Nurses' Perceptions of Usefulness of Nursing Information System: a Module of Electronic Medical Record for Patient Care in Two University Hospitals of Iran

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ABSTRACT

Introduction: For almost fifteen years, the application of computer in hospitals increasingly has become popular. Nurses' beliefs and attitudes towards computer is one of the most important indicators of the application of nursing information system. The purpose of this study was to investigate the perceptions of nurses on the usefulness of nursing information system for patient care. **Methods:** Here, a descriptive study was carried out. Sample was consisted of 316 nurses working in teaching hospitals in an urban area of Iran. This study was conducted during 2011 to 2012. A reliable and valid questionnaire was developed as a data collection tool. The collected data was analyzed using descriptive and inferential statistics. **Results:** It was not believed that nursing information system was useful for patient care. However, it was mentioned that nursing information system is useful in some aspects of patient care such as expediting care, making early diagnosis and formulating diet plan. A significant association was found between the demographic background of sample and their perceptions of the usefulness of nursing information system (P<0.05). **Conclusion:** Totally, it can be concluded that nursing information system has a potential for improving patient care in hospital settings. Therefore, policy makers should consider implementing nursing information system in teaching hospitals.
Key words: Nurse perception, nursing information system, electronic health record.

1. INTRODUCTION

The daily activities of nurses are widely varied including planning, organizing, collaborating, and documentation of nursing care according to the nursing process. Other nurses' important tasks are order entry and scheduling, dispensing and monitoring medication and communication with other healthcare professionals (1).

In today's information era, there is a need to computer systems for managing and controlling of information flood. Information system (IS) is rapidly applied in health care system for managing patient care. The extent to which nurses move to a paperless system is dependent on their beliefs about IS (2).

Nowadays, the nursing system is developing various new methods for applying computers and information technology as a useful tool. Therefore, the value of Nursing Information System (NIS) in conducting daily nursing activities is progres-sively emphasized (3). Nursing computer-based programs as the NIS enable nurses to collect, storage, and recover data. They also have the ability to integrate clinical data with nursing admin-istration resources and services for the management of nursing activities, improvement of patient care and the advancement of nursing knowledge (4). They are either stand-alone systems or, more often, a part of a larger clinical or electronic medical re-cord (EMR) system. The introduction or expansion of a nursing information system influences the overall hospital information processing (5).

Traditionally, nurses have found information technology as a disturbance to their established practice patterns and a distraction from bedside patient care (6). Furthermore, some nurses may view this change process as challenging (7). One of the main obstacles in information technology acceptance in nursing is a lack of understanding of its benefits.

Nurses' noncompliance is usually considered to be a natural reaction. The identification of these challenges and related factors can be used for developing strategies to assist nurses and to design a more developed computer program (8). Nurses' acceptance or satisfaction of the application of clinical computer-based program has been considered a critical factor for the successful implementation of information system (9). To adopt a new technology, the criteria such as the advantages of using the system, compatibility with values, user-friendliness, flexibility and obvious usage outcomes are evaluated by users (10).

Many strategies including surveys (9, 11), work sampling (12), time-and-motion studies (13), and interviews with users have been used to assess the outcomes of the applications of NIS (14). Among these methods, surveys are still considered an effective and impressive way to attain users' feedbacks (8). In Iran, nurses use computer programs in many hospitals. However, few studies have been conducted in the field of nursing information systems. Comparative studies about nursing computer-based programs (15) and the structure of nursing data classification (16) are some examples of these studies. However, these studies have not described nurses' understandings of the advantages of these programs, the impact of nurses' electronic records on nursing care, and factors affecting the nurses' perception. The purpose of this study was to investigate the perceptions of nurses on the usefulness of nursing information system for patient care.

