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Analytical Comparison between Nursing Informatics Competencies and Nursing Information Management System

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Abstract: ***Nursing informatics competencies are important and it should be followed by a good quality of nursing informatics system so that quality of nursing care will be delivered with a high quality. In hospital setting, there are two main classification which are governmental and private hospital with difference characteristics between those institutions. This study aim was to do analytical comparison between the nursing informatics competencies of nurses and the quality of the nursing informatics management system in both governmental and the private hospital. A cross sectional study design was used. Questionnaire distributed are the Self-Assessment of Nursing Informatics Competencies (SANIC) and questionnaire of Delone and Mc Clean model. Statistical analysis established used SPSS version 26 and SmartPLS version 2 tools to do the Structural Equation Model (SEM) followed by the Multi Group Analysis (MGA). Result for this research are namely: there are correlation among age, working experience and career ladder with nursing informatics competencies. Whereas there are no correlation between quality of nursing management system with the age, working experience and educational background. With SEM model it is found that nursing informatics competencies of nurses and the quality nursing management system are correlated in both governmental and private hospital. It can be concluded that there is correlation of nursing informatics competencies with age, working experience and nursing career ladder. Furthermore, this study reflects that nurses in both hospital have quite the same nursing informatics competencies and the quality of nursing management systems also quite similar.***

Keywords: nurses, nursing informatics, nurses informatics competencies, nursing information management system

1. Introduction

In the 4.0 era, the nursing information management system management system has become a key point to be established within the hospital management system.

Especially for nurses in using this system, an adequate nursing informatics competencies must be full filled as the users (Yoon et al., 2009). Nursing informatics competencies initially refers as the process of nursing data, information and knowledge within management system (Saba & McCormick, 2011)

There are different tools to measure informatics competencies of nurses. Two most popular tools are the Self-assessment of nursing informatics competencies scale (SANIC) and the Technology Informatics Guiding Educational Reform (TIGER) competency sets (Godsey, 2015; Hunter et al., 2013; O'Connor et al., 2017; Pangandaman, 2018; Seo et al., 2019; Yoon et al., 2009).

Generally, there are four informatics competency levels namely: beginning nurse, experienced nurse, informatics specialist and informatics innovators (Darvish et al., 2014). Whereas in SANIC, mainly there five levels of competencies for nursing informatics which are the clinical informatics role, basic computer knowledge and skills, applied computer skills, nursing informatics attitudes and wireless device skills (Godsey, 2015; Yoon et al., 2009). Whereas in TIGER, nursing informatics competencies are classified in three parts which are basic computer skills, information literacy and clinical information management (Huebner et al., 2018; Hunter et al., 2013; O'Connor et al., 2017; Pangandaman, 2018).

Following, nurse's informatics competencies, to significantly improve the quality of nursing care nurses need to master using the nursing management system hospital. Because of that, it is important that the nursing information management system need to fulfilled need of nurses (Darvish et al., 2014). When nurses are aware of the concepts of nursing informatics, they should able to deliver nursing care more safely, effectively and efficiently with technology integration (Bell, 2018; Lee et al., 2017).

In Indonesia, there are two main types of hospitals which are government and private hospitals. These two types hospitals have main differences in terms of organizational structure, job satisfaction, leadership style, organizational culture and also the source of budgeting. Research found that governmental nurses reflect higher job satisfaction compared with the private nurses. In the governmental hospital, nurses' work load is considered lower compared with the private hospital, nevertheless, facilities for nurses in the public hospital are also far better compared with the nurses in the private hospital. (Abdelhafiz et al., 2016).

The purpose of this study was to do an analytical comparison between the nursing informatics competencies of nurses and the quality of the nursing information management systems in both governmental and private hospitals

2. Materials and Methods

In this research, a cross sectional design was applied. Data were collected from the participant at a single point in time (Plichtam Stacey ; Kelvin, 2013; Polit & Beck, 2014). This design is suitable for explaining a large amount of data concerning specific phenomena and relationships among it within a specified period of time (Polit & Beck, 2014).

The sampling method in this study using G power was performed to determine the sample size required for a Chi Square test of means at alpha = 0.05. This tools calculated that a total sample size of 220 participants was needed with 95% power (Erdfelder et al., 2009)

There are three main parts of the questionnaire. First, it contains demographic characteristics which are age, gender, educational background, working experience, job position, nursing career level and participation in the training on the nursing information management system.

