

# Predictors of Nursing Performance for Patient Safety among Nurses in Regional Hospitals: A Cross-sectional Study

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**Abstract:** Nursing performance for patient safety is crucial for improving patient safety outcomes and quality of care. This cross-sectional study aimed to explore nursing performance for patient safety and identify the predictability of patient safety knowledge, patient safety attitude, nurse practice environment, patient-to-nurse ratio, and nursing hours per patient day on nursing performance for patient safety. The participants included 234 nurses randomly selected from six regional hospitals across Thailand. The research instruments included a demographic data form, the Practice Environment Scale of the Nursing Work Index, the Patient Safety Principles and Knowledge Questionnaire, the Safety Attitudes Questionnaire, and the Nursing Performance for Patient Safety Scale, which yielded scale-level content validity indices ranging from .85 to .88. The Cronbach's alpha coefficients ranged from .81 to .98. Descriptive statistics and stepwise multiple regression were utilized for the data analysis.

The results revealed that the nurses perceived overall nursing performance for patient safety at a high level. Patient-to-nurse ratio was the strongest predictor of nursing performance for patient safety, followed by patient safety knowledge, patient safety attitude, nurse practice environment, and nursing hours per patient day. All predictors could predict nursing performance for patient safety, accounting for 56.00% of the variance. Nurse administrators and policymakers can use the results of this study to develop strategies for improving nursing performance for patient safety. We recommend longitudinal studies using different samples of Thailand nurses in diverse settings to confirm results across the country.

**Keywords:** Nursing hours per patient day, Nursing performance, Nurse practice environment, Nursing workload, Patient safety, Patient safety attitude, Patient safety knowledge, Patient-to-nurse ratio

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## Introduction

Patient safety performance in nursing, also known as safety practice, is a critical process enhancing patient safety outcomes and healthcare quality. Nurses are key healthcare professionals who ensure patient safety while providing direct patient care.<sup>1</sup> Task performance involves essential behaviors related to nursing care, whereas contextual performance

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encompasses behaviors influencing the hospital's organizational setting.<sup>2</sup> Healthcare organizations demand

high performance from nurses to attain patient safety goals. Therefore, assessing nurses' behaviors on patient safety is crucial.<sup>3</sup> Although patient safety issues have been a global public health concern for more than two decades, incidents reported regarding unsafe care are one of the leading causes of millions of patients' morbidities and mortalities worldwide each year. Numerous patient safety incidents and clinical risks in healthcare emerge from malpractices or unsafe performance by healthcare professionals.<sup>4</sup>

Unsafe performance or care practices, risks, and errors in the performance of care processes cause patients harm, create a high-cost burden, and demonstrate low quality of care in healthcare organizations.<sup>5</sup> In Thailand, data from the National Reporting and Learning System (NRLS) reveal a steady rise in the recorded occurrences of patient safety issues. The reported cases have increased from 114,669 in 2018 to 733,689 in 2021, indicating an annual growth rate of 5.40%.<sup>3</sup> Most incident reports were based on patient safety goals or common clinical risk incidents. The average cost of the adverse events was 5470.46 USD (200,000 Thai baht) per case.<sup>3</sup> Several patients have been harmed by severe clinical risk incidents during the care process each year.<sup>3</sup> Generally, most sentinel patient safety incidents occur in large hospitals and tertiary hospitals, primarily regional hospitals, where there are rising numbers of patients with complex illnesses, heavy workloads, and limited human resources, which has led to the emergence of error in the performance of healthcare providers, especially nurses.<sup>3</sup> Hence, regional hospitals must prioritize improving patient safety performance among nurses to improve patient safety outcomes and the overall quality of nursing care.

## **Literature Review and Conceptual Framework**

Healthcare providers, especially nurses, require specific expertise in safety performance to fulfill an

essential role in delivering safe care and maintaining and enhancing patient safety.<sup>6</sup> Developing patient safety performance can elevate work quality and improve patient safety outcomes. Improving nursing performance for patient safety (NPPS) is a crucial, challenging goal for healthcare organizations, particularly regional hospitals striving to achieve patient safety goals.<sup>7</sup>