2. METHODS

A descriptive design was used. The sample was consisted of 316 nurses working in two teaching hospitals in an urban area of Iran. This study was conducted during 2011 and 2012. These hospitals offer 450 beds with nearly 450 nurses working there. Around 30,000 inpatients per year are hospitalized in these hospitals. While before 2007, nursing documentation was conducted in a paper-based manner in the hospitals, since 2007 the NIS as a module of hospital information system has been introduced by nursing managers of these hospitals. Therefore, a computer-based system was provided for nursing documentation. In these hospitals, each ward had one personal computer (PCs) and one printer for nurses working in each ward. Since 2010, all wards were switched to the NIS. In this study, all nurses working in these hospitals were approached to participate. The data collection tool was a questionnaire designed based on the scientific and relevant literatures and library studies. The questionnaire consisted of three sections: 1) demographic information 2) the level of computer literacy and 3) the impact of the NIS on patient care. The samples were asked to determine their perceptions using the Likert scale from strongly agree to strongly disagree. The scoring was 1 = completely disagree, 2 = somewhat disagree, 3 = somewhat agree and 4 = completely agree. If the average of each of the questions was more than 2, it was interpreted that the computer-based programs had an impact on that aspect of patient care, and if the total score was more than 26, it was interpreted that the nurses have understood the benefits of the NIS. The initial questionnaire was reviewed by experts in the field of nursing and health information management for content validity in terms of relevance, accuracy, and its relationship with the nursing roles. Then the questionnaire was revised and amended based on the experts' views. Then the questionnaire was piloted on 40 nurses. Internal consistency expressed as Cronbach's alpha was 80.3% for computer literacy,

Demographics' and Computer literacy's characteristics	Groups	No.	Percent
Position	Nursing	266	84.2
	Head of nursing	20	6.3
	Metron	18	5.7
	Supervisor	2	0.6
Sex	Male	52	16.5
	Female	260	82.3
Age (year)	20-30	128	40.5
	30-40	76	24.1
	>40	46	14.6
Type of Ward	Medical	56	17.7
	Neonatal	32	10.1
	Surgical	62	19.6
	ICU	52	16.5
	NICU	4	1.3
	Dialysis	18	5.7
	ENT	2	0.6
	Genecology	16	5.1
	Emergency	36	11.4
Education	Diploma	12	3.8
	Technician	6	1.9
	Bachelor	294	93
	Master	4	1.3
Experience (y)	<10	150	47.5
	10-15	24	7.6
	15-20	20	6.3
	>20	14	4.4
Work with computer (y)	<5	88	27.8
	5-10	106	33.5
	>10	14	4.4
Place of computer using	Workplace	84	26.6
	Home	26	8.2
	Home & Workplace	182	57.6
	None	8	2.5
The ability to use the software	Word	42	13.3
	Access	4	1.3
	Power point	2	0.6
	E-mail	2	0.6
	Internet	30	9.5
	More than one software	204	64.6
	None	28	8.9
Computers' knowledge	Less than moderate	76	24.1
	Moderate	182	57.6
	More than moderate	38	12
	Very good	4	1.3
Rate of computer usage in each work shift (hour)	< 0.5	76	30.4
	0.5-1	106	33.5
	1-2	80	25.3
	2-3	4	1.3
	3-4	6	1.9
	>4	6	1.9
Informed of the purpose of setting up the computer program in ward	Yes	79	50
	No	23	14.6
	Somewhat	48	30.4
Awareness of their duties towards the computer program in ward	Yes	150	47.5
	No	52	16.5
	Somewhat	98	31

Table 1. Demographics' and Computer literacy's characteristics of nursing in hospitals affiliated to Semnan University of Medical Sciences.

