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Original Article

Factors Influencing Children's Hospital Nurses' Safety Accident Management Activities for Hospitalized Children

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Abstract

Background: We aimed to identify the factors influencing safety accident management activities for hospitalized children in children's hospitals.

Methods: In August 2022, data were collected from 170 nurses across seven children's hospitals in Gwangju Metropolitan City, Korea. The collected data were analyzed using independent *t*-tests, analysis of variance, Pearson's correlation analysis, and multiple regression analysis.

Results: Safety accident management activities for hospitalized children differ significantly based on nurses' experience in children's hospitals (P=0.048). Safety accident management activities were positively correlated with patient safety culture (r=0.47, P<0.001), critical thinking (r=0.35, P<0.001), and nursing work environment (r=0.51, P<0.001). Furthermore, the most influential determinant of safety accident management activities for hospitalized children was the nursing work environment (β=0.42, P<0.001), followed by nurses' experience in children's hospitals (β=0.20, P=0.004), and patient safety culture (β=0.17, P=0.041). These variables had an explanatory power of 34.0 % (adjusted R^2=0.34, P<0.001).

Conclusion: A positive nursing work environment and strong patient safety culture are essential for increasing safety accident management activities among children's hospital nurses. Additionally, children's hospitals should provide support to the nursing staff and implement policies that encourage long-term retention of experienced nurses.

Keywords: Accident management activities; Children's hospital nurse; Critical thinking; Nursing work environment; Patient safety culture

Introduction

In Korea, the proportion of children in the total population is decreasing every year, but the rate of child safety accidents is increasing (1). In Korea, the child safety accident death rate is 2.3 per 100,000 population, which is higher than those in major Organization for Economic Cooperation and Development countries (2). A children's hospital is a hospital that offers its services exclusively to patients from birth up to 18 years, and through age 21 and older in the United States (3). However, safety accidents can occur at children's hospitals (4). Among inpatients, medication er-

rors are the most common safety events in the Patient Safety Reporting and Learning System, followed by falls and incidents related to medical examinations (5). Often, children focus on one phenomenon that interests them, and they lose awareness of other elements in their surroundings. Since their emotional judgment precedes their rational judgment (even in dangerous situations), safety accident management activities become crucial for hospitalized children (5). Even if a child is slightly injured in a safety accident, the after-effects can be serious and even fatal (6). Moreover, there are enormous social costs associated with such injuries, such as the cost of disability and the economic burden on the parents taking care of their children. This makes it necessary for healthcare workers to manage safety accidents. Among healthcare workers, nurses are the closest to the patients in everyday care.

Patient safety culture refers to shared beliefs, values, and behavioral patterns at the organizational, departmental, and individual levels aimed at minimizing injuries and accidents during health care provision (7). Strong patient safety culture is associated with reduced patient harm and hospital mortality (8). Additionally, hospitals with a strong patient safety culture exhibit the highest levels of teamwork and fewer medical errors (9). Critical thinking is a skill that nurses must possess for professional practice in a rapidly changing healthcare environment (10). It involves careful observation and accurate assessment of patient conditions to provide skilled and multidimensional nursing care and essential for ensuring patient safety and quality of care (11). Another factor that affects patient safety management activities in healthcare settings is the nursing work environment (12). The nursing work environment consists of the physical environment, which supports nurses' work, and human environment, which facilitates interactions with other healthcare professionals and individuals (13).

Many studies have explored the factors that affect safety accident management activities. They have shown that patient safety culture, critical thinking, nursing work environment, patient safety competence, and organizational commitment influence safety accident management activities. However, most of these studies have involved nurses who provide nursing care to the entire unit. Regarding nurses who provide care to children, their safety accident management activities are influenced by the patient safety culture, family-centered care, and awareness of the importance of patient safety management. However, research remains scant on the determinants of the safety accident management activities of nurses who provide care to the hospitalized children. Therefore, we aimed to identify the factors affecting safety accident management activities of nurses who provide care to the hospitalized children.

Materials and Methods

Participants and data collection

We targeted nurses who had provided direct nursing care to children for more than three months in a children's hospital. The required sample size was calculated using the G* Power software (G* Power 3.1.9.7, Heinrich-Heine-University, Düsseldorf, Germany). For an effect size of 0.15, a significance level of 0.05, a power of 0.90, and 12 predictor variables (patient safety culture, critical thinking, nursing work environment, age, marital status, childbirth status, education level, total clinical experience, experience in children's hospitals, job position, experience with patient safety accidents, and experience of receiving patient safety education), the minimum sample size for multiple regression analysis was 157. Considering a 15% dropout rate, we distributed self-administer questionnaires to 185 nurses from seven children's hospitals in Gwangju Metropolitan City, Korea, in August 2022. We received responses from 170 nurses, and all of them were used in data analysis.

