have

- Decreased MSS, pain intensity scores (at least 1 point), medication use and sick leave days due to MSS symptoms, Rapid Upper Limb Assessment (RULA) A, B and total scores (at least 1 point) during patient repositioning and bending down movements on the first and third months following the intervention
- Increased exercise frequency compared to nurses in the control group.

Sampling

The study was conducted in two different hospitals since the intervention is considered to effect nurses in different ICU units within the same hospital settings. These two hospitals (hospital A and B) where the study was performed were selected randomly from 120 public hospitals located in the European side of Istanbul. Within those two hospitals, the hospital where the intervention was performed was selected by a draw (hospital A). There were 70 nurses in hospital A and 80 nurses in hospital B. These nurses were selected from a group of 150 ICU nurses working in two hospitals who met certain criteria: having ICU nursing experience for a minimum of 6 months, and having a high ergonomic risk score (2 or above) as assessed by RULA. The study population comprised of 116 nurses meeting those criteria (Hospital A: 57, Hospital B: 59).

The study sample size was calculated by power analysis considering 2 points of difference with 1 point of standard deviation as significant, minimal study sample was found to be 72 (intervention = 36, control = 36) accepting Type I error as 5%, Type II error as 20% (α = 0.05, 1-β = 0.80).

The sample comprised of 72 ICU nurses selected by systematic sampling from 8 ICUs of the hospitals (intervention = 35, control = 37).

During this process, 11 nurses dropped out from the study. The study was finalised with 61 nurses in total (intervention = 30, control = 31). The nurses who dropped out were not considered as missing due to following the intention to treat (ITT) principle in the data analysis process (Sainani, 2010).

Data collection tools

Four data collection tools were employed.

Descriptives of Nurses and Ergonomic Risk Reporting Form

This was developed by researchers based on McAtamney and Nigel Corlett, 1993 "Ergonomic Risk Assessment Guide". This self-reported form's reliability for the question related to pain