Infection Control Practices among Pediatric Critical Care Nurses

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KEYWORDS

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ABSTRACT:

Background: Hospital-acquired infections (HAIs) are critical health problems. They are leading causes of increased morbidity and mortality, financial costs, prolonged hospitalization, and decreased quality of care. Pediatric critical nurses who have close contact and spend much time delivering comprehensive care services for patients are the most common transmitted factor of pathogens during clinical activities. Therefore, their practices of infection control procedures have been recognized as an efficient means to create a culture of safety for patients and control the spread of HAIs. **Objective:** This study aimed to examine infection control practices among pediatric critical care nurses and the factors related to practices. **Methods:** A descriptive cross-sectional study was conducted on 95 nursing participants who worked in a selected government tertiary hospital for children in Can Tho, Vietnam. This study used a 4-point Likert-scale questionnaire with 20 items to assess the participants' practices of infection control. **Results:** Nurses' infection control practices were intermediate, with an overall mean score of 3.15 (S.D = 0.48). Among the subscales, disposal of sharps had the lowest score, while disposal of waste had the highest one (mean of 2.98±0.66 and 3.43±0.61, respectively). Besides, the study showed a significant relationship between experience in years and infection control practices (p=0.02). **Conclusion:** Nurses play a central role in controlling and preventing HAIs. Even so, the study findings showed that the practice of infection control was unsatisfied. This highlights the need to take the necessary measures to enhance the level of practice, especially for nurses who have less experience in the nursing profession.

INTRODUCTION

Hospital-acquired infections (HAIs) are complicated problems in the healthcare system that could appear in any healthcare setting, including hospitals, urgent care centres, rehabilitation centres, nursing homes, and outpatient surgery centres (Tweddell et al., 2019). There are 1.4 million hospitalized patients with HAIs during their treatment each year, and the rate of HAIs in developing countries is 25% (Bekele et al., 2020). In the intensive care units (ICUs), the risks of HAIs are more significant and challenging because of the increasing numbers of severe patients and healthcare demands, the high frequency of emergencies, the diversity of clinical procedures, and complex healthcare services and equipment. According to previous study findings, over 24% of patients suffered sepsis from HAIs, and 52.3% of them died in ICUs (Donati et al., 2019).

HAIs are significant burdens not only to patients and families but also to healthcare systems. They are leading causes of increased morbidity and mortality as well as reduced quality of life and extended hospitalization among patients, changing many aspects of family daily lives, particularly those of the

caregivers. Besides, the overall average cost associated with an episode of HAIs increase by 4.2 times. Therefore, HAIs are significant economic and financial burdens for the family and healthcare service system, particularly in developing countries (Leoncio et al., 2019; Tweddell et al., 2019). In healthcare institutions, infection control practice procedures focus on the use of protective devices, disposal of sharps and waste, decontamination of spills and used articles, and prevention of cross-infection to prevent the spread of HAIs. Critical care nurses who have close contact and spend much time delivering comprehensive care services for patients are the most common transmitted factor of pathogens during clinical activities. Therefore, their infection control practices have been recognized as efficient means to control HAIs and create a culture of safety for patients (Beyamo et al., 2019).

Investigating the compliance with infection control measures among critical nurses is crucial to identifying the gap in practices and direct nursing interventions to enhance HAIs control. Then, this study aimed to examine the infection control practices among paediatric critical care nurses and the association between background factors and infection control practices.

METHODS

Study Design

A descriptive correlational design was conducted to achieve the study objectives. This study was conducted in a selected government tertiary hospital for children in Can Tho, Vietnam, from September 2022 to September 2023. The research locale is the biggest hospital for children in the Mekong Delta, Vietnam.

Sample

The target nurse respondents in this study included those who are involved in direct patient care of pediatric patients at ICUs (Intensive Care Units, Neonatal Intensive Care Units, and Operation Rooms) in selected government tertiary hospitals in Can Tho City, Vietnam. Participants were selected based on specific inclusion criteria, including (1) pediatric nurse; (2) full-time staff in the pediatric ICU units; and (3) at least three months of work experience in the pediatric ICU areas. Following the inclusion criteria, nurses who are on-leave during the period of the study, those who are working part-time in ICUs, and nurse managers in the ICU were excluded from the study. 102 nurses who met the inclusion criteria were invited to participate in the study, and the response rate was 93.1%, resulting in ninety-five enrolled participants.