Ethical considerations

This study was approved by the Institutional Review Board of Kwangju Women's University (IRB number: 1041465-202208-HR-001-26) and was conducted in accordance with the Declara-

tion of Helsinki. In addition, all participants provided written informed consent.

Measures

Patient safety culture was measured using the Korean Patient Safety Culture Tool (7). The tool comprises 35 items across seven dimensions. All items are rated on a 5-point Likert scale ranging from 1 ("not at all") to 5 ("very much so"). The minimum score on the tool is 35, and the maximum score is 175. Higher scores indicate a stronger patient safety culture. The Cronbach's α of the tool was 0.93 when it was developed and 0.94 in this study.

Critical thinking was assessed using the critical thinking instrument (14). This instrument consists of 35 items across eight domains. All items are rated on a 5-point Likert scale ranging from 1 ("not at all") to 5 ("very much so"). The minimum score on the instrument is 35, and the maximum score is 175. Higher scores indicate better critical thinking skills. The Cronbach's α of the instrument was 0.89 at the time of its development and 0.91 in this study.

The nursing work environment was evaluated using the Practice Environment Scale of the Nursing Work Index (15,16). This instrument comprises 29 items across five dimensions. All items are rated on a 4-point Likert scale ranging from 1 ("not at all") to 4 ("very much so"). The minimum score on the instrument is 29, and the maximum score is 116. Higher scores indicate a more positive nursing work environment. The Cronbach's α of the instrument was 0.82 when it was developed and 0.93 in this study.

Safety accident management activities for hospitalized children were evaluated using the Safety Accident Management Activity Measurement Tool for Hospitalized Children (17). This tool consists of 48 items across nine dimensions. All items are rated on a 5-point Likert scale ranging from 1 ("never") to 5 ("always"). The minimum score on the tool is 48, and the maximum score is 240. Higher scores indicate a higher level of safety accident management activities for hospitalized children. The Cronbach's α of the tool was 0.95 at the time of its development and 0.96 in this study.

Statistical analysis

We performed independent *t*-tests and analysis of variance to investigate differences in safety accident management activities based on participants' general characteristics. Post-hoc analysis was performed using Scheffé's test. Pearson's correlation analysis was conducted to examine the correlation between patient safety culture, critical thinking, nursing work environment, and safety accident management activities. Finally, multiple regression analysis was conducted to identify the factors influencing safety accident management activities for hospitalized children. Statistical significance was set at $P<0.05$. All statistical analyses were performed using SPSS for Windows (version 24.0; IBM Corp., Armonk, NY, USA).

Results

Table 1 shows the characteristics of the participants.

Table 2 shows the results of analyzing patient safety culture, critical thinking, nursing work environment, and safety accident management activities for hospitalized children.

Table 3 shows differences in safety accident management activities for hospitalized children based on participant general characteristics. Safety accident management activities for hospitalized children differed significantly based on the number of years of experience of working in children's hospitals ($F=2.13$, $P=0.048$). They did not differ based on age, marital status, childbirth status, education level, total clinical experience, job position, experience with patient safety accidents, or experience of receiving patient safety education ($P>0.05$). According to the post-hoc test, participants with more than 20 years of experience of working in children's hospitals performed significantly higher levels of safety accident management activities than those who had 3–10 years of experience ($P<0.05$).

Table 1: Characteristics of the participants (n=170)

Characteristic	*Categories*	*n (%)*
Age (years)	Less than 30	54 (31.8)
Mean±standard deviation	30–39	63 (37.1)
(34.62±7.91)	40–49	47 (27.6)
	50 or older	6 (3.5)
Marital status	Married	88 (51.8)
	Single	82 (48.2)
Childbirth status	With children	76 (44.7)
	Without children	94 (55.3)
Education level	College	64 (37.6)
	University	103 (60.6)
	Graduate school	3 (1.8)
Total clinical experience (years)	Less than 3	26 (15.3)
Mean±standard deviation	3–10	70 (41.2)
(9.47±6.40)	10–20	61 (35.9)
	More than 20	13 (7.6)
Experience in children's hospitals	Less than 3	52 (30.6)
(years)	3–10	66 (38.8)
Mean±standard deviation	10–20	46 (27.1)
(6.75±5.73)	More than 20	6 (3.5)
Job position	General nurse	146 (85.9)
	Nurse manager	8 (4.7)
	Charge nurse or higher	16 (9.4)
Experience with patient safety accidents	Yes	121 (71.2)
	No	49 (28.8)
Experience of receiving patient safety education	Yes	161 (94.7)
	No	9 (5.3)