Second, the questionnaire sought to measure the nurse competencies in nursing informatics using the Self-Assessment of Nursing Informatics Competencies (SANIC). SANIC includes fives variables, namely: basic computer knowledge skills, applied computer skills, clinical informatics role, clinical informatics attitudes and wireless device skills. It uses Likert scale from 1 (not competent) to 5 (expert) (Godsey, 2015). Psychometric properties of the SANIC were found as follows: clinical informatics role (α = .91), basic computer knowledge and skills (α =.94), applied computer skills: clinical informatics (α =.89), nursing informatics attitudes (α =.94), and wireless device skills (α =.90). (Yoon et al., 2009)

The third part of questionnaire sought to measure informatics system adoption using the Delone and McClean Information System Success Model. The Likert scale used in this questionnaire ranged from 1 (strongly agree) to 5 (strongly disagree). This model has been used in several studies (Ojo, 2017; Petter et al., 2008; Petter & Fruhling, 2011). The Delone and Mc Clean questionnaire contains the variables of system quality, information quality, service quality, use/intention to use, user satisfaction, net benefits (Petter et al., 2008).Statistical analysis was conducted using Statistical Packages for Social Sciences version 26. Moreover, SmartPLS version 2 tools were used to do the Structural Equation Model (SEM) followed by the Multi Group Analysis (MGA).

Ethical Considerations

This study was approved to be conducted by the Ethics Commission of Health Research and Development Sint Carolus School of Health Sciences (030/KEPPKSTIKSC/III/2020). Besides that, the SANIC questionnaire granted permission from Yoon, Columbia University on July 27, 2020.

3. Results

The demographic characteristics of the sample shows that the majority of respondents were aged 21-30 years old (70%) and female (90.5%). The most common level of education of the respondents was the diploma degree (57.7%) and work experience ranged 0-5 years (75%). The majority of respondents hold a position as an associate nurse (88.6%), within career ladder of clinical nurse level 1 (36.4%). Nearly two thirdsof respondents do not have any training in the nursing information management system (72.3%). Regarding working placement, the respondent distribution was equally divided within the governmental and private sectors.

Table two reflects that both SANIC and Delone and Mc Clean questionnaire data are not normally distributed. Due to that, researcher used non parametric statistic for further statistical analysis.

Table three reports the correlation between SANIC, Delone and Mc Clean with the age and working experience of the respondents. It can be concluded that there are correlation among age with SANIC (p value = -0.000, correlation coefficient = -0.239) and also between working experience and SANIC (p value = 0.000, correlation coefficient = -0.241). The correlations are negative or reverse correlation and fair correlation. Whereas there was no statistically significant correlation between Delone and Mc Clean with the age (p value = 0.864) and working experience (p= 0.293).

Table four reveals there was no correlation between SANIC score with type of hospital (p value = 0.063) and gender (p value =0.982). On the other hand, therewas a statistically significant correlation between SANIC and clinical career ladder (p value = 0.036).

Table five reflects that there was no statistically significant correlation between Delone and McClean with educational background (p value = 0.993), gender (p value = 0.265) and training in nursing informatics (p value = 0.583).

Diagram one reflects that all indicator in this model are valid, significant and reliable. Furthermore, the path coefficient also significant. The convergent validity both for the Delone and McClean and SANIC ranged from 0.724 – 0.9551 which can be inferred that all item are valid.

Table six show that 22.51% of quality of the nursing management information system was directly affectedby the nurse's informatics competencies in the governmental hospital which is higher compared with the private hospital

In the multi group analysis it is found that R square for the quality of nursing management system in the private hospital is lower compared with government hospital (R square government= 0.225; R square private = 0.107). The path coefficient analysis found that there is significance difference between the nursing informatics competencies and the quality of the nursing management information system within the government and private hospital (t value = 1.30).

Using confidence interval of 80% it was found that nursing informatics competencies of the nurses in the governmental hospital was affected by the quality of the nursing information system (t value = 1.301).

4. Discussion

In this study it was found that nursing informatics of nurses correlates with the age and working experience. This finding is similar with the study conducted by Yang et al. (2014) who concluded that educational background, working experience and informatics training were significant variables influencing the informatics competency levels (Yang et al., 2014). On the other way, a study concluded that system quality, information quality and service quality have positive impacts on both user satisfaction and intention to use the system., the organizational impacts of the system were affected by use of the system's individual impact on the user (Petter & Fruhling, 2011).