Computer program provide necessary information for following processes:	Complete disagree No. (%)	Somewhat disagree No. (%)	Somewhat agree No. (%)	Complete agree No. (%)	Mean ± SD
Achieving to nursing diagnosis	156 (49.4)	32 (10.1)	96 (30.6)	32 (10.1)	2.01± 1.09
Intervention that need for patient	162 (54.4)	34 (10.8)	84 (26.6)	26 (8.2)	1.8 ± 1.06
Patient status assessment	150 (47.5)	44 (13.9)	106 (33.5)	16 (5.1)	1.8 ± 1.06
Giving necessary education to patient	176 (55.7)	40 (12.7)	76 (24.1)	24 (7.6)	1.8 ± 1.03
Improving patient-nurse communication	172 (54.4)	52 (16.5)	78 (24.7)	14 (4.4)	1.7 ± 0.96
Decreasing hospital staying	190 (60.1)	50 (15.8)	68 (21.5)	8 (2.5)	1.7 ± 0.96
Patients' problem solving	156 (49.2)	52 (16.5)	80 (25.3)	28 (8.9)	1.9 ± 1.04
Promotion of patient care quality	108 (27.8)	50 (15.8)	138 (43.7)	20 (6.3)	2.2 ± 0.99
Recording whole of patient data	138 (43.7)	56 (17.7)	90 (28.5)	32 (10.1)	2.05 ± 1.06
Better coordination with other colleagues for care plan	152 (48.1)	68 (21.5)	84 (26.6)	12 (3.8)	1.8 ± 0.93
Decreasing patient complaints	152 (48.1)	68 (21.5)	88 (27.8)	8 (2.5)	1.8 ± 0.91
Keep confidential of patient information	122 (38.6)	48 (15.2)	114 (36.1)	32 (11.1)	2.1 ± 1.06
Planning for patient Diet	146 (46.2)	36 (11.4)	86 (27.2)	48 (15.2)	2.1 ± 1.15

Table 2. Nursing attitude toward effect of nursing computer programs on caring process in hospitals affiliated to Semnan University of Medical Sciences

75.2% for the impact of computers on patient and 83.3% for all questions. Descriptive and inferential statistics using Chi-square and Fisher tests were used for data analysis.

3. RESULTS

Of 441 nurses working in hospitals, only 316 (71.6%) participated in this study. 84.2% of the participant was clinical nurses and 82.3% of them were female. 40.5% of them were 20-30 years old. Most of the population (6/19%) were working in the surgical ward. 93% of the participator, had bachelor's degree. 47.5% had less than 10 years of experience. 33.5% of the nurses used computer between 5-10 years 57.6% of the population used a computer both at work and at home. 64.6% of the nurses were able to use more than one software such as Word and Access. 57.6% of the population had moderate computer knowledge. They used computers for more than half an hour in each working shift. 30.4% of the nurses were aware of some of the goals of the nursing computer program; and finally, 47.5% of them had knowledge about their duties towards the nursing computer programs (Table 1). The results showed that the total score of 42.4% of the population was over 26. Results showed that the nurses obtained several advantages from using the computer programs in the process of patient care such as promoting patient care, planning of diet and nursing diagnosis (Table 2). As demonstrated in table 1 a significant relationship was found between some of the demographic characteristics of the population (position and place of computer using) and their perceptions of the benefits of the nursing computerized program (P <0.05) (Table 3).

4. DISCUSSION

The results demonstrated that more than 60 percent of the population was below 40 years old and more than half of the nurses had less than 15 years of work experience. On average, these people had not understood the benefits of the computer program. In general, these nurses had negative attitudes towards the impact of the nursing computer program on patient care. These nurses were younger and had less experience towards nursing in comparison with the nurses in other studies (11). Our findings was in contrast with the results of Ting-Ting, et al' study (2008). They emphasized that younger age of nurses has higher degree of satisfaction with NIS (4).

The results also showed that less than half of the sample has

understood the benefits of the nursing computer-based programs. Our results indicated that after a few years of launching the computerized program in nursing units, some nurses have accepted it and have put the technology in their daily work flow.