Table 2: Results of analyzing patient safety culture, critical thinking, nursing work environment, and safety accident management activities for hospitalized children (n=170)

Variable	*Minimum–maximum*	*Mean±standard deviation*	*Minimum~maximum*	*Mean±standard deviation*
Patient safety culture	35–175	132.09±16.30	1–5	3.78±0.47
Critical thinking	35–175	119.78±12.33	1–5	3.42±0.35
Nursing work environment	29–116	77.46±10.18	1–4	2.67±0.35
Safety accident management activities for hospitalized children	48–240	179.68±29.40	1–5	3.74±0.61

Table 4 shows correlation between patient safety culture, critical thinking, nursing work environment, and safety accident management activities for hospitalized children. Safety accident management activities for hospitalized children were positively correlated with patient safety culture (r=0.47, P<0.001), critical thinking (r=0.35, P<0.001), and nursing work environment (r=0.51, P<0.001).

Table 3: Differences in safety accident management activities for hospitalized children based on participants' general characteristics (n=170)

Characteristic	*Categories*	*Mean±standard deviation*	*t/F (p)*	*Scheffé's test*
Age (years)	Less than 30	3.72±0.66	0.04 (0.988)	
	30–39	3.76±0.59		
	40–49	3.74±0.79		
	50 or older	3.75±0.99		
Marital status	Married	3.75±0.56	0.18 (0.860)	
	Single	3.73±0.70		
Childbirth status	With children	3.78±0.56	0.68 (0.500)	
	Without children	3.71±0.65		
Education level	College	3.79±0.59	0.29 (0.749)	
	University	3.72±0.63		
	Graduate school	3.60±0.19		
Total clinical experience (years)	Less than 3	3.88±0.61	0.69 (0.558)	
	3–10	3.68±0.63		
	10–20	3.76±0.57		
	More than 20	3.78±0.74		
Experience in children's hospitals (years)	Less than 3[a]	3.72±0.63	2.13 (0.048*)	b<d
	3–10[b]	3.65±0.63		
	10–20[c]	3.84±0.56		
	More than 20[d]	4.23±0.44		
Job position	General nurse	3.76±0.63	0.42 (0.659)	
	Nurse manager	3.68±0.52		
	Charge nurse or higher	3.62±0.53		
Experience with patient safety accidents	Yes	3.69±0.59	-1.72 (0.087)	
	No	3.87±0.64		
Experience of receiving patient safety education	Yes	3.76±0.61	1.71 (0.089)	
	No	3.41±0.58		

Note: *P<0.05, assessed using independent t-tests or analysis of variance and Scheffé's test

Table 4: Correlation between patient safety culture, critical thinking, nursing work environment, and safety accident management activities for hospitalized children (n=170)

Variable	*Patient safety culture*	*Critical thinking*	*Nursing work environment*	*Safety accident management activities for hospitalized children*
Patient safety culture	1.00			
Critical thinking	0.50 (<0.001)***	1.00		
Nursing work environment	0.57 (<0.001)***	0.31 (<0.001)***	1.00	
Safety accident management activities for hospitalized children	0.47 (<0.001)***	0.35 (<0.001)***	0.51 (<0.001)***	1.00

Note: ***P<0.001, assessed using Pearson's correlation analysis

Table 5 shows factors influencing safety accident management activities for hospitalized children. Since the Durbin–Watson statistic was 1.97 (close to 2.00), there was no autocorrelation. An exami-

nation of multicollinearity showed that the tolerance ranged from 0.55 to 0.87, exceeding 0.10. The Variance Inflation Factor ranged from 1.15 to 1.82 and was not greater than 10, indicating the absence of multicollinearity. The nursing work environment (β=0.42, *P*<0.001) was the most influential determinant of safety accident management activities for hospitalized children, followed by experience in children's hospitals (β=0.20, *P*=0.004) and patient safety culture (β=0.17, *P*=0.041). The F statistic for the goodness-of-fit of the estimated regression model was highly significant at 22.76 (*P*<0.001), with an explanatory power (adjusted R^2) of 34%.