Instruments

The study instrument comprised two sections: (1) background information, including age, gender, level of education, and experience in years; and (2) the Compliance with Standard Precautions Scale (the CSPS). The CSPS was developed by Lam (2011) for measuring nurses' infection control practices. It consisted of twenty items to evaluate compliance with the procedures in use of protective devices, disposal of sharps, disposal of waste, decontamination of spills and used articles, and prevention of cross-infection. Among the 20 items, there are 16 positively worded items and 4 negatively worded items. The responses for each item are on a 4-point Likert scale: 1=never; 2=seldom;3=sometimes, and 4=always. For getting the compliance scores, the items of 5, 7, 9, and 15 (items of negative aspects) must be reversed scored. The total score was calculated by averaging the average scores of the five subscales. A higher score indicated better infection control practices among nurses. The scale was a valid and reliable instrument to measure compliance with infection control procedures. The good reliability of the scale was confirmed by the high internal consistency of Cronbach's alpha of 0.89 (Lam, 2011). The original version of CSPS was in English. Thus, it was translated into Vietnamese by using the back-translation method (Cha et al., 2007) to determine the effectiveness and appropriateness of the questionnaires when they are used for Vietnamese. The Vietnamese version of CSPS was distributed to 30 nurses who had the same characteristics as the study participants to test its reliability. Based on the results of the pilot test, the Cronbach's alpha coefficient of the CSPS was 0.88.

Data Collection

Data were collected using a two-part self-report questionnaire after getting research approval from the Dean of the Graduate School and the Ethics Committee of Trinity University of Asia (Ethical Approval No. TUA.IERC. 015.R02, August 12, 2022). Nursing participants are carefully explained the research objectives, significance of the study, data collection procedure, research procedure, potential risks and benefits, assured confidentiality and anonymity, and respected for their rights to participate in and withdraw from the study. Consent was secured from the participants to ensure voluntary participation. Participants were invited to a separate room, where the researcher distributed questionnaires. The private space was used to reduce the bias of the answers caused by the discussion or support from other nurses or colleagues. The participants were clarified in the directions to respond to the questionnaires, which took approximately ten to fifteen minutes to complete. Ninety-five nursing respondents completed the questionnaire independently. The survey was administered at the end of the morning or afternoon, after the nurses' daily duties were almost completed. The data gathering took about three months, from October to December 2022.

Statistical Analysis

The data analysis was performed using IBM® SPSS Statistics Version 26.0. Descriptive statistics in terms of frequency, percent, mean, standard deviation, and range were used to examine background characteristics among nursing respondents. Besides, to determine the assessment of pediatric critical care nurse respondents on their infection control practices in selected government tertiary hospitals in Can Tho, Vietnam, a weighted mean standard deviation, and range were used. The relationship between background characteristics and nurses' practices was examined using One-way ANOVA test. Statistical significance was considered at lower than 0.05.

Ethical consideration

The study was approved by the Institutional Ethic Review Committee of Trinity University of Asia (Ethical Approval No. TUA.IERC. 015.R02, August 12, 2022). The participants were assured of their privacy and the confidentiality of all gathered personal information. The anonymity of the respondents was maintained by eliminating all potential identifiers. It was also clarified that participants can withdraw from the study at any time, and their decision will not affect their working activities or position. After the nurses agreed to participate in the study, they were asked to sign the informed consent form to confirm their willingness and voluntary participation in the study. All of the participants' answers were only used for this research. The risk involved in completing the survey questionnaire was less than minimal.

RESULTS

Participants

The mean age of the participants in this study was 31.1 ± 4.5 years, with a range of age from 24 to 47. 71.6% of the participants identified as female. The percentage of participants had 5-10 years of nursing experience was 43.2%, while the remaining 3.2% included participants had <3 years of experience. Approximately half (52%) of participants in this study had a bachelor degree in nursing science; 12.6% of nurses had a post-graduate degree; and 35.8% had a college degree or lower.

Infection Control Practices among Participants

The results of nursing participants' infection control practices were presented in Table 1, with the mean score of practices was 3.15 $\pm$ 0.48. Among the subscales, disposal of sharps had the lowest score, while disposal of waste had the highest one.

Table 1. *Infection Control Practices among Nursing Participants*

	Range	Minimum	Maximum	Mean	Std. Deviation
Infection control practices	1.8	2.20	4	3.15	0.48
Subscales					
• Use of protective devices	2.33	1.67	4	2.99	0.59
• Disposal of sharps	2.33	1.67	4	2.98	0.66
• Disposal of waste	3.00	1	4	3.43	0.61
• Decontamination of spills and used articles	2.00	2	4	3.42	0.58
• Prevention of cross-infection	1.86	2.14	4	3.18	0.49

(Source: Authors)

The mean score of nursing participants' practices across different items of infection control measures. The strongest component of infection control practices pertained to "I decontaminate my hands immediately after the removal of gloves" (3.83 $\pm$ 0.38 scores). Meanwhile, the weakest component referred to using soap or hand scrub appropriately for hand washing (2.42 $\pm$ 1.06 scores) (table 2)

