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RESEARCH ARTICLE

Competency in Nursing Informatics of Health Educators

YoungRan Chin¹ and Hyun Kim^{2,*}

¹Department of Nursing, Chungwoon University, Hongseong County, South Korea

²Department of Nursing, Mokpo Catholic University, Mokpo, South Korea

Abstract:

Introduction:

The purpose of this study was to identify career preparation activities among nursing students.

Methods:

The study was designed as a descriptive study. Typically, 132 middle and high school health educators worked in areas of Chungcheong Province and Seoul.

Results:

Nursing informatics competencies in accordance with the age, education level and type of business of the subject did not show a significant difference. It showed a positive correlation between NEIS utilization, satisfaction and nursing informatics competencies.

Conclusion:

This study suggests standardization of duties of health educators and system improvement and education.

Keywords: Computers, Nursing, Informatics, Healthcare, Educators, Quantative study.

Article History

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1. INTRODUCTION

School years are highly significant for establishing lifelong healthy habits. According to the 11th adolescent health behavior online survey which analyzed health behavior in school-age youth in Korea, an average of 20.0% males and 13.1% females were smokers, and the obesity rate was 14.2% and 7.3%, respectively [1]. The recent MERS epidemic emphasized the importance of healthcare education such as student health care and infectious disease prevention education in schools, which were otherwise unfamiliar with safety accidents [2]. In order to efficiently manage a recurrence of this problem, a systematic school healthcare program led by health educators is required.

Accordingly, in 2009, Korea expanded the existing curriculum of medical treatment and health advice-oriented role by reorganizing the curriculum of elementary, middle school and high school students to receive healthcare education more than 17 hours per year. However, based on the 2014 data,

the average number of health educators placed per school is 0.70 for elementary, 0.51 for middle, and 0.68 for high school [3]. In order to efficiently accomplish multiple tasks with this lack of manpower, securing long-term human resources is essential, but it is more important to obtain the assistance of an appropriate information system in the current scenario. Introduction of a school nursing information system is one of the most effective ways to monitor the health status of students, as well as maintain health-related records [4]. In an attempt to make healthcare education efficient, various systems have been employed globally: School Health Management Information Systems (MIS) in the U.S [5] and School Nurse Information System (SNIS) in Australia and Taiwan [6].

For the purpose of alleviating the workload of teachers and improving the efficiency of education business administration, the Government started computerizing school records in 1997, and further developed the system into a National Education Information System (NEIS). Recently, the establishment and operation of education information system, such as business process transaction by the information system, have been added in the education act in 2005 [5]; it also mentions that the

* Address correspondence to this author at the School of Department of Nursing, Mokpo Catholic University, South Korea; E-mail: hyunkim@mcu.ac.kr

duties of the health educators require information and computerization skills.

Since increasing school healthcare problems can spread into the community, health educators need to identify the public health problems, such as influenza, meningitis, enteritis virus, and MERS, and proceed to be the main barrier against the spread of these diseases. They should be able to efficiently manage the health of students and the community, and also provide regular information on the latest infectious disease outbreaks and healthcare by systematic management of health conditions, immunization, *etc.* This requires diverse skills. Among these, informatics competencies refer to the ability to search literature, healthcare information and health-related data to be used in conjunction with education [6].

Due to the trend of medical technology development and the rapid rise of the disease diversity and healthcare information [7], we are unable to apply NEIS, which is used as a current information system, to school teachers. In fact, as one of the unit tasks of NEIS, 'healthcare' belongs to the health educators and is classified as the sole management of student data, health record, and patients with infectious diseases. However, it is urgent to develop an information system for school healthcare business administration, because the health educators are very limited to leverage work in conjunction with the NEIS, owing to performing a variety of tasks, including education, counseling, screening, vaccination, direct healthcare task, *etc.* Meanwhile, a study on domestic nursing informatics competencies was done to primarily identify the relevant factors and check nursing informatics competencies of hospital nurse [8 - 10], nursing students [11] and public healthcare nurses [12]. There is no previous study for identifying informatics competencies targeting school health educators. Therefore, this study was conducted to serve as the basis of the future system development for healthcare nursing, by investigating the nursing informatics competencies of health educators. The specific objectives of the study are as follows.

1) Investigate health educators' NEIS utilization and satisfaction. 2) Investigate differences in nursing information competency according to the characteristics of health educators. 3) Investigate the relationship between nursing information competency and NEIS utilization and satisfaction.

2. METHODS

2.1. Design

The design of this study is a descriptive research study.