The performance of nurses was developed from their tasks, and contextual performance.<sup>2</sup> Nursing task performance refers to nurses' behavioral contributions to an organization's technical core, encompassing essential duties integral to their roles and providing specialized care, information, support, and coordinating patient care. Nursing contextual performance refers to nurses' behaviors to operate technical core effectively and use more discretion to help hospital's function. These behaviors comprise job-task support, interpersonal support, volunteering for additional duties, and compliance.<sup>2</sup> In this study, NPPS adopted the concept of task and contextual performance for nurses and patient safety concepts.<sup>8</sup> These refer to nurses' behaviors that achieve patient safety goals.<sup>8</sup> It is the responsibility of all nurses to perform in a manner that helps attain these goals and ensures patient safety.<sup>8</sup> NPPS consists of two dimensions: nursing task performance for patient safety is nurses' behaviors related to protection, prevention, mitigation, and promotion of patient safety, and nursing contextual performance for patient safety are nurses' collaborative behaviors with healthcare providers in patient care and dedication to patient safety.<sup>8</sup> Nurses who demonstrate high patient safety performance can prevent and reduce patient harm, ultimately enhancing patient safety outcomes and nursing care quality.<sup>8</sup> Enhancing NPPS is essential across healthcare organizations, primarily regional hospitals striving for continuous quality improvement (CQI) to become leading excellence centers for the delivery of high-quality care and advance hospital accreditation.<sup>3</sup>

Effective enhancement of NPPS requires consideration of various influencing factors. Social

Cognitive Theory (SCT), developed by Bandura, demonstrated that individuals acquire and maintain knowledge and beliefs within their social environment, integrating past experiences to change behavioral outcomes.<sup>9</sup> SCT's core lies in the dynamic interplay among individual or personal factors (e.g., knowledge and attitudes), social contexts or environmental factors (e.g., social norms and environmental influences on others), and responses to stimuli to achieve goals or behavioral factors (e.g., skills, practice, and self-efficacy).<sup>9</sup> SCT was used in the theory framework in nursing patient safety practice through educating programs about hand hygiene knowledge and attitudes among nursing students.<sup>10</sup> The findings demonstrated that the intervention could bolster nursing students' confidence and skills, often leading to heightened self-efficacy, which refers to personal factors affecting the patient safety practices of nurses.<sup>11</sup> Thus, SCT was adopted in this conceptual framework in this study.

Underpinning the SCT, personal factors are represented by patient safety knowledge<sup>12</sup> and patient safety attitude,<sup>13</sup> which are the individual characteristics and experiences impacting behavioral maintenance.<sup>9</sup> Environmental factors are represented by the nurse practice environment representing social contexts in the workplace,<sup>9,14</sup> and the nursing workload,<sup>15,16</sup> which influences nurses' performance. A behavioral factor was quantified of NPPS—nurses' behaviors aimed at achieving patient safety goals.<sup>8,9</sup>

Concerning personal factors affecting NPPS, patient safety knowledge refers to understanding the principle of information regarding prevention and avoiding harm to patients in the hospital.<sup>17</sup> It is related to NPPS because nurses with a strong understanding of patient safety principles can apply and recognize situations that might lead to harm and analyze patient safety knowledge in nursing performance to implement strategies to prevent and avoid patient harm and mitigate risks in the care process.<sup>17</sup> Empirical research found that patient safety knowledge is associated with staff nurses' safety performance in South Korea's general

hospitals,<sup>12</sup> and a study in China showed knowledge could predict nursing practice.<sup>18</sup>

Another personal factor is patient safety attitude, which is the thinking, feeling, and beliefs toward patient safety culture, including teamwork climate, safety climate, job satisfaction, perceptions of management, working conditions, and stress recognition in the hospitals.<sup>19</sup> Nurses with a positive patient safety attitude are more likely to recognize their behavior and roles to ensure the safe delivery of care to patients. They prioritize following established protocols, guidelines, and best practices to prevent errors and adverse events, improving NPPS and enhancing patient safety outcomes and nursing care quality in hospitals.<sup>19,20</sup> A study in Ethiopia indicated that nurses who had a positive attitude toward patient safety tended to perform well in ensuring patient safety.<sup>13</sup> Several research studies in various countries demonstrated that nurses with high patient safety knowledge<sup>12,13,18</sup> and a positive patient safety attitude<sup>13,18</sup> leads to improving NPPS and enhancing quality care.