Table 2. *Infection Control Practices on each Items among Nursing Participants*

Items	Mean	Std. Deviation
• I remove Personal Protective Equipment (PPE) in a designated area	3.45	0.50
• I wear gloves when I am exposed to body fluids, blood • products, and any excretion of patients	3.40	0.61
• I wear a surgical mask alone or in combination with goggles, face shield and apron whenever there is a possibility of a splash or splatter	2.45	1.07
• My mouth and nose are covered when I wear a mask	2.48	1.06
• *I reuse a surgical mask or disposable Personal Protective • Equipment (PPE)	3.07	0.76
• I wear a gown or apron when exposed to blood, body fluids • or any patient excretions	3.11	0.71
• *I recap used needles after giving an injection	3.46	0.54
• I put used sharp articles into sharps boxes	2.77	1.00
• *The sharps box is disposed only when it is full	2.72	0.86
• Waste contaminated with blood, body fluids, secretion and excretion is placed in red plastic bags irrespective of the patient's infection status	3.43	0.61
• I decontaminate surfaces and equipment after use	3.45	0.62
• I wear gloves to decontaminate used equipment with visible • soils	3.42	0.63
• I clean up spillage of blood or other body fluids immediately • with disinfectants	3.43	0.75
• I wash my hands between patient contacts	3.16	0.76
• *I only use water for hand washing	2.42	1.06
• I use alcoholic hand rubs as an alternative if my hands are not visibly soiled	3.35	0.56
• I take a shower in case of extensive splashing even after I have put on Personal Protective Equipment (PPE)	2.82	0.74
• I cover my wound(s) or lesion(s) with waterproof dressing before patient contacts	3.48	0.70
• I change gloves between patient contacts	3.22	0.77
• I decontaminate my hands immediately after removal of gloves	3.83	0.38

*Items reverse scored; (Source: Authors)

Relationship between Infection Control Practices and Participants' Background Information

The relationships between nursing respondents' infection control practices and demographic characteristics. Experience in years (p = 0.02) was found to have a statistically significant relationship with infection control practices (table 3). However, there was no significant association between practices of infection control and gender or education level

Table 3. *The Relationships between Self-Care Knowledge and Demographic Characteristics*

	Variables	**Infection Control Practices**	***p*-value**
Gender	Male (n=27)	3.09$\pm$0.41	0.50
	Female (n=68)	3.17$\pm$0.50	
Level of education	Intermediate (n=8)	3.08$\pm$0.55	0.63
	College (n=26)	3.95$\pm$0.48	

	Variables	Infection Control Practices	*p*-value
	Bachelor (n=49)	3.19±0.48	
	Postgraduate (n=12)	3.19±0.45	
Experience in years	<3 years (n=3)	2.42±0.10	0.02*
	3-5 years (n=19)	3.15±0.52	
	5-10 years (n=41)	3.10±0.41	
	>10 years (n=32)	3.27±0.50	

(Source: Authors); Using One-way ANOVA test; (*): Significant at $p < 0.05$

DISCUSSION

Infection Control Practices among Nursing Participants

Nursing practices of infection control precedence are crucial for any improvement in healthcare services. The gap in practices might lead to various complications and burdens for patients, their families, and the healthcare system. In this study, the mean score of infection control practices among pediatric critical care nurses was 3.15 (SD = 3.48). This study findings were consistent with those of Al-Faouri et al. (2021), who studied registered nurses at three hospitals in the north of Jordan. The scores of practices to prevent HAIs were 49.15 ± 12.36/80 scores (Al-Faouri et al., 2021). Consistently, a descriptive cross-sectional study conducted with 408 registered nurses found that nursing respondents' compliance with infection control procedures was intermediate, with an overall mean score of 59.65 ± 14.57 out of 80 (Ghabayen et al., 2023).

When we compared the mean score among domains of infection control practices, the domain of disposal of waste had the highest score, while the disposal of sharps had the lowest. Similar findings were presented by previous studies. A study that aimed to assess the level of knowledge, level of compliance, and associated factors toward compliance with standard precautions among registered nurses was conducted at three hospitals in the north of Jordan with 266 participants. Its findings revealed that the participants may possess satisfactory knowledge and compliance levels regarding standard precautions. Furthermore, compliance among nurses with the guidelines for disposal of sharps was the lowest. For needles recapping compliance, it was found that only 9.8% were fully compliant and wouldn't recap the used needles, while 35.3% of them reported that sometimes they recapped the used needles (Al-Faouri et al., 2021).