2.2. Participants

The elementary, middle, and high school health educators working in areas of Chungcheong Province and Seoul, were enrolled as the study subjects. A total of 146 health educators were selected based on their understanding of the contents of the questionnaire and agreement to participate voluntarily. Inappropriate responders were excluded, making a final total of 132 (90%) health educators evaluated. Under the G power program and t-test standard, 120 is the suggested sample size to maintain the significance level (0.05), effect size (0.25), and statistical power (0.8).

Data collection period was from 10th April, 2016 until 25th April, 2016. Data collection methods were performed by questionnaire surveys. The purpose of the study was explained over the phone or by visiting the center after gaining telephonic pre-approval from school. The average time taken for a survey was 30 minutes.

2.3. Instruments

A structured questionnaire was used for study tools; the questionnaires consisted of 6 questions of general features, 5 questions of characteristics related to nursing informatics, 10 questions of NEIS utilization and satisfaction, and 33 questions of nursing informatic competencies. Chung's questionnaire [13], which is one of the questionnaires in the Nursing Informatics Competencies Questionnaire (NICQ), is developed by Stagers *et al.* [14] and revised by [14] was used for the nursing informatics competencies questionnaire. Chung adapted the computer technology competencies of the novice stage, Informatics knowledge competencies, and Informatics technology competencies, *etc.* Stagers *et al.* [14] mentioned that a nurse with a capacity indicated as novice stage refers to a nurse who has the basic ability to use computers and apply the computerized system into nursing. Final 33 questions were selected by modifying and supplementing the questionnaires in order to make them appropriate to the system environment for schools.

Three sub-categories of questionnaires on nursing informatics competencies were prepared: 1) Computer information technology, a basic technology competency which includes computer literacy and information, and communication technology, contained 10 questionnaires. 2) Informatics knowledge consisted of 12 questionnaires of competencies of using knowledge for basic and theoretical background of major fields, which included skills beyond basic computer knowledge. 3) Informatics technology consisted of 11 questionnaires of competencies of utilizing informatics related methods, tools, and technology.

Each questionnaire has a five-point scoring scale: one point indicates "very low" score, to five point score of "very high". A higher score thus indicated better competency in nursing informatics. The Cronbach's α was 0.98 in both Chang's study [14], and Chung's study [13]. In this study, the Cronbach's α was 0.93.

2.4. Ethical Consideration

The study was conducted under the approval of the Institutional Review Board (IRB 1041566-201603-HR-008-01) for ethical protection of the subjects. In the process of recruitment of study subjects, study details were explained orally and in writing, which includes the purpose and method of the study, the guarantee of anonymity, voluntary participation agreement and study refusal, the possibility of abandonment, the possible advantages and disadvantages, *etc.* The study subjects were protected as much as possible by accepting their voluntary agreement.

2.5. Data Analysis

The data collected in this study were analyzed using the

SPSS / WIN 22.0, and statistical significance was set at $p < 0.05$. Descriptive statistics, average, and standard deviation were used to analyze general characteristics and characteristics of nursing informatics relevant to the study subjects. Nursing informatics competencies based on the general characteristics of the study subjects were analyzed by t-test and ANOVA. Correlation with variables was analyzed by Pearson's correlation coefficient.

3. RESULTS

3.1. General Characteristics of Study Subjects

All 132 study subjects were female. Among these, the number of elementary health educators was 48 (36.4%), high school health educators 45 (34.1%), and middle school health educators 39 (29.5%). Maximum subjects over 40 years old were 53 (40.2%), 30-39 years of age were 49 (37.1%), and 30 years of age were 30 (22.7%). Regarding education status, there were 10 (7.6%) college level subjects, 79 (59.8%) graduates, and 43(32.6%) post-graduates. The average work experience was 15.8 (± 9.8) years: 63 (47.0%) had > 20 years, 27 (20.5%) < 5 years, 25(15.6%) between 15-19 years, 16 (12.1%) between 5-9 years, and 12 (9.1%) 10-14 years

experience. Full-time employment was 98 (34.0%), and part-time employment was 34 (25.8%).

The number of health educators possessing informatics-related certificates was 88 (66.7%), and those who received informatics-related education was 88 (66.7%). Average time for work related computer usage was 5.0 (± 1.6) hours, and average time for non-business use of computers was 1.7(± 1.5) hours. A total of 114 (86.4%) subjects responded that informatics training is essential (Table 1).

