

Information Technology (IT) in Hospitals' Nursing Management: Mixed Method Study

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Abstract

Introduction: Management of hospital wards is one of the most substantial and influential components in providing health services. New technologies such as information technologies (IT) can play a significant role in the efficacy of nursing management activities.

Method: This Mixed Method study was conducted in 2016 aiming to define the status of IT in hospital nursing management. The research population was composed of all wards under the supervision of nursing management in Kowsar Hospital in Semnan city. Research tools included direct observation on the use of computer systems using checklist and including two main parts of demographic section and section of evaluating the use and deficiencies of computers and information technology in hospital wards that were prepared by the researcher and then they were assessed and verified. Data were organized and analyzed using SPSS 16 software. Findings of the qualitative section were analyzed using Directed Content Analysis method.

Results: The computers in all wards under the management of nurses in Kowsar Hospital were directly observed and evaluated using a checklist for assessing the use of information technology. The data was prepared in a descriptive report and it was given to the head nurse for confirmation and fixing the possible errors. At the end, the final data was provided to the managers and IT educational instructors to be completed by them. In addition to finishing the descriptive report, eight nursing managers and IT managers were interviewed. In the case of concurrency, the review of organized data was carried out after interviews.

Generally, nursing managers felt comfortable using the computer systems and considered them as the facilitator of affairs. In the management process, head nurses used computer system to access and transfer data, and the detachment between some data elements was considered as an important problem. Moreover, the potential possibilities of data analysis were not fully realized; besides, the managers did not feel need to access and analyze classified data.

The use of new approaches in management based on increasing the use of data resources by nursing managers, generalization and concentration of data and reconstructing the technology system for integration can enhance the efficacy and development of using information technology in nursing management.

Key words:

Health Information Technology, Nursing Management, Hospital.

1. Introduction

Since nurses are the key factors in providing health services, nursing management has an essential role. Nursing Management comprises a smart combination of knowledge and skills of management and leadership for nursing activities in accordance with the objectives of providing health care and establishing a positive ambience (1). Management and providing services in the nursing sector and in general in the Health System, like the management in other fields, depend on many factors outside and within the system. Management tasks (concepts) can be divided into planning, organizing, guidance and coordination, control and supervision (2). Today's world is changing and it is going towards the development of technology and communication. At the same time there are changes in politics, economics, and demographic, social, and environmental variables. These changes are effective in health service systems. Nursing managers use human resources, and also financial, physical, environmental and information resources to achieve their goals (3). Different definitions of nursing informatics can be found in various articles. Hannah defines it as "the use of information technology in association with any nursing practice done by the nurses to carry out tasks including patient care, management, education, and research" (4). Use of technology and computer systems to collect, save, process and modify nursing care data can facilitate nursing services and enables the management of resources and nursing care (5). Nowadays, the development and use of informatics in

nursing is increasing (6, 7). The study of Garde et al. showed that nurses used informatics in all their tasks (8), but other studies indicated that the use of technology was slow and even dissatisfaction with its use was reported (9, 10).

It is necessary to mention that two models are needed in the design and implementation of electronic and informatics networks. One view is to quit old networks and replace them with new networks; and another one is to evaluate the functioning of existing system, detect its deficiencies, and realize the new needs of the organization. Based on the latter, the old system is reconstructed and modified. