

# Use of Health Information Technology in Patients Care Management: a Mixed Methods Study in Iran

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## ABSTRACT

**Introduction:** New technologies, including health information technologies, play an important role in effectiveness of management and nursing care services. **Aim:** This study was aimed to determining the use of health information technology in patient care management in a case study in Iran. **Methods:** This Mixed method study was conducted in 2018 in Kowsar Hospital of Semnan, Iran. Data gathered by an observational checklist and one questionnaire included two main parts, one demographic and another assessment of information technology use in care management of inpatients. The researcher prepared the questionnaire and its validity was verified. The data were organized and analyzed in the form of a descriptive analytic report. In the process of data collection, 10 participants including nurses, head nurses, physicians, radiology experts and Information Technology (IT) managers were interviewed and data analyzed using Directed Content Analysis. **Results:** Nurses were satisfied with the computerized system and believed it can facilitate the affair. From the nurse's viewpoint, the most common use of the Health Information Technology (HIT) were access (observation) of patients admit and discharge information (100%), providing medicine and equipment, transfer of patients (92.3%). The least of them were retrieve of evidence in the care process (0 %) and judgment and analysis of radiological diagnostic procedures (0%). The potential of electronic record is not still applicable. **Conclusion:** Use of modern information and communication technology in hospitals facilitates access and transfer of information, and also accelerates patient's admission and discharge process, relation between hospital units, providing medical equipment supporting affairs' process and diagnostic procedures. However, modifying organizational policies, improve the infrastructure and enhancing nurses' motivation in documenting nursing reports can be effective in increasing the impact of information technology in care management processes especially in electronic record and nurse's clinical judgment and evidence-based care.

**Keywords:** Nursing, Supervisory, Information Technology, Hospital Units, Medical Informatics, Iran.

## 1. INTRODUCTION

Today world is changing by development of technology and communication, meanwhile change in policies, economics, demographic and socio-environmental variables, which influence on healthcare delivery systems (1). Today, the use of in-

formation technology becomes a routine activity for many organizations (2). In fact, the term informatics means the use of computerized information systems to answer questions, solve problems and make decisions (3). Based on the results of past studies when informatics use

in nursing tasks and procedures such as financial, clinical, and other administrative transactions, it can help reduce costs and the time required to complete the process (4). Therefore, one of the areas where informatics can be used is the nursing field. Different definitions of nursing informatics presented. One of these is “the use of information technology in relation to any practice within the nursing area and is indicated by nurses such as patients care, management, education and research” (5). computer and HIS can use for collecting, storing, processing and modifying related data in the field of nursing care can facilitate the provision of nursing services, resource management and nursing care (6).

Nowadays, application of informatics in nursing is in expanding (2, 7). Some Studies, indicate that nurses use informatics in all their activities (8), and evidence suggests that with the development of the use of information technology, even by the client and could help to increase their participation in the care process (9). So, many studies have been done on the acceptance and use of information technology in the field of health. For example, informatics reduces medical and drug errors (10-12), improve the quality of care, increase patient safety (10, 13, 14), Clinical warnings and reminders (15), improving the quality of nursing documentation (12), nurses’ access to medical documentation (16), improved prevention services and increased patient satisfaction (17), and reduced health care costs (10, 18, 19). However, other studies indicate that the use of this technology is slow, or even somewhat dissatisfied with their application (20).

Currently, in Iran, due to the widespread use of information technology in other areas, but it was slower developed in the health sector. While the use of these technologies will bring more health goals, provide better services and access information in the shortest time, increase patient satisfaction, increase system efficiency and reduce costs. As a result, using these technologies in the field of health will accelerate the transition towards a better future, and health care organizations should be prepared to accept these systems and to escape the challenges posed by their use. In spite of the importance of informatics in nursing, there has not been a specific study on the status of informatics use in care management, and studies have generally focused on the provision of services (21). Clarifying and determining the status

and finding defects and possible barriers can provide the basis for redesign and improve the quality of care management and provide nursing services.

## 2. AIM

The researcher aims to investigate the status of informatics use by nurses in the process of patients, care management.

## 3. METHODS

This research is a mixed method study conducted in one of the educational hospitals in Iran. All hospital inpatient wards and also emergency ward were considered as research environments. Data collection was performed using the observational checklist, consisting of 5 questions related to the use of information technology (informatics) in patients care management, which was made by the researcher. Checklist answers ranked in three level score, use of a computer to quickly access and observe of information on score 1, transferring information score 2, and information analyzing were scored 3. Furthermore, a questionnaire including 5 demographic questions and 8 main questions was designed by a researcher and used for data gathering. The questionnaire answers were ranked with 5-point, from complete agree to complete disagree. For validity of the checklist and questionnaire, 10 experts had been consulted and their views were considered. The reliability of the questionnaire confirmed by Cronbach’s alpha score of 0.87. Entering the research environment and data gathering done by Coordination and permission of hospital managers. Meanwhile, research process was explained to participants, and assured to them about confidentially and use of data solely for the purposes of the research. The research did in below three steps.

