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An Analysis of Head Nurses' Nursing Informatics Competencies and Nurse' Attitudes Towards Patient Safety in Hospitals

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ABSTRACT

Introduction: *Improving patient safety attitudes will provide quality care and a safe environment and practice for patients. The attitude of nurses towards patient safety in hospitals still requires improvement and improvement efforts. The assessment of nurses' attitudes towards patient safety can be used as a reference for preparing programs to maintain the quality and patient safety in hospitals.* ***Objectives:*** *This study aimed to determine the relationship between head nurses' nursing informatics competencies and nurses' characteristics and attitudes towards patient safety.* ***Methods:*** *A cross-sectional study involving 251 nurses at a hospital in Jakarta was conducted. The Nursing Informatics Competency Assessment Tool and the Safety Attitudes Questionnaire with demographic information were used for data collection.* ***Results:*** *Overall, nurses' attitudes towards patient safety showed a median value of 141 (80.18% of the maximum value), and the mean value of head nurses' nursing informatics competency was 99.53 (66.35% of the maximum score). This study showed a significant relationship between head nurses' nursing informatics competencies and nurses' attitudes towards patient safety. Nursing informatics competencies, computer literacy, informatics literacy, and informatics management skill significantly influenced patient safety attitudes ($p<0.05$).* ***Conclusion:*** *Nursing informatics competence is the basis for nurses to respond to the development of health management information systems and technology in modern health care environments. Nursing informatics competence of the head nurses' encourages the success of the head nurses' following the rapid development of information, it will have.*

Keywords: *Nursing Management; Nursing Informatics; Nurses, Head Nurses; Patient Safety; Safety Attitude*

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INTRODUCTION

Nurses' attitude toward patient safety is a way of thinking and commitment to the application of nursing services aimed at patient safety. Safety attitudes are nurses' beliefs and feelings about their commitment and responsibility to patient safety issues (1). The attitude toward patient safety by nurses is essential in providing safe care. This is because the attitude of safety by nurses will affect the actions of nurses in implementing patient safety (2). Attitude is a concept that includes individual beliefs and behaviors that can influence decisions and enable them to shape behavior (3). Safety attitudes among nursing professionals are considered important because patient safety is closely related to the attitude of health care providers in maintaining a safe patient environment and practice in

hospitals (4). Improving patient safety attitudes will provide quality care and a safe environment and practice for patients.

Failure to develop patient safety attitudes in hospitals may affect things related to patient safety. Nurses' negative attitudes towards patient safety can impact the quality of care and safety behavior to patients (5). To reduce the number of patient safety incidents in hospitals, it is required to have patient safety attitudes from nursing professionals (4). Moreover, patient safety incidents may reduce patient satisfaction with nursing services (6). Therefore, nurses' attitudes regarding patient safety still become a serious problem.

The attitude of nurses towards patient safety in hospitals still requires improvement and improvement efforts. Research conducted on 424 nurses in four Gaza-Palestinian hospitals, stated that only 41.9% of nurses had a positive attitude towards patient safety (5). Research in Iran also resulted that only 52.2% of nurses had positive patient safety attitudes (7). The results of other studies also state that the attitude toward patient safety by nurses to date still requires improvement in care services (8;9;10). There is a need for continuous efforts by hospitals in improving patient safety attitudes by nurses.

The assessment of attitudes towards patient safety is a reliable measure to evaluate patient safety programs in hospitals. Patient safety attitudes determine the behaviors that nurses will demonstrate in carrying out patient safety activities (11). The results of the assessment of nurses' attitudes towards patient safety can be used as a recommendation for effective patient safety management in reducing the number of incidents, unsafe actions, and human errors, as well as increasing cost-effectiveness (1;12). Nurses' attitudes towards patient safety are reliable measures to evaluate the effectiveness of patient safety programs in hospitals (7). The assessment of nurses' attitudes towards patient safety can be used as a reference for preparing programs to maintain the quality and patient safety in hospitals.

Several factors are shown to affect nurses' attitudes towards patient safety in hospitals. Previous studies showed that age (9), gender (1;4), education level (13), work experience (14), , training (15), clinical nurse career path (16), and head nurses' nursing informatics competencies (17;18) are factors that affect nurses' attitudes towards patient safety.