Our results are in line with Ting and et al' findings. They found that nurses have little difficulty in using information systems for patient care plan (4). Several studies have been performed about the impact of NIS on nursing activities including the quality of nursing documentation (17), the required time for performing specific functions (18), user satisfaction (4, 7) and patient outcomes (19). The results of those studies have shown different effects for example increasing in documentation workload other than documentation quality. However, the results of this study showed different effects of nursing computerized programs on the patient care process. So that we found that the nursing electronic reports has good quality in some aspects of patient care.

The statistical result of Lee study demonstrated that nurses generally valued using the computerized nursing care plan (CNCP) system (20). Furthermore, Kossaman studied the nurses' perceptions of the impact of electronic health records (EHR) on nursing process. He found that nurses were comfortable with the technology and he also felt that the EHR increased access to information and improved efficiency (21). Results showed that nurses who had reported amount of their computer knowledge moderate further were satisfied with the computerized program than those who their computer knowledge more than average.

In addition, those who were not aware of their duties towards the computer-based program had a better attitude than the people who were aware of their duties. These findings may suggest Levin's theory of change in organization. According to this theory, the change occurs in three phases, melting phase, changing phase and freezing phase (22). Therefore, Levin's change theory should not be ignored by nursing staff. It seems that this theory has an impact on the nurses' health information technology acceptance.

These findings may indicate that some nurses are in changing phase while others are often in freezing phase. It seems that some nurses are still fighting to adapt to new situation. While they had to do their daily work, nurses complained about the quality of the hardware and software and lesser time for patient caring. Others might be in freezing phase. They have accepted a new position and understood its benefits. The findings indicated

Demographics' and Computerliteracy's characteristics	Groups	Mean ± SD	p-value
**Position	Nursing	2.1 ± 0.8	
	Head of nursing	1.6 ± 0.47	
	Metron	1.6 ± 0.37	0.022
	Supervisor	1.8 ± 0.4	
*Sex	Male	2.18 ± 0.87	0.926
	Female	1.93 ± 0.75	
*Age (year)	20-30	1.9 ± 0.84	
	30-40	1.9 ± 0.71	0.323
	>40	2.1 ± 0.77	
*Type of Ward	Medical	2.08 ± 0.92	
	Neonatal	1.97 ± 0.57	
	Surgical	1.97 ± 0.66	
	ICU	1.83 ± 0.85	
	NICU	2.5 ± 0	0.783
	Dialysis	1.95 ± 0.55	
	ENT	1 ± 0	
	genecology	2.01 ± 0.87	
	Emergency	2.03 ± 0.94	
**Education	Diploma	1.35 ± 0.28	
	Associate degree	2.6 ± 0.21	0.05
	Bachelor	2.06 ± 0.78	
	Master	2.1 ± 0.54	
*Experience (y)	<10	1.89 ± 0.8	
	10-15	1.85 ± 0.88	0.764
	15-20	2.05 ± 0.91	
	>20	1.7 ± 0.86	
*Work with computer (y)	<5	1.8 ± 0.74	
	5-10	2.1 ± 0.79	0.764
	>10	2.2 ± 1	
*Place of computer using	Workplace	1.9 ± 0.76	
	Home	2.8 ± 0.66	
	Home & Workplace	2.04 ± 0.74	0.018
	Non	1.9 ± 0.96	
**The ability to use the software	Word	2.06 ± 0.81	
	Access	1.3 ± 0.54	
	Power point	1.7 ± 0.2	
	E-mail	1.76 ± 0.2	0.568
	Internet	1.93 ± 0.73	
	More than one software	2.08 ± 0.79	
	None	2.02 ± 0.77	
*Computers' knowledge	Less than moderate	1.87 ± 0.67	
	Moderate	2.1 ± 0.82	
	More than moderate	1.8 ± 0.75	0.421
	Very good	1.7 ± 0.1	
*Rate of computer usage in each work shift (hour)	< 0.5	1.9 ± 0.77	
	0.5-1	2.1 ± 0.81	
	1-2	1.9 ± 0.72	
	2-3	2.3 ± 0.65	0.223
	3-4	2.1 ± 0.21	
	>4	1.8 ± 0.1	
**Informed of the purpose of setting up the computer program in ward	Yes	2.06 ± 0.76	
	No	2.1 ± 0.82	0.608
	Somewhat	1.9 ± 0.78	
**Awareness of their duties towards the computer program in ward	Yes	1.9 ± 0.77	
	No	2.2 ± 0.71	0.067
	Somewhat	2.08 ± 0.81	