In the first step, the use of the informatics system in the care management process, including admission, inpatient period and finally, discharge was evaluated based on checklist. Unclear points fixed with s by additional questions from users. The data from the observation checklist organized by the researcher in the form of a descriptive analytic report. In the second step, at least 2 nurses completed questionnaire on the use of information technology in care management in each hospital ward. Samples were selected from nurses who had a history of at least 1-year work experience by HIS and had a willingness to coop-

erate with the researcher. In the last step, some of these hospital staff and clients were also interviewed by researchers (Table 1).

Data from the quantitative section organized and analyzed using SPSS 16 software and appropriate statistical methods and qualitative data analyses in conventional content analysis method.

Participant N	Individual/ Organizational Character	Age	Sex	Work/care receive experience (year)
1	Nurse	34	man	12
2	Hospital ward Secretary	36	woman	5
3	Nurse	52	man	27
4	Head Nurse	48	woman	26
5	Head Nurse	41	man	17
6	Physician	51	man	24
7	Staff in Radiology unit	39	woman	16
8	Staff in Informatics unit	41	man	14
9	Instructor	48	woman	27
10	Client	50	man	7 (intermittent)

Table 1. Characterize of participants (Interviewees) in the research process

#### 4. RESULTS

There were 24 computers in 5 General inpatient wards, 4 Intensive and 2 emergency wards evaluated based on observation checklist. In addition, 10 participants interviewed. Meanwhile in this process, the research questionnaire was completed by 26 nurses, 21 of whom were female and the rest of them were male and with average age of 36.8 (24- 52) and average 13 years (1-29 years) working experience. 92% of nurses had a BS degree, and the rest of the master's degree. 80% of the nurses had spent at least 1 formal training programs from the 7th ICDL skills. Only 58% of nurses participated in the HIS training course and 40% of them believed that ICDL skills were ineffective on HIS-related skills.

Findings from the observational section showed that there were generally 3 computers and at least 2 computers in each hospital ward. In addition to the HIS system and Internet connectivity and possibility for use of flash and CD, head nurse computers equipped with automation program. Another computer, which also has Internet connectivity, mostly used day affairs, providing support services and relationship between wards based on HIS, and the third computer is sometimes used for HIS, but mainly for retrieval of the CT scan and radiographies.

The results of observations and participants' experiences showed that nurses used the HIS system in daily work. The HIS system used to interact with other units, especially pharmacy, laboratory and radiology. Physicians, residents and medical students used a computer system to receive and review radiology and CT. Hospital wards secretaries also used computers based on the HIS system for work affairs. The secretary's use was in fact complementary to head nurse and nurse activity. In addition to the exchange of organizational and administrative information, head nurses also requested the general medical equipment in this way. However, it was not possible to view daily, weekly, or monthly queries.

From nurses' viewpoint, the most commonly used computer system is patient admission and discharge and providing of medicines and equipment (100%), and the least of them is Retrieving evidence in the care process (0%) and the analysis of radiological diagnostic judgment (0%) (Table 2).

The medical equipment, such as syringes and drugs, is specifically request for each patient and sent to the pharmacy. These orders can be made by nurses and head-nurses. Medical equipment for hospital wards, such as serum, iodine, etc., are ordered on a daily or weekly by head-nurse.

In answer to the question of using the internet and intranets available to improve the quality of information on disease or treatment associated with or about patients' previous hospitalization history, but only 23.1% of the nurses believed computer systems help them in this regard (retrieval of evidence in the care process). Despite the limited amount of Internet traffic for the hospital nurses (near to 20 hours monthly), 46% of the respondents did not know enough about it, and 28% of nurses, despite being aware, did not used it.

In general, the findings indicate that the most common use of the computer in the care management process is the admission and discharge of the patient, as well as support in the provision of drugs and equipment, and the least was related to the recovery of evidence in the care process.

The qualitative data derived from the interview with the participants included three main categories (themes): "Positive attitude to use of information technology in service support", "Utilizing information technology in accelerating cross-sectoral interactions", and "Expediency