Head nurses' nursing informatics competencies are associated with nurses' attitudes towards patient safety. A previous study showed that nursing informatics competencies are significantly correlated with patient safety competencies, including nurses' attitudes towards patient safety (19). Head nurses, as the first-line managers, have the responsibility to improve their competencies to lead and direct the staff under their supervision (20). Head nurses have an important role in providing guidance, supervision, quality management, and safety of care to staff nurses that they lead, and this will be a basis for developing the attitudes towards patient safety among nurses (10). Therefore, head nurses have a significant influence on nurses' attitudes to ensure the safety of the patients (21). Nursing informatics competency is significantly correlated with patient safety competency, which becomes

the basis of nurses' attitudes. In other words, head nurses' nursing informatics competencies affect nurses' attitudes towards patient safety.

The competence of nurses in nursing informatics makes it easier for nurses to manage information technology-based management systems. Adaptation efforts in integrated and cost-effective nursing care through paperless will also be easier with this competency (22). This ability helps nurses in improving care, which reduces human error, improves human behavior, improves patient safety and increases the role of nurses (23;24). Based on the data of head nurses' nursing informatics competencies and the challenge of aligning nurses' attitudes towards patient safety, the researchers were interested in conducting a study on the relationship between head nurses' nursing informatics competencies and nurses' attitudes towards patient safety in hospitals in Jakarta.

METHODS

This study used a cross-sectional approach. Data were collected from June to July 2021. The population in this study was all nurses in the hospital where the study took place. The inclusion criteria included nurses with at least a D3 degree in nursing, one year of working experience, and were not head nurses. Meanwhile, the exclusion criteria were nurses on a maternity leave. A simple random sampling technique was applied in this study. This technique provides equal opportunities for all members of the target population to be selected as research samples. The sampling technique used was proportionate random sampling where 362 samples were obtained with a total return of 251 (70% response rate).

The demographic data questionnaire, the Nursing Informatics Competency Assessment Tool (NICAT) developed by Rahman (25), and the Safety Attitudes Questionnaire (SAQ) (26) were used to collect the data to assess the relationship between nurses' characteristics, head nurses' nursing informatics competencies, and nurses' attitudes towards patient safety. Both instruments use a Likert scale with 5 answer choices, the NICAT instrument includes 30 statements while the SAQ instrument consists of 36 statements. Each instrument has been tested for validity with a range of 0.418 – 0.850 (NICAT) and 0.400 – 0.744 (SAQ) so that both instruments are said to be valid. The reliability test on these two instruments was carried out using the Crombach alpha test, with the results of 0.972 (NICAT) and 0.950 (SAQ), which means that both instruments are reliable.

The questionnaires were administered using Google Forms to all respondents who met the inclusion and exclusion criteria. Each participant provided informed consent regarding their voluntary participation, and confidentiality of the information collected was maintained. This study was approved by the Ethics Committee of the Faculty of Nursing, Universitas Indonesia (SK-134/UN2.F12.D1.2.1/ETIK/2021) and the Faculty of Medicine, Universitas Indonesia (No. 433/UN2.F1/ETIK/PPM.00.02/2021). Data were entered and analyzed using statistical applications. The scores of the two survey items with negative words were reversed. The data analysis included univariate and bivariate analyses. Descriptive statistics, including percentages, means, and standard deviations were used for all survey items

Table 1. Nurses' attitudes towards patient safety (n=251)

Variable	Median	SD	Min-Max	% of Max	95% CI
Patient safety attitude	141	16.681	89-176	80.1	137.84-141.99
Teamwork	24	2.451	17-30	80	23.27-23.88
Safety atmosphere	28	4.030	19-35	80	28.18-29.19
Job satisfaction	22	3.168	10-25	88	21.20-21.98
Recognizing stress	11	3.899	4-20	55	10.86-11.83
Perception of management	40	5.959	15-50	80	38.86-40.34
Working condition	15	2.669	8-20	75	14.79-15.45

and domains. This analysis used a 95% confidence interval and a significance level of 0.05.

RESULTS AND DISCUSSION

A total of 251 questionnaires were returned by the respondents. Table 1 summarizes the description of nurses' attitudes towards patient safety. Overall, nurses' attitudes towards patient safety showed a median value of 141 (80.18% of the maximum value), and it was believed that 95% of nurses' attitudes towards patient safety ranged from 137.84 to 141.99. The highest median value of nurses' attitudes towards patient safety was job satisfaction with a score of 22 (88% of the maximum value), while the lowest was recognizing stress with a score of 11 (55% of the maximum value).