3.2. Utilization and Satisfaction of NEIS

NEIS total satisfaction of the subjects was 3.50 out of 5 (± 0.82), categorized in the following order: student health records management 3.73(± 0.85), notice transfer 3.55(± 0.99), student informatics management 3.63(± 0.91), education management 3.37(± 0.99), discussion with faculties 3.42(± 1.11), and inventory management 3.01(± 1.19). NEIS total utilization was 3.49 out of 5 (± 0.81), categorized in the following order: student health records management 4.06(± 0.98), notice transfer 3.66(± 1.09), student informatics management 3.38(± 1.22), education management 3.38(± 1.22), discussion with faculties 3.38(± 1.31), and inventory management 3.20(± 1.29) (Table 2).

Table 1. The characteristics of subjects.

Characteristics		Categories	n	%
General	Sex	Female	132	100.0
	Kinds of School	Elementary school	48	36.4
		Middle school	39	29.5
		High school	45	36.1
	Age (yrs)	Range/M(SD)	26-59/46.8(8.2)	
		<30	30	22.7
		30-39	49	37.1
		>40	53	40.2
	Educational status	College graduate	10	7.6
		University graduate	79	59.8
		Master's degree or above	43	32.6
	Work experience (yrs)	Range/M(SD)	1-36/15.82(9.81)	
		>5	27	20.5
		5-9	16	12.1
10-14		12	9.1	
15-19		25	15.6	
<20		62	47.0	
Type of employment	Full-time	98	74.2	
	Daily worker	34	25.8	
Informatic	Licence	Yes	88	66.7
		No	44	33.3
	Experience of informatics education	Yes	88	66.7
		No	44	33.3
	Computer usage hours	Business hours	5.02(1.61)	
		Non-business hours	1.71(1.53)	
	Perception of need for education	Yes	114	86.4
		No	18	13.6

Table 2. Utilization and satisfaction of NEIS.

Characteristics	Utilization of NEIS	Satisfaction of NEIS
Total	3.49±0.81	3.50±0.82
Student Information Management	3.61±1.10	3.63±0.91
Inventory Management	3.20±1.29	3.01±1.19
Education Management	3.38±1.22	3.37±0.99
Student Health Records Management	4.06±0.98	3.73±0.85
Discussion with Faculties	3.38±1.31	3.42±1.11
Notice Transfer	3.66±1.09	3.55±0.99

Table 3. Nursing informatics competency of subjects.

Categories	M±SD
Nursing informatics competencies	3.47±0.51
Informatics knowledge competencies	3.53±0.59
Computer technology competencies	3.54±0.52
Informatics technology competencies	3.35±0.61

Nursing informatics competency of the subjects was 3.47(±0.51) of 5, in the order: informatics knowledge competencies 3.53(±0.59), computer technology competencies 3.54(±0.52), and informatics technology competencies 3.35(±0.61). The result showed that practically technology utilized was much lower than the knowledge of informatics (Table 3).

3.3. Difference of Nursing Informatics Competencies According to the Characteristics of the Subject

Nursing informatics competencies in accordance with the age, education level and type of business of the subject did not show a significant difference (Table 4).

Subjects' nursing informatics competencies showed a positive correlation with computer usage time ($r=0.23, p=.030$) as an information related characteristic. Depending on the nursing informatics training experience ($t=3.35, p<.001$), nursing informatics competencies showed a statistically significant difference. There is a significant positive correlation between NEIS total utilization ($r=0.48, p<.001$), NEIS total satisfaction ($r=0.58, p<.001$), and nursing informatics competencies. Nursing informatics competencies showed no significant difference based on nursing information-related characteristics, such as information-related eligibility and recognition of the need for IT training (Table 4).

Table 4. Nursing informatics competency according to subjects' characteristics.

Characteristics	Categories	Nursing Informatics Competency		
		M±SD	t/F/r	p
Age (yrs)	NIC*	3.47±0.51	0.63	.536
Educational status	College graduate	3.51±0.64		
	University graduate	3.49±0.49		
	Master's degree or above	3.41±0.53	0.58	.143
Work experience(yrs)	NIC	3.47±0.51	0.15	.208
Form of employment	Full-time	3.41±0.59	-0.75	.450
	Daily worker	3.49±0.48		
License	Yes	3.48±0.48	-0.76	.450
	No	3.45±0.58		
Training experience	Yes	3.64±0.44	3.35	.001
	No	3.35±0.53		
Perception of need for education	Yes	3.32±0.43	1.08	.299
	No	3.49±0.53		
Computer usage hours	Business hours	3.47±0.51	0.23	.030
	Non-business hours	3.47±0.52	-0.05	.579

(Table 4) contd....

