American Journal of Infection Control 44 (2016) 85-90

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major article

Prevalence and risk factors of needlestick injuries, sharps injuries, and blood and body fluid exposures among operating room nurses in Thailand

Nongyao Kasatpibal PhD [a,*], JoAnne D. Whitney CWCN, FAAN, PhD [b], Sadubporn Katechanok MNS [c], Sukanya Ngamsakulrat MNS [c], Benjawan Malairungsakul MNS [c], Pinyo Sirikulsathean MPPM [d], Chutatip Nuntawinit PhD [e], Thanisara Muangnart MPA [f]

[a] Division of Nursing Science, Faculty of Nursing, Chiang Mai University, Chiang Mai, Thailand
[b] Department of Biobehavioral Nursing and Health Systems, School of Nursing, University of Washington, Seattle, WA
[c] Operating Room and Recovery Room Service, Maharaj Nakorn Chiang Mai Hospital, Chiang Mai University, Chiang Mai, Thailand
[d] Operating Room, Rajavithi Hospital, Bangkok, Thailand
[e] Operating Room, Siriraj Hospital, Mahidol University, Bangkok, Thailand
[f] Operating Room, Police General Hospital, Bangkok, Thailand

Key Words:
Needlestick injuries
Operating room nurses
Prevalence
Risk factors
Sharps injuries
Splashes

Background: Operating room nurses are at high risk for occupational exposure to bloodborne pathogens. This study examined the prevalence of and risk factors for needlestick injuries (NSIs), sharps injuries (SIs), and blood and body fluid exposures (BBFEs) among operating room nurses in Thai hospitals.

Methods: A cross-sectional study was performed in 247 Thai hospitals. Questionnaires eliciting demographic data and information on injury occurrence and risk factors were distributed to 2500 operating room nurses, and 2031 usable questionnaires were returned, for a response rate of 81.2%. Adjusted odds ratios (ORs) and 95% confidence intervals (CIs) were calculated using multiple logistic regression analysis.

Results: The prevalence of NSIs, SIs, and BBFEs was 23.7%, 9.8%, and 40.0%, respectively. Risk factors for NSIs were training without practice (OR, 1.67; 95% CI, 1.29-2.17), haste (OR, 4.81; 95% CI, 3.41-6.79), lack of awareness (OR, 1.36; 95% CI, 1.04-1.77), inadequate staffing (OR, 1.60; 95% CI, 1.21-2.11), and outdated guidelines (OR, 1.69; 95% CI, 1.04-2.74). One risk factor was identified for SIs: haste (OR, 2.43; 95% CI, 1.57-3.76). Risk factors for BBFEs were long working hours per week (OR, 2.07; 95% CI, 1.06-4.04), training without practice (OR, 1.55; 95% CI, 1.25-1.91), haste (OR, 1.66; 95% CI, 1.30-2.13), lack of awareness (OR, 1.54; 95% CI, 1.22-1.95), not wearing protective equipment (OR, 1.61; 95% CI, 1.26-2.06), and inadequate staffing (OR, 1.63; 95% CI, 1.26-2.11).

Conclusion: This study highlights the high prevalence of NSIs, SIs, and BBFEs among Thai operating room nurses. Preventable risk factors were identified. Appropriate guidelines, adequate staffing, proper training, and self-awareness may reduce these occurrences.

Needlestick injuries (NSIs), sharps injuries (SIs), and blood and body fluid exposures (BBFEs) through splashes occur frequently in hospitals. NSIs and SIs affect an estimated 384,325 health care workers (HCWs) in the United States[1] and 100,000 HCWs in the United Kingdom[2] each year. One review found a mean rate of NSIs and SIs of 4.0% (range, 1.0%-6.2%) per 10,000 HCWs.[3] In Thailand, the incidence rate of percutaneous and mucocutaneous exposures among HCWs is 70% and 30%, respectively.[4] In the operating room, HCWs encounter situations that put them at increased risk of NSIs, SIs, and BBFEs.[4-6] The Exposure Prevention Information Network (EPINet) reported that among the total accidents occurring in US hospitals annually, nurses experience 36% of NSIs and SIs and 48%

* Address correspondence to Nongyao Kasatpibal, PhD, Division of Nursing Science, Faculty of Nursing, Chiang Mai University, Chiang Mai, Thailand 50200.
E-mail address: nongyaok2003@gmail.com (N. Kasatpibal).
This work was funded by the Thai Perioperative Nurses Association.
Conflicts of interest: None to report.

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http://dx.doi.org/10.1016/j.ajic.2015.07.028

of BBFEs,[5,6] highlighting the fact that operating room nurses are at high risk for these injuries.

NSIs and SIs may occur before use (2%), during use (33%), after use and before disposal (46%), and during or after disposal (16%).[7] Operating room nurses may experience NSIs and SIs while administering injections, recapping needles, assisting a surgeon with an operation, cleaning instruments during an operation, cleaning instruments after surgery, and other related activities.