Regarding environmental factors influencing NPPS, the nursing practice environment refers to an organization's workplace characteristics that can either support or inhibit the professional nursing practice.<sup>21</sup> A prior study demonstrated that a suitable nursing environment could enhance nursing practice for patient safety in inpatient wards of different public and private hospitals in Jordan.<sup>22</sup> Nursing workload is an essential factor affecting NPPS. According to the Thailand Nursing and Midwifery Council policy, nursing working hours for patient safety should not exceed 48 hours per week.<sup>23</sup> High nursing workloads negatively affected the patient safety performance of nurses and quality care.<sup>24</sup> Nursing workloads can be determined by the patient-to-nurse ratio and nursing hours per patient day (NHPPD). Based upon the literature review in other countries, good environment practice for nurses,<sup>14,22</sup> suitable patient-to-nurse ratio,<sup>15,24</sup> and appropriate NHPPD<sup>16,24</sup> can improve nurses' performance to ensure patients' safety and provide high-quality care.

Prior empirical evidence revealed various factors associated with NPPS in different settings and countries. The associations were inconsistent among organizations and countries. Furthermore, the investigation of five predictors affecting NPPS based on SCT in Thai regional hospitals has not been examined. Therefore, this study aimed to identify the predictors of NPPS among nurses in Thai regional hospitals. The results of this study supply a better understanding of the phenomenon of NPPS and will expand the knowledge of predicting factors of NPPS among nurses in Thai regional hospitals.

## Study Aims

This study aimed to examine the nursing performance for patient safety and to determine the predictability of personal factors (patient safety knowledge, patient safety attitude) and environment factors (nurse practice environment, patient-to-nurse ratio, and nursing hours per patient day) on nursing performance for patient safety among nurses in regional hospitals.

## Methods

**Study design:** The study used a descriptive, cross-sectional approach. This report followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines to enhance the reporting quality of the study report.<sup>25</sup>

**Sample and Setting:** The study's sample size was considered based on the rule of thumb with 40 participants per predictor variable ratio.<sup>26</sup> There were five predictors and an added 20% for potential attrition. As a result, the anticipated sample size was 240 registered nurses (RNs), randomly selected from RNs working for at least one year in different wards across six regional hospitals in Thailand. The selection process would involve a cluster random sampling approach. First, six regional hospitals were selected by simple random

sampling from five regions of Thailand. Then, a proportional stratified sampling method was employed to recruit RNs from four wards: general surgical, general medical, orthopedic, and gynecology wards. Lastly, systemic sampling was used to select RNs from the name list of RNs in each ward. Finally, the RNs were recruited at 44, 32, 30, 36, 52, and 46 in six target hospitals, respectively, with a total of 240.

**Ethical Considerations:** This research study received approval from the Research Ethics Committee (EC) at the Faculty of Nursing, Chiang Mai University in Thailand (Approval No: 114/2020–2022) and the EC of six hospitals. Additionally, we secured permission from six hospitals to collect data. Potential participants were given informed permission and research questionnaires, elucidating the study's purpose and details. Participants received assurances regarding the privacy of their information and the unequivocal right to refuse participation or leave this study at any moment to avoid consequences. Anonymity and confidentiality were guaranteed throughout the study.

**Instruments:** Five instruments were used for data collection in this study. The original authors and translators granted permission to use the research instruments.

*The demographic form* was developed by the primary investigator (PI) to obtain the participants' age, gender, marital status, education level, years of nursing experience, years working in the current ward, number of patients under their responsibility, and nursing workload on the previous day.

*The Practice Environment Scale of the Nursing Work Index (PES-NWI)* was developed by Lake based on the literature review of the nursing practice environment and patient outcomes concept.<sup>21</sup> The Thai version of PES-NWI, translated by Nantsupawat et al.,<sup>27</sup> was used in this study with permission from the Graduate School of Chiang Mai University. It comprises 31 items in five dimensions, including nurse participation in hospital affairs (9 items), nursing foundations for quality of care (10 items), nurse manager ability,

leadership, and support for nurses (5 items), staffing and resource adequacy (4 items), and collegial nurse-physician relations (3 items). Participants utilized a 4-point Likert scale, ranging from 1 (strongly disagree) to 4 (strongly agree). This scale has a possible score ranging from 1 to 4, where a higher score indicates a greater environment for nurse practice.<sup>21</sup>

The total score of PES-NWI was computed as the mean of the five subscales (dimensions) scores. The score interpretation ranges into three categories: favorable nurse practice environments (mean scores higher than 2.5 on four or five subscales), mixed nurse practice environments (mean scores higher than 2.5 on two or three subscales), and unfavorable nurse practice environments (mean scores higher than 2.5 on zero or one subscale).<sup>21</sup> The confirmatory factor analysis showed good construct validity. Five dimensions with 31 items could explain 48.00 % of the total variance and are loaded onto one factor, with an eigenvalue of 2.39.<sup>21</sup> The PES-NWI exhibited strong reliability within its subscales, ranging from .85 to .91.<sup>21</sup> In a previous study, the reliability of Thai PES-NWI in subscales was .85 to .91.<sup>27</sup> In this study, the PES-NWI displayed robust internal consistency reliability, with Cronbach's alpha coefficient of .91 for the pilot study and .93 for the main study.