Utilization	NIC	3.47±0.51	0.48	<.001
Satisfaction	NIC	3.47±0.51	0.58	<.001
Level of demand for nursing informatics education	Computer skills	3.54±0.52	0.87	<.001
	Informatics knowledge	3.34±0.61	0.93	<.001
	Informatics skillseducation	3.53±0.59	0.74	<.001

*NIC(Nursing Informatics Competency).

3.4. Correlation Between Nursing Informatics Competencies and NEIS Utilization, Satisfaction

It showed a positive correlation between NEIS utilization, satisfaction and nursing informatics competencies ($r=.48, p<.001, r=.58, p<.001$) (Table 5).

Table 5. Correlation between nursing informatics competencies and NEIS utilization, satisfaction.

	NEIS utilization	NEIS satisfaction
Nursing informatics competency	.484**	.578**

**<0.01

4. DISCUSSION

The purpose of this study is to obtain basic data for the improvement and development of school healthcare services information system, by identifying the status of nursing informatics competencies, NEIS utilization and satisfaction. In terms of the education level of subjects of this study, the number of the university graduates is 79 (59.8%), and graduates is 43 (32.6%), which showed higher education level compared to the previous study for nurses [8] working at community healthcare centers. In terms of the information-related characteristics, the number of nurses who have informatics related certificate is 88(66.7%) and nurses [8] who work at community healthcare center is 48(30.0%). In the previous study, hospital nurses [10, 11] having informatics related certificates showed a higher percentage, as compared to 4~5% of the previous study. Informatics related education experience showed much higher percentage at 66.7%, compared to 52.5%~66.1% of hospital nurses [10, 11] and 28.1% of community healthcare center nurses. This is because the working environment is favorable and stable to study and to gain certificates. Even though health educators are nurses, their teaching duty requires continuous study and relevant certification. Also, 86.8% of the subjects of this study replied that informatics education program is necessary, which was much higher as compared to the previous study [10 - 12] for the hospital nurses.

NEIS utilization and satisfaction result was 3.5 points of a total of 5. In the detailed area of NEIS utilization, student health records management showed high point of 4.06(±0.98), followed by student information management of 3.61(±1.10). On the other hand, in the case of education administration management, which is a major task for the health educator, utilization gained 3.38(±1.22) and product management showed lowest utilization points. Scores of utilization and satisfaction of NEIS were above average; however, in the descriptive reply, 59% of the respondents mentioned that system improvement is urgent because the current system does not meet the standards of actual work. Therefore, a repeated and expanded study is needed. In the overseas cases of Taiwan

[4, 15], recognition of the school nursing information system, recognition of easy instruction, training completion status, and workload are found to be related with school nursing information system [16]. Furthermore, it mentioned that workload should be reduced and satisfaction should be increased in future, so that eventually information system is designed towards improving the work performance.

The UK Department of Health reported that school nurses played an important role in finding and managing hidden health problems of students, bullying, and truancy; therefore, their role should be expanded and strengthened in future. Also, they should be supported with School and Public health nurses' Association as the center [17]. In this way, system satisfaction and utilization is critical for efficient work performance of health educators. However, in the domestic scenario, NEIS healthcare management features are limited to only three categories: student data management, health record management, and infectious disease management. Hence, there is a gap between the actual duties of the health educators and current system. System renovation, based on specific studies on the duties of the health educators, is necessary to solve and improve this situation.

Studies on the job analysis of health educators have been studied very briefly, such as a job analysis of elementary and middle school [6]. On the other hand, very active discussions on the job analysis, such as the amount of job hours and job necessities [5] of other courses, are underway. Therefore, system improvement to define the duties of health educators is necessary.

For example, as one of the duties of the health educators, establishment and connection of the 'infectious disease patient care' database is an urgent issue to deal with identifying student patients by connecting other schools' database at the level of city-county, since management of vulnerable children at the time of frequent disasters and calamity is important beyond the current system of only reporting the number of student patients.

As a public healthcare center performing a business which is designed for the local customers, school healthcare should not overlook that it is centered around the local community. If an elementary school is located in an area suffering from atopic dermatitis, it needs to select subjects related to that disease for healthcare education, which will be very useful and can attract parent participation. If the student patients are managed by connecting with the information system, nursing quality will be improved continuously with the evaluation and feed-back collected during the school nursing period.