Table 2. Age and work experience of nurse respondents (n=251)

Variable	Mean	Min-Max	SD
Age	36.5	22-57	9.141
Work experience	13.46	1-38	9.680

Tables 2 and 3 summarize the characteristics of the respondents. The mean age was 36.5, with an average work experience of 13.46 years. The majority were female (n=215; 85.70%), obtained D3 nursing education (n=162; 64.50%), attended patient safety training (n=119; 47.4%) and had level 3 of clinical nurse career path (n=136; 54.20%).

Table 4 summarizes head nurses' nursing informatics competency. Overall, the mean value of head nurses' nursing informatics competency was 99.53 (66.35% of the maximum score). The highest mean value of head nurses' nursing informatics competency was shown in the sub-variable of computer literacy with a mean value of 33.63 (67.26% of the maximum score), while the lowest was in the informatics literacy with a mean value of 42.77 (65.8% of the maximum score).

Tables 5 and 6 show the relationship between nurses' characteristics and attitudes towards patient safety. Table 5 shows the analysis results of age (p=0.160) and work experience (p=0.210), indicating no relationship between age, work experience, and nurses' attitudes towards patient safety (p>0.05). Likewise, Table 6 shows no significant difference (p>0.05) between nurses' characteristics (gender, education level, career path, and training) and nurses' attitudes towards patient safety.

Table 3. The gender, education level, training (patient safety and nursing informatics), and clinical nurse career paths of the respondents (n=251)

Variable	Frequency	Percentage (%)
Gender		
Male	36	14.3
Female	**215**	**85.7**
Total	251	100
Education level		
D3	**162**	**64.5**
Bachelor	20	8
Nurse Profession	69	27.5
Master	-	-
Nurse Specialist	-	-
Total	251	100
Training		
Patient safety	**119**	**47.4**
Nursing Informatics	-	-
Patient safety and Nursing Informatics	21	8.4
None	111	44.2
Total	251	100
Clinical nurse career path		
Clinical nurse level 1	42	16.7
Clinical nurse level 2	66	26.3
Clinical nurse level 3	**136**	**54.2**
Clinical nurse level 4	7	2.8
Clinical nurse level 5	-	-
Total	251	100

Table 7 shows a significant relationship between head nurses' nursing informatics competencies and nurses' attitudes towards patient safety in hospitals (p=0.0001), with a relatively strong and positive correlation (r=0.273). Therefore, it could be concluded that the higher the head nurses' nursing informatics competencies, the better the nurses' attitudes towards patient safety would be.

The results of the analysis showed that the mean value of patient safety attitudes by nurses was 141 (80.1% of the maximum value). This result is greater than a previous similar study where patient safety attitudes were 137 (78.7% of the maximum value) (Tomy Suganda, Hariyati, Handiyani, Rahman, & Afriani, 2021). Safety attitudes are nurses' beliefs and feelings about their commitment and responsibility to patient safety issues (1). This attitude will facilitate actions aimed at improving patient safety (27). The attitude of nurses greatly influences the application of patient safety (28). Safety attitude is the main factor that influences nursing activities. The safety attitude of nurses is important in providing safe care to patients, but aligning patient safety attitudes is still a challenge.

Table 4. The description of head nurses' nursing informatics competencies (n=251)

Dimensions	Mean	SD	Min-Max	% of Max Score	95% CI
Nursing Informatics Competency	99.53	20.377	42-150	66.35	97.00-102.07
Computer Literacy	33.63	7.231	15-50	67.26	32.73-34.52
Informatics Literacy	42.77	8.974	17-65	65.80	41.65-43.88
Informatics Management Skill	23.14	5.009	8-35	66.11	22.52-23.76

The results of the analysis showed that the mean nursing informatics competence of the head nurses' was 99.53 (62% of the maximum value). The results of research studies related to critical care nursing informatics competence in southeastern Iran have a mean result of 114.29 (29). Another recent study, measuring nursing informatics competence through Training Need Analysis (TNA), obtained the results of the interpretation of the nursing informatics competencies level of 75 head nurses' with the result that 17 head nurses' had good scores and 58 head nurses' had poor NIC scores (30). In a modern healthcare environment, nurses are faced with a variety of complex clinical technologies where advanced skills and knowledge in the field of informatics are required (31). This causes informatics to be increasingly in demand as a basis for improving patient safety and quality of care so that nursing informatics competence becomes important in fulfilling the professional role of nurses (32;33). In the current health care system, technology and informatics have become the infrastructure to increase access to health information, patient safety, cost efficiency, and improve treatment outcomes, so there needs to be more awareness among nurse managers (34). The results of this study indicate that nursing informatics competence is still not optimal. Currently, nursing informatics competence is the basis for improving patient safety and quality of care, so optimizing modern nurses to have these competencies in fulfilling their professional roles is something that needs to be considered.