Operating room nurses face significant risks from these accidents owing to several factors. They are required to work with sharp objects for long periods, during which they may be directly exposed to blood-borne pathogens.[8] In addition, accidents may result from time pressures, misunderstandings among surgical team members, fatigue, inadequate staffing, lack of awareness, inattention during the procedure owing to noise, and lack of cooperation from patients.[3,9]

Although NSIs, SIs, and BBFEs are common in the operating room, risk adjustment studies for those accidents among operating room nurses have been limited and inconsistent. In addition, to date there have been no studies in Thailand emphasizing the prevalence and risk factors for those accidents among operating room nurses. The primary aim of the present study was to examine the prevalence of and risk factors for NSIs, SIs, and BBFEs among operating room nurses in Thailand.

METHODS

Study setting and study design

This cross-sectional study was performed between June 2011 and May 2012. A total of 247 hospitals throughout Thailand were selected using stratified sampling, including 184 government hospitals, 14 university hospitals, 19 regional hospitals, 86 general hospitals, 65 community hospitals, and 63 private hospitals. The study was approved by the Ethical Review Committee for Research in Human Subjects, Faculty of Nursing, Chiang Mai University, and later reaffirmed by the deans of the Faculty of Medicine and the Directors or Ethics Committees of the study hospitals.

Definition of NSIs, SIs, and BBFEs

For this study, an NSI was defined as an accidental skin-penetrating stab wound caused by a suture needle or a hollow-bore needle, such as a hypodermic needle. An SI was defined as a skin-penetrating stab wound caused by a sharp instrument, such as a lancet, scalpel, trocar, scissors, drill bit, sawing blade, or broken glass. A BBFE was defined as splashing of blood or body fluids onto skin or mucous membranes.[10]

Data collection

Questionnaires were sent to a total of 2500 operating room nurses working in the study hospitals. The questionnaire comprised 3 main parts: (1) demographic data, including sex, age, position, educational level, marital status, operating room experience, hours worked per week, operating unit/section, and training in or access of knowledge about NSIs, SIs, and BBFEs; (2) information relating to NSIs, SIs, and BBFEs, including the occurrence of accidents, time of accident, site of injury, level of exposure, type of exposure, activities during the accident, and type of needle and sharp object; and (3) factors affecting the occurrence of NSIs, SIs, and BBFEs, consisting of personal factors, practical factors, and organizational factors.

Statistical analysis

Demographic data for the responding operating room nurses and general information relating to NSIs, SIs, and BBFEs were recorded as frequency and percentage, mean $\pm$ standard deviation, and median and range, as appropriate. Univariate analysis was conducted to examine the variables associated with NSIs, SIs, and BBFEs, including (1) personal factors (sex, age, marital status, educational level, job position, operating unit/section, operating room experience, hours worked per week, and training), (2) practical factors (haste, hazard awareness, noise during operation, outdated practices), and (3) organizational factors (adequate staffing, updated practice guidelines and instructional manual, use of PPE, adequate number of PPE, safety culture). Three additional confounders were examined for NSIs (1 practical factor, using the 1-hand technique, and 2 organizational factors, having puncture-resistant disposal containers and an adequate number of puncture-resistant disposal containers). Four additional confounders were examined for SIs (2 practical factors, using a hands-free technique and signaling when passing sharp instruments, and 2 organizational factors, having puncture-resistant disposal containers and an adequate number of puncture-resistant disposal containers). Potential factors with a P value $<.20$ on univariate analysis were included in the multivariate analyses. Adjusted odds ratios (ORs) and 95% confidence intervals (CIs) were calculated using multiple logistic regression analysis.

RESULTS

Demographics

A total of 2043 questionnaires were returned. Of these, 12 were excluded because they were incomplete, leaving 2031 usable questionnaires, for an 81.2% response rate. The majority of the respondents were female (92.3%), and the mean respondent age was 38.4 $\pm$ 9.8 years. The mean years of operating room experience was 13.7 $\pm$ 9.7 years. The mean hours worked per week was 47.9 $\pm$ 14.5 hours. All participants had been trained or educated in the prevention of NSIs, SIs, and BBFEs. The range of training sessions was 1-8 times a year, and the majority (62.3%) had trained once in the past year. Demographic data of the responding operating room nurses are provided in Table 1.

Prevalence of NSIs, SIs, and BBFEs

In the previous year, 23.7% of the responding operating room nurses had experienced at least 1 NSI (range, 1-10 injuries). Of these, 71.5% had experienced 1 NSI, 19.3% had experienced 2 NSIs, and 6.2% had experienced 3 NSIs. In addition, 9.8% of the respondents had experienced at least 1 SI (range, 1-15 injuries); of these, 78.4% had experienced 1 SI, 13.1% had experienced 2 SIs, and 4.5% had experienced 3 SIs. Finally, 40.0% of the respondents had experienced at least 1 BBFE (range, 1-20 injuries). Of these, 32.5% had experienced 1 BBFE, 29.0% had experienced 2 BBFEs, and 15.5% had experienced 10 BBFEs.

The majority of NSIs, SIs, and BBFEs occurred during the morning shift (45.2%), followed by the afternoon shift (29.1%) and then the night shift (25.7%).

Level of exposure, types of blood and body fluid, and types of sharp devices

Percutaneous exposure was the most common accident among operating room nurses (43.0%), followed by skin exposure (40.3%; nonintact skin, 26.1%; intact skin, 14.2%) and mucocutaneous exposure (16.7%). Blood was the most common fluid exposure (46.3%), followed by intra-abdominal fluid or pus (15.2%),