The average of a health educator's nursing informatics competencies was 3.47(±0.51); this is above the average and slightly higher than that of hospital nurse in the previous study

[12, 15] It is considered to be a similar result since the health educators have much more educational experiences and possess a high degree of certification. It can be interpreted that meaningful experiences and acquisitions of certification resulted in informatics competencies. Evaluating the nursing informatics competencies, it was found that informatics knowledge competencies and computer technology showed similar points of 3.5 each, while the informatics technology showed 3.3 points. This result showed a high similarity with the previous study [7, 8, 11, 13], which mentioned that informatics knowledge competencies are higher than technology competencies. However, health educators showed higher technology competencies than public healthcare center and hospital nurses. This is because the health educators prepare for the class and have frequent media exposure. As mentioned above, health educators are regarded to have informatics competencies and can improve nursing informatics competencies if the system is revamped and appropriate training is imparted.

Nursing informatics competencies based on general characteristics showed no significant results. The previous study reported a strong correlation with age, and variables such as education level [17] and years of service were statistically significant and different from the current study result. The health educators were older than other subjects of the study, and education level and years of service were relatively high; thus, it is limited to compare horizontally with other subjects. Future studies involving diverse areas and an expanded number of subjects are needed.

The average time of computer usage per day showed a positive (+) correlation with nursing information characteristics. This result supports the report [10, 18 - 20] which mentioned that the average time to use a computer per week affects computer competencies. Also, subjects who have experience in nursing informatics training showed high nursing informatics competencies. In the previous study of using hospital nurses as a subject, the need for informatics education and hospital information system affected the information system utilization. Therefore, by identifying the needs of work of health educators, opening a new educational program to improve nursing informatics competencies is required.

The need for education content as one of the questionnaires of this study was surveyed in the narrative questions section. Of the total subjects, 38(28.8%) respondents replied that statistics education is necessary; other comments included the necessity for gaining access to the national statistics for the various duties of health educators. Statistics were included in the middle school curriculum from 2016, so it needs to be actively utilized in healthcare education and the establishment of the system. Especially, basic epidemiologies such as incidence, morbidity rate and prevalence of local community where the school is located is essential to diagnose the local community and fulfill appropriate nursing intervention.

In the US, school healthcare programs have been organized to reflect the various tasks performed by the actual health educator. For example, reflection of regional and national needs where the school is located, monitoring of local community healthcare program, matters of health, reflection of

policy, management and evaluation of the generated problems, are all included. Furthermore, to perform the broad range of healthcare duties, school health records are digitalized and systemized to be managed [3]. Similarly in Korea, to enable the simple task of maintaining records, the operation of a system that can connect various duties of the health educators is urgent.

The study shows a strong positive correlation between NEIS utilization, satisfaction and nursing informatics competencies. It suggests a program improvement to reflect duties which can be actively utilized. In this study, subjects were selected only from the health educators in some areas of Chungcheong Province and Seoul, so careful consideration is required for exaggerated interpretation and generalization. Also, there is a limitation to the reliability for the subjective questions and on recollection because of the self-report questionnaires method. This study has the advantage over the healthcare education and practical aspects, since it improved the information system and provided basic resources for quality improvement of the school healthcare duties by identifying the NEIS utilization and informatics competencies of health educators.

CONCLUSION

The study result revealed that the health educators have above average healthcare informatics competencies. Also, they revealed above average competencies in sub-area such as computer literacy, informatics knowledge, and informatics technology. Furthermore, health educators are considered to have basic knowledge and capabilities for strong informatics competencies since they have accumulated educational experience and have higher education level. However, NEIS, as an information system that can improve informatics competencies, has the limited ability to reflect fully utilized or reflect school health activities. This study has significance in that it provided data to improve the program for information technology by identifying the information competency of teachers for the first time in Korea. This study suggests standardization of duties of health educators and system improvement and education.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was conducted under the approval of the Institutional Review Board (IRB 1041566-201603-HR-008-01), for ethical protection of the subjects. In the process of recruitment of study subjects, study details were explained orally and in writing, which includes the purpose and method of the study, the guarantee of anonymity, voluntary participation agreement and study refusal, the possibility of abandonment, the possible advantages disadvantages, *etc.* The study subjects were protected as much as possible by accepting their voluntary agreement.

HUMAN AND ANIMAL RIGHTS

No animals were used in this research. All procedures performed in studies involving human participants were in accordance with the ethical standards of institutional and/or

research committee and with the 1975 Declaration of Helsinki, as revised in 2013.

CONSENT FOR PUBLICATION

Informed consent was obtained from all the participants prior to data collection.

AVAILABILITY OF DATA AND MATERIALS

The author confirms that the data supporting the findings of this research are available within the article.

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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