Computer user domains	Usage type in care management	Completely agree (5)	%	Relatively agree (4)	%	No Idea (3)	%	Relatively disagree (4)	%	Completely disagree (4)	%
Patients Admission	Quick access and observation(1)	26	100	-	0	-	0	-	0	-	0
	Transfer of Information(2)	20	76.9	6	23.1	-	0	-	0	-	0
	Organization and analysis (3)	4	15.4	4	15.4	2	7.7	12	46.12	4	15.4
Retrieving evidence in the care process	Quick access and observation(1)	6	23.1	4	15.4	6	23.1	8	30.8	2	7.7
	Transfer of Information(2)	3	11.5	4	15.4	6	23.1	7	26.9	6	23.1
	Organization and analysis (3)	-	0	2	7.7	4	15.4	14	53.8	6	23.1
Receive support in the provision of medicines and equipment	Quick access and observation(1)	24	92.3	2	7.7	-	0	-	0	-	0
	Transfer of Information(2)	26	100	-	0	-	0	-	0	-	0
	Organization and analysis (3)	2	7.7	6	23.1	4	15.4	10	38.5	4	15.4
Get support on providing patients nutrition	Quick access and observation(1)	3	11.5	-	0	23	88.5	-	0	-	0
	Transfer of Information(2)	24	92.3	2	7.7	-	0	-	0	-	0
	Organization and analysis (3)	2	7.7	6	23.1	4	15.4	8	30.8	4	15.4
Laboratory diagnostic procedures	Quick access and observation(1)	4	15.4	1	3.8	1	3.8	22	76.9	-	0
	Transfer of Information(2)	20	76.9	4	15.4	2	7.7	-	0	-	0
	Organization and analysis (3)	1	3.3	1	3.8	3	11.5	10	38.5	11	43.1
Radiological diagnostic procedures	Quick access and observation(1)	2	7.7	1	3.8	1	3.8	12	46.2	10	38.5
	Transfer of Information(2)	22	84.6	2	7.7	2	7.7	-	0	-	0
	Organization and analysis (3)	-	0	4	15.4	2	7.7	14	53.8	6	23.1
Transfer to other hospital wards	Quick access and observation(1)	26	100	-	0	-	0	-	0	-	0
	Transfer of Information(2)	22	84.6	4	15.4	-	0	-	0	-	0
	Organization and analysis (3)	6	23.1	4	15.4	4	15.4	8	30.8	4	15.4
Discharge or transfer to other Hospitals	Quick access and observation(1)	26	100	-	0	-	0	-	0	-	0
	Transfer of Information(2)	24	92.3	2	7.7	-	0	-	0	-	0
	Organization and analysis (3)	8	30.1	4	15.4	4	15.4	8	30.8	2	7.7

Table 2. Usability of Computers in Care Management from Nurses' Viewpoints

Prevention to expanded care-based information technology” which is detailed in the following (Table 3).

In general, most of the participants agreed with the speed and convenience of working with the computers in support of the service, and considered it can facilitate and speeding up access to the necessary equipment and resources, the experience of one of the nurses expressed in this way:

“Most of the time, it is very likely that, after a short time after a computerize request, medical equipment

bring and ready for use”(Nurse, p 1).

The dominant approach in designing and using information technology, especially HIS, was that nurses were used it in public affairs to facilitate interactions with Para clinic units, and the participants were satisfied with the ease of transferring requests and receive of responses (diagnostic tests). However, in the case of laboratory tests findings, they refer to the computer according to their necessity. One of the nurses’ tricks is as follows:

Main Category	Sub-category
Positive attitude to use of IT in service support	Satisfaction with the facilitation of send requests by HIS
	Satisfaction with the speed reception of consumables medical equipment
The use of IT to accelerate cross-sectoral interactions	Facilitating interactions with inter-wards and Para clinic units
	The use of HIS for patients in hospital transfers
Expediency Prevention to expanded IT,s evidence-based utility	Nursing documentation focusing on paper records
	Concerned about time-consuming electronic recording
	Low tendency to retrieve and extract cares evidences

Table 3. Qualitative data derived from the interview with the participants

“We usually receive diagnostic tests result in paper form and kept it inside the Patient paper-based medical records file, but sometimes we in hurry or paper form not be to access, we refer to computer.” (Nurse, p 3).

For of CT Scan and patients imaging result, nurses rarely used from computers. However, medical students and physicians frequently used based on HIS or by CD. Most of the nurses complained of parallel work in request of patients imaging in paper and electronic form. However, removal paper form of patients imaging result and complete replacement with electronic form, increased durability and access of images and were a positive change in view of physicians and nurses. According to radiology staffs, nurses and even patients “focusing on code rather than patient Personal Information can considered as one of the focal points of increased error”. One patient experience stated as: “Unfortunately, my brain CT confused with another patients CT and even the doctor wrote to me medical prescription, but fortunately, he timely corrected this mistake.” (p 10, client).

The findings from the direct observation and evaluation of the researcher indicated that HIS generally used to establish daily work interactions, and the researcher rarely encountered the icons and specified cases of classified information. Participants experience shows that some of the organized data usually monthly send to the nursing office through the Department of Statistics and Information Technology that may be sent to relevant ward nursing office. The experience of one of the supervisors is as follows:

“We do not need much summed up and categorized information. Some of the important information, such as the monthly number of discharge, is for-

warded to us by the Hospitals nursing office. Some-time even if we need we give some of necessary categorized information directly from the Department of Statistics and Information Technology “(P4, head nurse).