Table 5: Factors influencing safety accident management activities for hospitalized children (n=170)

Variable	*B*	*Standard error*	*β*	*T*	*P*	*Tolerance*	*Variance Inflation Factor*
Constant	0.21	0.42		0.50	0.620		
Experience in children's hospitals	0.02	0.01	0.20	2.91	0.004**	0.87	1.15
Patient safety culture	0.23	0.11	0.17	2.05	0.041*	0.55	1.82
Critical thinking	0.17	0.13	0.10	1.32	0.188	0.72	1.38
Nursing work environment	0.73	0.14	0.42	5.22	<0.001***	0.61	1.65
R^2=0.37, Adjusted R^2=0.34, F=22.76 (*P*<0.001***)							

*P<0.05, **P<0.01, ***P<0.001, assessed using multiple regression analysis

Discussion

The mean score for safety accident management activities among children's hospital nurses was 3.74 out of 5 points. This score is higher than that reported in a study that used a similar tool and involved nurses working in small- and medium-sized hospitals (3.51 points) (18). In this study, 62.4% of the nurses had a bachelor's degree or higher educational qualifications, an average of 9.47 years of total clinical experience, and an average of 6.75 years of departmental experience. In the other study (18), 42.1% of the nurses had a bachelor's degree or higher educational qualifications, an average of 6.17 years of total clinical experience, and an average of 2.72 years of departmental experience. These differences may have contributed to the difference in the performance of safety accident management activities. Indeed, studies have shown that higher levels of education and more clinical and departmental experience are associated with higher levels of critical thinking (19). In another study (20), a similar tool, the Patient Safety Management Activity, was administered to nurses in general hospitals, and the mean score was 4.30, which is higher than that reported in this study. This result suggests that general hospitals have higher levels of safety accident management activities than children's hospitals. This could be due to the regular evaluation of medical institutions for improved quality of medical services. These evaluations may have increased awareness of the importance of patient safety and the level of safety accident management activities. Therefore, it is necessary to develop educational programs that are tailored to the characteristics of nurses and comply with medical institution evaluation certifications.

In this study, participants with more than 20 years of experience in children's hospitals exhibited higher levels of safety accident management activities than those with 3–10 years of experience (20). This result is similar to that of a study involving general hospital nurses. It found that the level of patient safety management activities is positively related to the number of years of departmental experience (4). Because nurses gained more experience of working in children's hospitals, they may have become more confident in their practice of pediatric nursing and more efficient in their work. This may have increased their safety accident management activities for hospitalized children. Therefore, to increase safety ac-

cident management activities among children's hospital nurses, it is necessary to ensure their long-term careers in children's hospitals. This can be done through work incentives, motivational programs, and flexible work systems that increase employees' satisfaction with their jobs.

In this study, safety accident management activities for hospitalized children were positively correlated with patient safety culture. This result aligns with that of studies demonstrating that safety accident management activities for hospitalized children are positively related to patient safety culture (21), and the stronger the patient safety culture perceived by general hospital nurses, the greater their safety accident management activities (8). Therefore, to increase safety accident management activities for hospitalized children, it is necessary to create a strong patient safety culture. This culture will help prevent safety accidents among children and allow them to lead a healthy life. This will, in turn, build patients' trust in clinical care and improve public health.

In this study, safety accident management activities for hospitalized children were positively correlated with critical thinking. This result is similar to that of studies showing that the better the critical thinking skills of nurses in university hospitals, the greater their patient safety management activities (10). In children's hospitals, there are children of various ages, and, unlike the case for adults, accidents can be fatal for children. Therefore, safety accident management activities are crucial, and it is necessary to strengthen nurses' critical thinking (6).

In this study, safety accident management activities for hospitalized children were positively related to the nursing work environment. This result is similar to that of a study showing that the more positive nurses' perceptions of their work environment, the greater their patient safety management activities (12). However, contrary to the findings of this study, some studies have not found a correlation between nurses' work environments and patient safety management activities (22). Therefore, more research is needed to confirm the relationship between the nursing work environment and patient safety management activities. In this study, safety accident management activities for hospitalized children were correlated with patient safety culture, critical thinking, and nursing work environment. Therefore, establishing a strong patient safety culture, increasing critical thinking skills, and improving the nursing work environment may increase the performance of safety accident management activities among nurses in children's hospitals.