*The Patient Safety Principles and Knowledge Questionnaire* was developed by Robson et al. based on the patient safety concept by the WHO patient safety curriculum guide for medical schools.<sup>17</sup> It consists of two dimensions (8 items), including 1) knowledge about the principles of patient safety (4 items) and 2) knowledge about patient safety in the hospital (4 items). Items are rated on an indicated level of agreement with a 7-point Likert-type scale (ranging from 1 indicating a very low level of agreement to 7 or ranging from 1 indicating a very strong level of agreement). The negatively worded question is reverse-coded. The mean score was interpreted as a mean score less than 4, indicating a low knowledge level, 4 to 5, indicating a moderate knowledge level, and greater than 5,

indicating a high knowledge level.<sup>28</sup> The higher score indicated a higher level of patient safety knowledge. In the previous study, the overall scale's content validity index (CVI) was .88,<sup>17</sup> and the overall scale demonstrated a reliability coefficient of .81.<sup>28</sup> In this study, this questionnaire was back-translated from the original English version into the Thai version using Brislin's back-translation approach,<sup>29</sup> and the displayed scale-level CVI (S-CVI) was .85. The reliability demonstrated was that the overall Cronbach's alpha coefficient was .84 in the pilot study and .87 in the main study.

*The Safety Attitudes Questionnaire (SAQ)* was developed by Sexton et al. based on the safety culture concept.<sup>19</sup> Sexton et al. selected the items of this scale based on Vincent's risk and safety framework and Donabedian's quality model.<sup>19</sup> The SAQ consists of 30 items in six dimensions, including teamwork climate (6 items), safety climate (7 items), job satisfaction (5 items), perception of management (4 items), stress recognition (4 items), and working conditions (4 items). It was rated on a 5-point Likert scale (1 indicating disagree strongly, 2 indicating disagree slightly, 3 indicating neutral, 4 indicating agree slightly, and 5 indicating agree strongly). The negatively worded question is reverse-coded. The mean scores ranged from 1 to 5, categorizing scores into three levels based on the interval of the mean score: low level (1 – 2.33), moderate level (2.34 – 3.66), and high level (3.67 – 5.00) of patient safety attitudes. The higher score indicated a higher positive patient safety attitude.<sup>19</sup> In Sexton et al.'s study, the confirmatory factor analysis of the SAQ was applied to indicate good construct validity with 30 items, and the reliability was .90.<sup>19</sup> In this study, the SAQ was back-translated from the original English version into the Thai version using Brislin's back-translation approach.<sup>29</sup> The content validity of this scale demonstrated the S-CVI of .86. The overall Cronbach's alpha coefficient was .90 in the pilot study and .92 in the main study.

*The Nursing Performance for Patient Safety Scale (NPPSS)* was developed by Panthulawan et al.<sup>8</sup>

based on a patient safety concept, task performance, and contextual performance concept, following DeVellis's guidelines.<sup>8</sup> It comprises 64 items in nine domains: 1) protection through communication (5 items); 2) protection through risk management (11 items); 3) prevention through the right drug and solution administration (4 items); 4) prevention through the implementation of practice guidelines (5 items); 5) prevention of emergency adverse events through critical care (5 items); 6) prevention through effective patient care process (5 items); 7) mitigation (10 items); and 8) promotion through team and responsibility (12 items); 9) dedication to patient safety (7 items). All the items are positively worded questions and are evaluated using a 6-point Likert-type scale from 0 (indicating never done) to 5 (indicating always done). The possible scores, ranging from 0 to 5, were categorized into three levels based on the interval of the mean score: low (0–1.66), moderate (1.67–3.33), and high (3.34–5.00) level of NPPS by the researchers. The possible score of the scale ranges from 0 to 5. The higher mean scores reflect the higher NPPS.<sup>8</sup> Panthulawan et al.'s confirmatory factor analysis indicated good construct validity and explained 63.54% of the variance.<sup>8</sup> Factor loading ranged from .34 to .90. The reliability coefficient of the NPPSS was .91.<sup>8</sup> In this study, the reliability of the NPPSS demonstrated the overall Cronbach's alpha coefficient of .98 in the pilot study and .98 in the main study.