The use of IT generally focuses on cross-linking and receiving support services, and in spite of relative strengthened the infrastructure, nurses are reluctant to expand it in care process. Typically, nurses and even nursing managers have little interest in retrieve disease-related evidence, as well as documentation reports in electronic form.

“Even though computers are connected to the Internet, in fact, we do not have enough time to resolve ambiguity or problem by use of computer or internet; it’s time consuming for us. Sometimes our time is free, but the computers are using by another “(P 3, nurse).

## 5. DISCUSSION

This study conducted with the aim of surveying computer and IT use in managing hospital wards by head nurses. Findings of this study indicated using IT is increasing, however, at present time, the most use of IT is in daily routine official relations, accessing guidelines and laws, presenting reports and exchanging information. In general, the findings of the present study indicate that, although the use of the IT system in care management is expanding, nurses mainly use IT for receiving support services and facilitating inter-ward relations. In other word electronic recording of care, processes and Evidence-based judgments are not formed properly.

According to findings of the research, one of the missing loops in health care delivery system is the lack of use of software systems such as Computerized Physician Order Entry (CPOE) and Clinical Decision Support System (CDSS), along with hospital information systems for prescribing drugs electronically, or computer-based orders. As a result, it reduces patient safety management and the lack of use of these systems causes medical errors by nurses and doctors. Perhaps the reason for not using these software systems with HIS is that at present, these computer systems are not exactly designed to match with nurses’ work processes. In fact, in order to meet nurse’ needs, system designers must involve nurses and physicians in designing and development of HIS. Also, the lack of acceptance by nurses and physicians of these systems is other reason of slowly expansion of HIS. The results of Piscotty and his colleagues

in 2015 were similar to those of the present study (22).

Contrary to some previous studies in health system, which indicate dissatisfaction with information technology and computer networks (23), in the current study, nurses were confidence with the use of technology in the hospital sector and its supportive and management application.

However, the study by Cohen and colleagues (2016) on the analysis of the performance and importance of hospital information systems from nurses' viewpoint in one of the developing countries showed that nurses were dissatisfied with the low number of computer systems in the department. Like current study, computer Systems in the hospital wards sometime occupied during the day (24). Therefore, proper training of nurses and suitable coordination can help to increase their ability to guide and optimize information availability (9).

The results of Study Guard et al. (2005), which illustrates the use of informatics in all nursing activities (8) and the widespread use of IT in facilitating communication, coordination with other care providers even outside hospitals (25) and develop of partnerships between health care providers by patients and the family (26, 27). However, in the current study, evidence-based care approach is not shaped, as nurses. For example, contrary to physician and medical students, Nurses have little tendency to electronic nursing documentation and Us IT for nursing diagnosis. The results of a study conducted in Singapore show that inadequate elderly nurses 'ability to use computers is one of the nurses' activity challenges (28). Electronic documentation of nursing reports is useful in improving interpersonal communication and facilitating communication with other health care providers (29, 30). In fact, nursing or hospitals software systems are not designed based on nurses' workflow and nursing process. Therefore, in addition to organizational policies, the poor design of these systems may causes dissatisfaction and increased workload for nurses (22).

According to the results of the current study, the retrieve of evidence in the process of care is not desirable. Because the physician orders, nursing reports, and patient care process are not recorded in any of the computer. Therefore, care providers cannot properly use evidence-based care, and this is one of the main shortcomings in the documentation of all medical records in HIS. Findings of

the study also show that, despite the good progress in the use of IT, some of the existing deficits, including inadequate communication between information elements, make rework and case of workload. Some studies have reported on the increasing success of the relationship between information elements and the development of the information network and its benefits (9). However, the expansion of the use of IT and its effectiveness in supporting services and access to diagnostic results can indirectly help accelerate treatment and care process and finally reduce the workload of nurses. Poon et al study (2006) showed that clinical staffs had sufficient access to the results of patient tests and therapies, as well as integrated information systems (31).

One of positive points of this study was use of various information gathering methods, as well as the participation of the main stakeholders and the use of their experiences, but conducting a study only in one hospital a limitation of the study. Therefore, it is recommending to study in more hospitals and even focus on and use outside of hospitals and between the health networks.

## 6. CONCLUSION

According to the results of the study, it can be said that computer systems use for support and access to parental information. Also, the findings of the study have been taken into account that less attention has been paid to clinical information, clinical judgment and evidence-based care. In fact, one of the missing loops in care management is the lack of use of CDSS systems in nursing care processes. By using these suitable informatics systems, the clinical can increase health care quality, reduce costs and therapeutic errors. In other words, managers and policy makers in the health sector should pay particular attention to the upgrade of systems in care management processes and re engaging organizational culture.

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