In this study, the first factor that influenced safety accident management activities among children's hospital nurses was the nursing work environment. Specifically, the results showed that the more favorable nurses' perceptions of their work environment, the more their performance of safety accident management activities. Studies involving nurses in general hospitals and women's hospitals have shown that the nursing work environment influences patient safety management activities, aligning with the results of this study (12,22). The nursing work environment is an organizational factor that determines the quality of nursing services, nursing work, and nursing performance (13). Therefore, it is necessary that nurses perceive their work environment positively. The nursing work environment includes these elements: the foundation for quality nursing care; nurse managers' competence, leadership, and support for nurses; sufficient manpower and material resources; cooperation between nurses and doctors; and nurses' participation in hospital management (16). For effective safety accident management activities, individual exploration and improvement of the components of the nursing work environment are necessary. Nurse Managers should strive to improve their work capabilities, and nurses should take ownership of safety accident management activities by improving their leadership skills. Additionally, hospitals must lay the foundation for safety accident management activities by providing sufficient resources and bolstering cooperation among medical staff. Unlike nurses in general hospitals, those in children's hospitals handle heavy workloads because they have to provide nursing care based on the child's illness, growth, and development stage. They must also handle interpersonal con-

flicts, as they look after not only children but also their caregivers. This burden can be reduced by securing a sufficient number of nurses. Therefore, to increase patient safety management activities among children's hospital nurses, it is necessary to secure a sufficient number of nurses, reduce their workload, and improve their work environment. This can be done through policies and improvements that consider nurses' job satisfaction and quality of life.

The second factor affecting safety accident management activities among children's hospital nurses was the years of experience of working in children's hospitals. Similar to this result, a study involving university hospital nurses found that the more experience one has working in the current department, the more one's performance of patient safety management activities. Similarly, another study involving nurses with children's hospital experience found that nurses with more experience report fewer falls (22). As nurses in children's hospitals gain more experience, they become more aware of the importance of safety accident management activities for hospitalized children and use their knowledge and skills to provide nursing care appropriate to the needs of children and their caregivers. The performance of patient safety management activities likely increases with the provision of high-quality nursing care. To increase the performance of safety accident management activities, accident prevention education should be provided to nurses according to their clinical experience. It is also important to focus on the welfare of nurses who are experienced in childcare and foster their careers to induce long-term service.

The third factor affecting safety accident management activities among children's hospital nurses was patient safety culture. Specifically, the results showed that the stronger the patient safety culture, the greater the safety accident management activities. Similar to our results, a study involving nurses in senior general hospitals showed that patient safety culture influences safety behavior and the quality of medical care. Another study involving nurses in general hospitals showed that patient safety culture influences safety management activities (21). These findings suggest that strengthening the patient safety culture is necessary to ensure patient safety. A patient safety culture consists of these elements: leadership, teamwork, patient safety knowledge and attitude, patient safety policies and procedures, a non-punitive environment, a patient safety improvement system, and patient safety priorities (7). Among these components, the higher the level of patient safety knowledge and attitude, the higher the level of patient safety management activities (20). Therefore, nurses should strive to improve their knowledge of patient safety and have a positive attitude toward it to increase their performance of patient safety management activities. These activities require not only individual-level efforts but also organizational support.

In this study, critical thinking skills did not affect safety accident management activities among children's hospital nurses. Critical thinking significantly affects patient safety in clinical nursing practice (10). Previous studies have also confirmed that critical thinking affects patient safety competency and patient safety nursing activities (10,11,14). Although critical thinking was not an influencing factor in this study, it is worth exploring and discussing, given its importance. Critical thinking is essential for ensuring patient safety and high-quality care (11). Considering that the patients in children's hospitals cannot take care of themselves, nurses in children's hospitals must have strong critical thinking skills to ensure their safety. However, a reason why critical thinking did not determine their safety accident management activities could be the timing of data collection. Considering that a heavy workload increases job stress and job stress affects critical thinking, it is speculated that participants' critical thinking skills may have been affected when the participants were facing a heavy workload at the time of data collection (23). To confirm this, it is necessary to reexamine the relationship between the critical thinking skills of nurses in children's hospitals and their performance of safety accident management activities.

This study found that the nursing work environment, experience in children's hospitals, and patient safety culture determine the performance of safety accident management activities in children's hospitals. Therefore, it revealed that safety accident management activities can be increased by improving the nursing work environment, increasing nurses' experience in children's hospitals, and establishing a patient safety culture. However, because this study was conducted among nurses in a local area in Republic of Korea, the generalizability of its results may be limited. Future research should develop programs that create a positive nursing work environment, encourage long-term retention of nurses in children's hospitals, and establish a patient safety culture.

Conclusion

The nursing work environment, nurses' experience in children's hospitals, and patient safety culture influence the safety accident management activities of nurses in children's hospitals. Therefore, it is necessary to improve nurses' work environment and establish a patient safety culture to increase nurses' performance of safety accident management activities.

Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of Interest

The author declares no conflicts of interest.

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