Table 3. Relationship between demographics' and nursing information literacy's characteristics with their perception of nursing computer programs advantages in hospitals affiliated to Semnan University of Medical Sciences & Social security.

that those nurses who are familiar with the purpose of setting up the nursing computer-based program have positive attitude toward its impact on the patient care process.

The results of this study are consistent with findings of Ammenwerth and *et al's* study in Austria. They found that the introduction of NIS in university hospitals in Austria, led to a clear increasing in quality of information processing (23). Studies showed that nurses' attitudes were different towards the impact of nursing computerized program on patient care in several wards. It should be mentioned that in the health care environment with the aim of costs controlling, many nursing

units have insufficient number of personnel and little time to learn and adopt new technology; and this can influence on their attitudes. The resolving of conflicts between nurses' expectations and the actual performance of the computerized programs is a major challenge in management process(24). It seems managers should constantly monitor nurses' requirements in order to perform strategies for training nurses the computer-based programs and needed skills (25).

The results indicated that the nurses who have the ability to use multiple practical software have better understood the benefits of nursing computer-based programs than others. These results suggested that nurses who had computer experience, have more readily comprehended the reasons for using the nursing computer-based program in nursing practice. It was also showed that these nurses are able to more critically evaluate pros and cons of using computer-based programs. The findings of this study demonstrated that nurses realize the effect of computer-based programs on maintaining the confidentiality of patient information. Nevertheless, proper training for data using and reports inspection system is essential to ensure the confidentiality of patient data (26).

The findings showed that more than half of the nurses have not conceived the benefits of the impact of the nursing computerized program on patient care process. They also believed that all the required information for patient care is not registered in the nursing computer-based program. NIS should be able to record nursing diagnosis, interventions and outcomes (27). Nurses perform two types of care activities; direct care interventions through interactions with patients and indirect care interventions that support the effectiveness of the direct care interventions and consider the environment of patient care (28).

It is essential that both direct and indirect care interventions can be recorded in NIS. It seems that the registration of any nursing interventions and activities in computer systems can be useful for indicating the type and volume of nursing work as a profession in the health system. Therefore, attention to the registration of different types of nursing interventions in computer systems is essential. Other things that can affect the nurses' attitude towards a computer-based program are nursing minimum data set and standard terms in the computer-based program.

Goossen *et al.* conducted a Delphi study to determine international standards for NIS. They found two criteria "nursing minimum data set" and "nursing standard terms" had the highest percentage of consensus (29).

As this study was conducted using a self-administered questionnaire, the findings of this study should be interpreted with caution. In this study, some potential problems such as poor understanding of questions and the likelihood of answer bias threatened the results. However, regarding to the reliability and the validity of the questionnaire, they had low impact on the results. Since, some of the study subjects did not answer some demographic questions of the questionnaire, the results can be influenced. However, these study findings were consistent with other studies.

5. CONCLUSION

We found that nurses have the ability to process their required information by the computer-based program to accelerate patient care, make a diet schedule for patient and to achieve

nursing diagnosis. The results also showed that less than half of the population had understood the benefits of the compute-based program. Hospitals put information technology gradually into daily activities of their employees. Therefore, in the clinical arena, nurses are under pressure both for patient care and entering technology information in their daily duties. The acceptance of NIS is not only a nurses' duty but it also requires changes in organizational policies and procedures to execute electronic documentation.

CONFLICT OF INTEREST: NONE DECLARED.

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