Result in this study similar with Phillips (2017) that conclude nurses leader need to have more experiences regarding nursing informatics competencies. Contrary, study regarding nursing career ladder in Indonesia found that implementation of clinical career ladder system in Indonesia was since 2006 and due to that not many nurses aware with the clinical career ladder (Tutik et al., 2017). In term of educational background, this study found that there is no correlation between nursing informatics competencies with it (p value = 0.834). It is contrary with the research which inferred that educational background had affect with the informatics competencies (Yang et al., 2014). One of the reason for this that in Indonesia, study regarding nursing informatics competencies has been introduced whether in vocational, bachelor and also post graduate nursing curriculum level with difference in term of competencies learning objectives.

Other findings in this study were that there are no statistically significant correlations between Delone and McClean competency score with educational background (p value = 0.993), gender (p value = 0.265) and training of nursing informatics (p value = 0.583). A study in Iran based on nurses experiences it was found that health information system developers must give more attention to the needs of nurses particularly in terms of documentation, online assistance, response time and reliability and flexibility of the system (Sheiikhtahere et al., 2014). Moreover, regarding educational background, study in Indonesia stated that dominantly nurses in Indonesia are from vocational school (Tutik et al., 2017), In nursing vocational college in Indonesia, students already occupied with adequate curriculum credits regarding management information system. Using the structured equation model established in this study the model shows that in both governmental and private hospital the nursing informatics competencies of nurses and the quality of nursing management system are correlated. It means that nurses as the users need to have a good nursing informatics competencies so that the nursing information management systems could run in a good way also. Competencies of nurses would give impact to the quality of nursing information management system.

Research regarding technology acceptance model (TAM) and information systems success models (ISSM) within nurses found that there is affects between those variables in term of system quality, quality of service (Lin, 2017). Another study found that system quality, information quality and service quality have positive influences on the user satisfaction and intention to use the system (Ojo, 2017; Petter & Fruhling, 2011).

This research also found that R square of the governmental hospital is the higher compared with the private hospital. It is in parallel with the study that stated that governmental hospital act in creating standardized methodology and implementation of the health informatics and also nursing information management system (Bell, 2018).

Then this research concluded that there is significance difference between the nursing informatics competencies and the quality of the nursing management information system within the government and private hospital (t value = 1.30). Study in Saudi, concluded that governmental health organization commonly have bigger management level compared with the private hospital and it also give higher job satisfaction (Abdelhafiz et al., 2016; Abualrub & Alghamdi, 2012). Consequently, it would affect with quality of nursing information management system applied.

Another finding in this study is when using CI of 80%, it could be concluded thatnursing informatics competencies affect the quality of nursing management system. A study found that nurses should aware regarding concept of health informatics including nursing informatics so that they could encourage the use of it in an effective and efficient method (Bell, 2018).

5. Conclusions

To sump up, there is correlation of nursing informatics competencies with age, working experience and nursing career ladder with the structured equational model (SEM) diagram reflects that in both governmental and private hospital the nursing informatics competencies of nurses and the quality of nursing management system are correlated. Then, the nursing informatics competencies and quality of nursing information management systems are quite similar. The SEM model in this study reflects that types of hospital not give significance influence to the nursing informatics competencies and also the quality of nursing information management system. So this study proposed that nurses within all hospital types need to keep on updating their informatics competencies in order to improve the quality of nursing care delivered. Limitation within this study especially regarding sample size. It is recommended for further research to use greater sample for wider generalization. Furthermore, this study could be used as database in creating nursing informatics training programme. In a nutshell, it is recommend that nurse manager need to establish differ continuous educational nursing informatics training programme based on various age and working experiences of nurses. Then further research need to conduct to see the correlation among nursing informatics competencies and also the quality of nursing management informatics system.

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Tables

Table 1: Demographic Characteristic of respondent (n=220)

Characteristics	Frequency	Percentage
Age		
21-30 years old	154	70
31-40 years old	57	25.9
41-50 years old	8	3.6
> 50 years old	1	0.5
Gender		
Male	21	9.5
Female	199	90.5
Educational Background		
Diploma	127	57.7
Bachelor degree	92	41.8
Master degree	1	0.5
Working Experience		
0-5 years	165	75
6-10 years	35	15.9
11-15 years	8	3.6
16-20 years	7	3.2
21-25 years	4	1.8
> 25 years	1	0.5
Job Position		
Associate Nurse	195	88.6
Team Leader	12	5.5
Head Nurse	12	5.5
Nursing Department Head	1	0.5
Nursing Career Ladder		
Pra PK	61	27.7
PK 1	80	36.4
PK 2	52	23.6
PK 3	21	9.5
PK 4	5	2.3
PK 5	1	0.5
Participation In The Training Of Nursing Informatics Management System		
Yes	61	27.7
No	159	72.3
Types of hospital		
Government	110	50
Private	110	50