Correspondingly, study of Han et al. (2018) mentioned the weakest dimension of the performance of standard precautions among nurses was the disposal of sharps. Moreover, in their study, dimensions related to using PPE and decontaminating spills had the highest score (Han et al., 2018). A relevant result was also indicated by Esu et al. (2019). Of the 332 participants interviewed, the majority (76.2%) were compliant with standard precautions, as well as very few of the respondents had a very low level of compliance with standard precautions. However, adherence to safe disposal of sharps among nurses was not at a strongly satisfied level (Esu et al., 2019). In addition, Kim and Park (2019) stated that the level of infection control practices among Korean young nurses was moderate. In details, the lowest domain was the use of protective devices and the disposal of sharps (Kim & Park, 2021).

The high average score of nurse respondents on practices of disposal of waste as well as decontamination of spills and used articles and cross infection prevention may come from the efforts of the healthcare system and hospital managers. In the Vietnamese healthcare system, procedures and guidelines for handling medical waste and preventing HAIs, especially hand hygiene, are updated frequently. In each healthcare setting, managers and leaders provided principles, available equipment, and sources to ensure adequate infection control practices in the organization. Support supervision may be one factor that promotes the satisfaction of nurses with infection control procedures. Conversely, the safe performance of nurses on disposal of sharps was presented at a low level. It is mentioned as a common weakness among nurses. Haile et al. (2017) identified that nurses had a moderate level of compliance with infection prevention procedures. Unfortunately, compliance with discarding used

needles or sharps into sharps containers was low (Haile et al., 2017).

In current study, paediatric nurses presented low level of practices regarding using soap or hand scrub appropriately for hand washing; wearing mask; and disposal of sharp box. Therefore, it is important that, besides having the adequate equipment, healthcare institutions should have professionals trained to guarantee the principles regarding the control of HAIs, especially critical nurses. The supervision focused on adherence to using personal protective equipment, disposal of sharps, and hand hygiene should be promoted.

Relationship between Infection Control Practices and Participants' Background Information

A statistically significant relationship was found between nursing participants' infection control practices and their experiences (p=0.02) (Table 3). Ghabayen et al. (2023) found that there was a positive correlation between compliance with infection control procedures. In other words, nursing participants who had more years of experience in nursing professionals had significantly higher infection control practices scores than other participants in the study (Ghabayen et al., 2023). Consistently, a cross-sectional survey among 332 respondents from 19 government health facilities in Nigeria found a link between years of practices and compliance with HAIs prevention measures (Esu et al., 2019). The higher practice scores among more experienced nurses may be related to training in infection control compared to other less experienced nurses. According to the requirements of the Vietnamese Ministry of Health, each nurse has to attend at least 24 hours per year for training and education, and one of the most common training courses is HAIs control in healthcare organizations. Thus, nurses, especially critical nurses, have adequate knowledge and a positive attitude regarding waste disposal. Those may lead to strict compliance among them regarding HAIs prevention procedures. However, some previous studies have shown that the results are inconsistent with years of experience and infection control practices. More research is needed to conclude and be clear about the relationship.

In the current study, there was no relationship between nurses' practices of infection control and gender or education level (see Table 3). Previous studies have produced different conclusions regarding the relationship between gender, the education level of nurses, and their practices of infection control. Esmail et al. (2019) indicated that there was a significant relationship between gender and HAIs prevention practices. In details, females had satisfactory practices more than males. This study also revealed that nurses who had a bachelor's degree had more satisfactory practices as compared to the other two groups of education levels (Esmail et al., 2019). This disagrees with the finding of Elseesy et al. (2023) in their study about "Compliance among Registered Nurses and Doctors in Critical Care Units: Challenges Affecting Their Adherence to Standard Precautions" who found that there were no significant differences between infection control practices based on gender and educational level (Elseesy et al., 2023).

It is crucial to enhance infection control practices among nurses. Therefore, regular training and necessary measures for all nurses, especially pediatric critical care nurses, should be offered in healthcare organizations. It is also suggested that hospital administration should continually update protocols or policies to strengthen infection control practices, particularly among all pediatric critical care nurses, in the use of protective devices, disposal of sharps and waste materials, decontamination of spills and used articles, and prevention of cross-infection. To enhance infection control practices among pediatric critical care nurses, there should be strategies to monitor and evaluate nurses' compliance. As a result, establishing a system to monitor and sustain compliance with infection control procedures as well as well-designed evaluation standards is required.

Research limitation

This study only involved pediatric nurses who worked at a selected government hospital in Can Tho, Vietnam. Thus, the study findings might not be generalized to other groups of nurses. The use of self-reported measures was another limitation of this study because of the potential for subjective bias.

CONCLUSION

The current study illustrated that nurses had unsatisfied practices in almost all domains of infection control measures at a selected government tertiary hospital for children in Can Tho, Vietnam. Nurses' practices for HAIs prevention varied significantly according to experience in years. These research results may help nurse leaders and nursing staff develop and refine interventions or programs to enhance competence and capacity for infection control.

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