**Data Collection:** Data were gathered from December 2020 to June 2021. The primary researcher (PI) made an appointment with the nursing directors of six regional hospitals to explain the research aim, research process, and benefits of this study. After getting permission for data collection, the vice directors for research in each regional hospital were invited to be the research coordinators. Before engaging with the six coordinators, the PI explained the data-gathering process. The PI provided 240 packages comprising a cover letter, a consent form, questionnaires, and the returning envelope. The researcher coordinator delivered the questionnaires to all participants. Participants were requested to complete questionnaires and return the questionnaire packages to

the assigned box at each regional hospital. The research coordinators were responsible for gathering and delivering the questionnaires to the PI. Subsequently, 234 completed questionnaires (97.50%) were returned and used for data analysis.

**Data Analysis:** Data were analyzed using the SPSS 22.0 program (licensed to the Faculty of Nursing, Chiang Mai University) with a significance level of alpha of .05. Descriptive statistics were utilized to analyze the participant's demographic data. The relationship between predictive variables and NPPS was based on Pearson's correlation coefficient. The data of this study met all of the multivariate assumptions, including normality (value of skewness – .04 to .13) and kurtosis (– .17 to – .73) of all variables less than  $\pm 1.5$ ,<sup>30</sup> linearity (ANOVA test had significant linear relationships ( $p < .001$ )),<sup>30</sup> homoscedasticity (the residual scatter plot demonstrated that the spread was equivalent across the zero axis within  $\pm 3$  standard deviations),<sup>30</sup> and multicollinearity (the tolerance value .47 to .84), which was higher than .20 and the VIF value (1.20 – 2.14, which was less than 10).<sup>30</sup> There is no missing data for analysis. Stepwise multiple regression was used to investigate the predictors of NPPS among nurses in regional hospitals. Correlation coefficient values ( $r$ ) were used to characterize associations with a value less than .30 for low, .30 – .50 for moderate, and equal to or greater than .50 for high.

## Results

The demographics of the participants are displayed in **Table 1**. Most participants were female; 59.83% were between 24 and 34 years old; 58.55% were single; 38.46% were married; and 91.88% obtained a bachelor's degree in nursing upon graduation. Approximately 50% had 1 to 5 years of experience working as professional nurses in their current ward. Most participants worked in the general medical ward (37.61%). **Table 2** presents that the nurses perceived a high level of NPPS (mean score of  $4.12 \pm .47$ ).

For the personal factors, they perceived a high level of patient safety knowledge (mean score of  $5.18 \pm .83$ ) and a positive level of patient safety attitude (mean score of  $3.73 \pm .43$ ). Regarding environmental factors, nurse practice environment was perceived a favorable level (mean score of  $3.20 \pm .33$ ), patient-to-nurse ratio exceeded the standard (mean score of  $8.00 \pm .88$ ). At the same time, NHPPD was accepted (mean score of  $5.32 \pm .05$ ). **Table 3** describes the correlation matrix between the study variables and NPPS, demonstrating that personal factors (patient safety knowledge and

patient safety attitude) and environmental factors (nurse practice environment) had a moderate and statistically positive association with NPPS. Conversely, the patient-to-nurse ratio and NHPPD had a moderate and significant negative association with NPPS. **Table 4** displays the stepwise multiple regression to determine the prediction of NPPS. Patient-to-nurse ratio was the strongest predictor, followed by patient safety knowledge, patient safety attitude, nurse practice environment, and nursing hours per patient day. Five variables could explain 56% of the variance in NPPS among nurses in regional hospitals.

**Table 1.** Characteristics of the participants (n = 234)

Demographic characteristics	Frequency (n)	Percentage (%)
Gender		
Male	7	2.99
Female	227	97.01
Age (year) (range = 24–59, mean = 34.94, SD = 8.89)		
24–34	140	59.83
35–44	47	20.08
45–54	43	18.38
≥ 55	4	1.71
Marital status		
Single	137	58.55
Married	90	38.46
Divorced / Widowed/ Separated	7	2.99
Education level		
Bachelor's degree	215	91.88
Master's degree	19	8.12
Years of nursing experience (range = 1–40, mean = 11.61, SD = 9.36)		
1–5	95	40.60
6–10	43	18.38
11–15	19	8.12
≥16	77	32.90
Years of working in present ward (range = 1–33, mean = 8.69, SD = 7.45)		
1–5	117	50.00
6–10	50	21.37
11–15	25	10.68
≥16	42	17.95
Type of work unit		
General medical ward	88	37.61
General surgical ward	87	37.18
Orthopedic ward	38	16.24
Gynecological ward	21	8.97