Table 2: Correlation between SANIC, Delone & McClean with age and working experience (n= 220)

		Age	SANIC	Delone and Mc Clean	Working Experience
Age	Pearson Correlation	1	-.239**	-.011	.773**
	Sig. (2-tailed)		.000	.864	.000
SANIC	Pearson Correlation	-.239**	1	.373**	-.241**
	Sig. (2-tailed)	.000		.000	.000
Delone and Mc Clean	Pearson Correlation	-.011	.373**	1	-.068
	Sig. (2-tailed)	.864	.000		.293
	N	.773**	243	243	243
Working Experience	Pearson Correlation	.000	-.241**	-.068	1
	Sig. (2-tailed)		.000	.293	

Table 3: Chi-square test of SANIC and demographic criteria (n= 220)

	Value	Asymptotic Significance (2-sided)
Pearson Chi-Square	99.234[a]	.062
Likelihood Ratio	131.219	.000
Pearson Chi-Square	55.056[a]	.982
Likelihood Ratio	53.982	.986
Pearson Chi-Square	446.900[a]	.036
Likelihood Ratio	302.937	1.000
Pearson Chi-Square	140.766[a]	.834
Likelihood Ratio	113.828	.997

Table 4: Chi-square test of Delone and McClean with demographic criteria (n = 220)

	Value	df	Asymptotic Significance (2-sided)
Educational background			
Pearson Chi-Square	95.273[a]	132	.993
Likelihood Ratio	94.420	132	.994
Gender			
Pearson Chi-Square	72.774[a]	66	.265
Likelihood Ratio	58.448	66	.734
Training of nursing informatics			
Pearson Chi-Square	62.970[a]	66	.583
Likelihood Ratio	76.910	66	.169

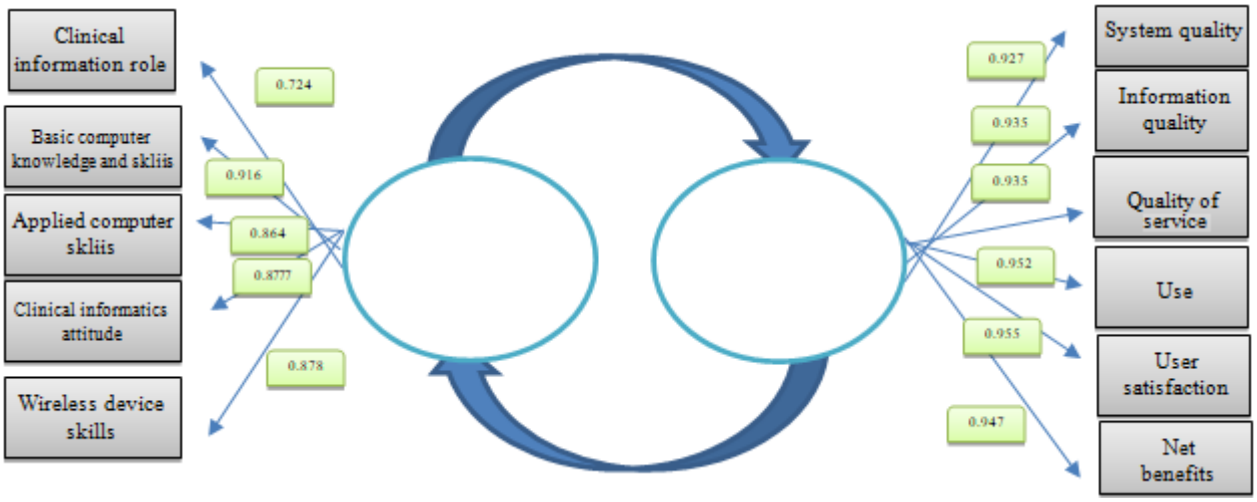

Diagram 1: Model Structured Equation Model

Table 5: Multi group analysis between governmental and private hospital (n = 220)

	Standard error	Path coefficient	t-value
	Governmental		
SANIC → Delone and McClean	0.068881	0.474502	1.301
	Private		
	0.089892	0.327744	

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