Table 5. The relationship between age, work experience, and nurses' attitudes towards patient safety (n=251)

Variable	Nurses' attitudes towards patient safety	
	r- value	*p*
Age	0.089	0.160
Work experience	0.079	0.210

This study showed no significant relationship between age and nurses' attitudes towards patient safety in hospitals. This result is in line with previous research, which reported that age did not significantly correlate with nurses' attitudes towards patient safety (35). In contrast, another previous study showed that age is a factor that affects patient safety attitudes (36). Previous research conducted at the Jakarta Hospital also stated that the age of nurses had a significant relationship with patient safety attitudes (37). The

Table 6. The relationship between nurses' characteristics and nurses' attitudes towards patient safety (n = 251)

Variable	Nurses' attitudes towards patient safety				
	N	*Mean*	SD	95% CI	*p*
Gender					
1. Male	38	115.28	15,748	-7.982 - 3.599	0.323
2. Female	213	127.91	16,856		
Education					
1. D3 Nursing	162	128.18	16.690	137.87 - 143.05	
2. Bachelor	20	154.90	11.668	141.19 - 152.11	0.058
3. Nurse Profession	69	112.51	17.344	132.51 - 140.85	
4. Master	-	-	-	-	-
5. Nurse Specialist	-	-	-	-	-
Career path					
1. PK 1	42	140.02	16.150	138.11 - 148.18	
2. PK 2	66	118.20	15.367	134.40 - 141.96	0.124
3. PK 3	136	122.93	17.443	136.26 - 142.18	
4. PK 4	7	174.93	12.854	138.40 - 162.17	
5. PK 5	-	-	-	-	-
Training					
1. Nursing Informatics	-	-	-	-	-
2. Patient safety	119	124.29	16.821	136.66 - 142.77	
3. Both (no 1 and 2)	21	111.19	18.121	128.94 - 145.44	0.498
4. No training	111	130.64	16.346	137.56 - 143.71	

**Mann Whitney correlational test with* $\alpha = 0.05$

results of comparison with several reviews of previous studies do not always state that age has a significant relationship with patient safety. This concludes that the age characteristics of nurses do not always have a relationship with nurses' safety attitudes.

This study also showed no significant relationship between nurses' work experience and nurses' attitudes towards patient safety in the hospital. This result is congruent with a previous study that reported no significant relationship between work experience and nurses' attitudes towards patient safety (35). Other studies say that tenure has a significant relationship with nurses' safety attitudes (37;38). Further analysis of previous studies showed that work experience is not always correlated with nurses' attitudes towards patient safety. This study showed that the mean of nurses' work experience was 13.46 years. According to Brasaite et al. (2016), nurses with more than 11 years of work experience will know their work well so that their attitudes towards patient safety will be better. Therefore, nurses with the work experience of 11 to 15 years are considered to have a higher patient safety score. On the other hand, patient safety scores will decrease to the lowest score if treated by nurses with work experience of 21 years or more (35). Therefore, the longer a nurse's work experience, the higher the

Table 7. The relationship between head nurses' nursing informatics competencies and nurses' attitudes towards patient safety (n=251)

Variable	Nurses' attitudes towards patient safety	
	r	***p***
Nursing Informatics competency	0.273	0.0001
Computer Literacy	0,273	0,0001
Informatics Literacy	0,258	0,0001
Informatics Management Skill	0,254	0,0001

**Spearman correlational test with α = 0.05*

nurse's attitude towards patient safety will be.

The results showed that the mean value of female nurses was higher than male nurses, but the results of the analysis stated that there was no significant difference between the mean female and male nurses in patient safety attitudes. Gender is a factor that influences patient safety attitudes (36). More positive attitudes of female nurses were reported than male nurses (Brasaite et al., 2016). Research conducted by Tirgar states the same thing, where good safety attitudes are dominated by female nurses compared to male nurses (1). Women are generally more sensitive to maintaining safety, quality of patient care, and safety principles than men. In this study, 84.8% of nurses were women, so the respondents in this study were dominated by female nurses. It is undeniable that in general women do have a higher level of sensitivity than men.

The results showed that the mean value of nurses with bachelor education level was higher than nurses with other education levels, but the results of the analysis stated that there was no significant difference between the mean level of nurse education in patient safety attitudes. This result is different from previous studies, which state that the level of nurse education is significantly associated with patient safety attitudes (1;14;36) nurses' clinical career paths . The analysis in this study showed that the highest mean value was found in nurses with undergraduate education. In another study, good safety attitudes were found dominant in nurses with a master's/doctoral level of education (1). This means that there is a possibility that the higher the level of education, the higher the knowledge of nurses about safety attitudes and patient safety, although the results in this study did not show such results.