**Table 2.** Description of study variables (n = 234)

Variables	Possible range	Actual range	M	SD	Level
Patient safety knowledge	1-7	3.25-6.63	5.18	.83	High
Patient safety attitude	1-5	2.73-4.60	3.73	.43	Positive
Nurse practice environment	1-4	2.42-3.94	3.20	.33	Favorable
Patient-to-nurse ratio	1-100	6.00-10.00	8.00	.88	High
Nursing hours per patient day	1-100	3.53-8.02	5.32	.05	Accepted
Nursing performance for patient safety	0-5	2.91-4.83	4.12	.47	High

Note. M = mean; SD = standard deviation

**Table 3.** Correlation matrix of the study variables (n = 234)

Variables	1	2	3	4	5	6
1. Patient safety knowledge	1					
2. Patient safety attitude	.68***	1				
3. Nurse practice environment	.53***	.52***	1			
4. Patient-to-nurse ratio	-.24***	-.24***	-.34***	1		
5. Nursing hours per patient day	-.32***	-.30***	-.42***	.34***	1	
6. Nursing performance for patient safety	.56***	.54***	.53***	-.57***	-.47***	1

\*p < .05, \*\*p < .01, \*\*\*p < .001

**Table 4.** Stepwise multiple regression analysis for variables predicting nursing performance for patient safety (n = 234)

Model	b	SEB	$\beta$	R <sup>2</sup>	R <sup>2</sup> Change	SEE	F Change
Patient safety knowledge	.11	.04	.20**	.56	.55	.81	57.93
Patient safety attitude	.20	.07	.19**				
Nurse practice environment	.25	.08	.18***				
Patient-to-nurse ratio	-.17	.03	-.32**				
Nursing hours per patient day	-.08	.02	-.17**				

Note. SEE = standard error of estimate

\*p < .05, \*\*p < .01, \*\*\*p < .001

## Discussion

The findings revealed that the nurses in regional hospitals perceived overall NPPS at a high level. A possible explanation for this high NPPS may be that nurses intend to engage in task performance—behavior that plays a crucial role in essential duties—and contextual performance, which involves behaviors ensuring the effective operation of the technical core,

utilizing more discretion to help hospitals function.<sup>2</sup> All nurses are responsible for performing in a manner that accomplishes patient safety goals.<sup>8</sup> Moreover, the nurses in regional hospitals play a pivotal role in the CQI process (involving patient safety goals, risk management, reporting, and monitoring patient safety incidents) and regular discussions concerning patient safety issues, aiming to increase patient safety and quality of nursing care performance.<sup>31</sup> Hence, this

process has led to nurses performing behaviors regarding protection, prevention, mitigation, promotion, and dedication to patient safety to achieve patient safety goals.<sup>8</sup> This finding was consistent with previous studies, which found practice according to patient safety goals at an excellent level among registered nurses in a military hospital and perceived nursing skills based on patient safety at an excellent level in a hospital.<sup>32</sup>

Regarding the factors predicting NPPS, our findings confirmed the SCT that the person who acquires and maintains knowledge and attitudes within their social environment might integrate past experiences to change their behaviors or practices to achieve goals.<sup>9</sup> The findings of this study indicated that the personal factors (patient safety knowledge and patient safety attitude) and environmental factors (nurse practice environment, patient-to-nurse ratio, and nursing hours per patient day) significantly predicted NPPS. Among them, the strongest predictor was the patient-to-nurse ratio, which had a negative effect on NPPS. This finding is consistent with a study which indicated the number of patients per nurse as an essential aspect affecting nurses' safety performance for patients in the hospital.<sup>33</sup> Concerning another nursing workload, nursing hours per patient day (NHPPD) also affected NPPS. This result is congruous with a previous study that identified NHPPD as a crucial determinant influencing the nurses' performance in ensuring patient safety.<sup>34</sup>

However, NHPPD was the least potent predictor affecting NPPS. It may be that NHPPD was calculated from the number of productive hours needed based on patient acuity in the patient classification system from all nursing staff to provide care per day for each patient on a given unit.<sup>35</sup> It is different from the patient-to-nurse ratio, which is the number of patients who receive care from one registered nurse. Additionally, NHPPD in this study was an accepted level from the standard that indicated NHPPD no more than 6 hours for the general inpatient ward.<sup>35</sup> A possible explanation

is that when nurses have a high workload, it means they have more responsibility and spend more time with patients. In general situations, it may be difficult for nurses to assign their attention and more efficient energy performance for patient safety because they must engage in greater activation and/or effort, ultimately negatively impacting NPPS.<sup>33</sup> When nursing workloads are suitable, nurses have more time and ability to protect, prevent, promote, and dedicate themselves to enhancing nursing performance to ensure patient safety.<sup>34</sup> In addition, this result found that an average patient-to-nurse ratio with a mean score of 8:1 was higher than the standard ratio of 4:1 in medical units, 5:1 in surgical and orthopedic units, and 6:1 in gynecological units.<sup>35</sup> The COVID-19 outbreak situation in Thailand might be a reason for the high nursing workload, especially the patient-to-nurse ratio in regional hospitals. Consequently, one nurse with many patients and nurses with high NHPPD might directly decrease their attention time to improve NPPS in this study. Therefore, well-balanced nursing workloads could enhance nurses' safety performance due to their ability to learn, practice, and concentrate on ensuring patient safety.<sup>33,34</sup>

Concerning the personal factors, patient safety knowledge was another significant predictor of NPPS. This finding is comparable to prior relevant evidence that patient safety knowledge had a significant positive effect on the prediction of the patient safety performance of nurses.<sup>36,37</sup> A possible explanation for this might be that nurses with high patient safety knowledge may recognize the protection and prevention of harm to patients and use this knowledge to support their engagement in safety performance for patients.<sup>36</sup> Our findings show that the nurses had patient safety knowledge at a higher level. It indicates that patient safety knowledge—including the understanding of principles regarding prevention and avoiding harm to patients in the hospital—may make more effort for nurses to improve their patient safety behaviors.<sup>36,37</sup> Thus, in this study, nurses' high patient safety knowledge

might have enhanced their performance regarding patient safety for achieving patient safety goals in hospitals.

Patient safety attitude was also a predictor of NPPS. This result supports previous findings that a positive patient safety attitude influences NPPS.<sup>38,39</sup> A possible explanation for this relationship might be that nurses with positive patient safety attitudes regarding their work's safety culture show better patient safety performance and tend to be more vigilant and attentive to details when providing nursing care. They are more likely to identify potential risks or errors and avoid harming patients.<sup>20</sup> These lead them to prevent, protect, promote, and mitigate patient safety. When nurses have a positive patient safety attitude, they will have the potential to influence their responsibility in improving their safety performance for patient safety to achieve patient safety goals effectively.<sup>37,39</sup> Hence, this finding demonstrates that nurses' patient safety attitudes positively and significantly affect NPPS.

Regarding environmental factors, the nurse practice environment positively predicted NPPS. This finding is congruent with a previous study, which found that professional nurses exhibit improved NPPS when working in a favorable nursing environment.<sup>40</sup> The probable explanation is that generally, nurses perform better patient safety behaviors more effectively when they perceive their hospital's nursing work environment as good.<sup>40</sup> When nurses perceived sufficient human and material resources, improved collaboration between nurses and doctors, support for nurses from the managing staff, opportunities for involvement in hospital management, and assistance in maintaining high nursing care quality standards, these factors have the potential to enhance nursing efficiency in ensuring patient safety.<sup>8,21</sup> Thereby, the excellent work environment of nursing might enhance the ability of these nurses to perform the prevention, promotion, and prevention of patient safety behavior for achieving patient safety goals in hospitals in this study.

## **Limitations**

The cross-sectional nature of this study limits the possibility that nurses' perceptions of NPPS may change over time; the effect of included factors in this study must be verified periodically. Data collected from various wards in regional hospitals may limit the generalizability to other healthcare settings.

## **Recommendations for further study**

As this study is a cross-sectional design, further study is needed. Firstly, longitudinal studies are recommended to confirm these findings over a more extended period as factors related to nursing performance for patient safety are changing over time. Therefore, the effect of factors included in this study must be verified periodically. Secondly, further experimental research can be developed to test the impact of different patient-to-nurse ratios on nurses' performance for patient safety. Thirdly, it is recommended that this study be replicated across diverse settings, encompassing university hospitals, community hospitals, general hospitals, or private hospitals.