The results showed that the mean value of nurses with a nurses' clinical career paths level of PK 4 was higher than nurses with other nurses' clinical career paths levels, but the results of the analysis stated that there was no significant difference between the mean career level of nurses in patient safety attitudes. Nurses with higher professional career paths have a lower

chance of making medical errors that threaten patient safety and nurses themselves (16). In this study, nurses with a level 4 career path have a higher mean score (M=174.93) than nurses with other clinical career paths. This means that nurses with high career paths, such as levels 3, 4, and 5, have a higher opportunity of having positive attitudes towards patient safety. Nurses' clinical career paths level have an important role in increasing the competence of nurses in carrying out quality nursing care, one of which is to improve patient safety (23). Nurses with high career paths level have less chance of making medical errors that can threaten patient safety.

This study also showed no significant difference between the mean score training and nurses' attitudes towards patient safety. This result is relatively different from other previous studies, which reported that nurses' attitudes patient safety would be more positive after they attended patient safety training (15;39). However, nurse training is a factor that influences patient safety attitudes (36). In addition, training effectively improves nursing informatics competencies (29;40). The results of the analysis in this study were the highest mean score for nurses who had never attended training with a score of 130.64 followed by patient safety training with a score of 124.29. This shows that in this study although the training variable did not have a difference in the patient's safety attitude, patient safety training had the potential to influence patient safety attitudes by nurses in hospitals.

The results of the analysis showed that there was a significant relationship between nursing informatics competence, computer literacy, informatics literacy, and informatics management skills with patient safety attitudes by nurses in hospitals ($P<0.05$). Nursing informatics competence variable and computer literacy sub-variable with higher power level than other sub-variables. Head nurses have the responsibility to improve their competencies in order to be able to direct the staff in their control optimally (20). Head nurses have important roles in helping staff nurses through guidance, supervision, quality management, and safety of care that provide the basis for developing patient safety attitudes of the nurses they lead (10). Head nurses have a significant influence on nurses' attitudes to ensure the safety of their patients (21). Nursing informatics competencies make it easier for nurses to manage information technology-based nursing management information systems (30). The significant correlation between nursing informatics competence and patient safety attitudes, further confirms that the head nurses' as a first-line nurse manager is required to have multifactorial managerial competence (41). The existence of good nursing informatics competence by the head of the room will affect a good patient safety attitude by nurses, so there needs to be more awareness about the importance of nursing informatics competence.

CONCLUSION

This study showed that the mean age of nurses was 36.5 with work experience of

13.46 years. In addition, most nurses were female, D-3 nursing graduates, had never attended patient safety training and were clinical nurses of level 3. Statistically, most nurses' demographic characteristics, including age, work experience, gender, education level, nursing career path, and training experience were not significantly correlated with nurses' attitudes towards patient safety. In contrast, head nurses' nursing informatics competencies, computer litracy, informatics literacy and informatics management skill were significantly correlated with nurses' attitudes towards patient safety.

Further analysis of the head nurses' nursing informatics competencies showed that the highest and lowest mean values were the *computer literacy* and the *informatics literacy* items, respectively. This result depicts a vital need to optimize nursing informatics competencies, especially in the sub-variable of informatics skills, regarding searching for literature on quality of care and patient safety, and nursing innovation development programs to improve nurses' attitudes towards patient safety. Furthermore, when science and technology change daily, head nurses, who act as managers and room leaders, should improve their nursing informatics competencies to improve nurses' attitudes towards patient safety.

Nursing informatics competence is the basis for nurses to respond to the development of health management information systems and technology in modern health care environments. Currently, nursing informatics competence is the basis for improving patient safety and quality of care, so it is important for modern nurses to have these competencies in fulfilling their professional roles. The results of the analysis showed that the nursing informatics competence of the head of the room had a significant relationship with patient safety attitudes by nurses in hospitals. Nursing informatics competence of the head nurses' encourages the success of the head nurses' following the rapid development of information, it will have an impact on the success of safety programs designed by the head nurses'.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the Ethics Committee of the Faculty of Nursing, Universitas Indonesia (SK-134/UN2.F12.D1.2.1/ETIK/2021) and the Faculty of Medicine, Universitas Indonesia (No. 433/UN2.F1/ETIK/PPM.00.02/2021).

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