## **Conclusions and Implications for Nursing Management**

This study's findings confirmed the SCT that personal factors (patient safety knowledge, patient safety attitude) and environmental factors —nursing workload (patient-to-nurse ratio and nursing hours per patient day) and nurse practice environment significantly affected NPPS among nurses in Thai regional hospitals. Our findings revealed that the patient-to-nurse ratio was the strongest predictor, emphasizing the importance of a reduced nursing workload for better NPPS. To achieve this, nurse administrators and hospital managers should monitor and manage the nursing staff ratio, job design, or job rotation to align with patient requirements based on the standard. Moreover, fostering nurses'

patient safety knowledge via educational workshops and cultivating a positive patient safety attitude is vital for improving NPPS. In summary, a good nurse practice environment is essential to enhance nurse's performance, ultimately ensuring patient safety and quality care.

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## ปัจจัยทำนายการปฏิบัติการพยาบาลเพื่อความปลอดภัยของผู้ป่วยของพยาบาลในโรงพยาบาลศูนย์: การวิจัยแบบภาคตัดบาง

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**บทคัดย่อ:** การปฏิบัติการพยาบาลเพื่อความปลอดภัยของผู้ป่วยเป็นปัจจัยสำคัญสำหรับการปรับปรุงผลลัพธ์และคุณภาพการดูแล การวิจัยแบบภาคตัดบางของนี้มีวัตถุประสงค์เพื่อศึกษาปัจจัยทำนายการปฏิบัติการพยาบาลเพื่อความปลอดภัยของผู้ป่วย กลุ่มตัวอย่าง คือ พยาบาลจำนวน 234 คน ที่ปฏิบัติงานในโรงพยาบาลศูนย์ 6 แห่งทั่วประเทศไทย เครื่องมือที่ใช้ในการวิจัย ได้แก่ แบบบันทึกข้อมูลส่วนบุคคล แบบสอบถามสภาพแวดล้อมในการปฏิบัติการพยาบาล แบบสอบถามหลักการและความรู้เกี่ยวกับความปลอดภัยของผู้ป่วย แบบสอบถามทัศนคติด้านความปลอดภัย และแบบสอบถามการปฏิบัติการพยาบาลเพื่อความปลอดภัยของผู้ป่วย ที่ผ่านการตรวจสอบคุณภาพมีค่าความตรงเชิงเนื้อหาอยู่ระหว่าง .85 ถึง .88 และค่าลัมป์ระสิทธิ์อัลฟาร์ของ cronbach อยู่ระหว่าง .81 ถึง .98 วิเคราะห์ข้อมูลโดยใช้สถิติบรรยายและการถดถอยพหุคุณแบบขั้นตอน

ผลการวิจัยพบว่า พยาบาลรับรู้การปฏิบัติการพยาบาลเพื่อความปลอดภัยของผู้ป่วยโดยรวมอยู่ในระดับมาก สัดส่วนของจำนวนผู้ป่วยต่อพยาบาลวิชาชีพเป็นปัจจัยที่มีอำนาจทำนายการปฏิบัติการพยาบาลเพื่อความปลอดภัยของผู้ป่วยมากที่สุด รองลงมา คือ ความรู้ด้านความปลอดภัยของผู้ป่วย ทัศนคติ ด้านความปลอดภัยของผู้ป่วย สภาพแวดล้อมการปฏิบัติงานของพยาบาล และชั่วโมงการพยาบาลต่อวันของผู้ป่วย ปัจจัยทั้งหมดทำนายความแปรปรวนของการปฏิบัติการพยาบาลเพื่อความปลอดภัยของผู้ป่วย ได้ร้อยละ 56.00 จากการศึกษานี้ ผู้บริหารการพยาบาลและผู้กำหนดนโยบายสุขภาพสามารถใช้ผลการศึกษาครั้งนี้ไปกำหนดกลยุทธ์สำหรับการปรับปรุงการปฏิบัติการพยาบาลเพื่อความปลอดภัยของผู้ป่วย

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**คำสำคัญ:** ชั่วโมงพยาบาลต่อวันของผู้ป่วย การปฏิบัติการพยาบาล สภาพแวดล้อมในการปฏิบัติงานของพยาบาล ภาระงานพยาบาล ความปลอดภัยของผู้ป่วย ทัศนคติ ด้านความปลอดภัยของผู้ป่วย ความรู้ด้านความปลอดภัยของผู้ป่วย สัดส่วนผู้ป่วยต่อพยาบาลวิชาชีพ

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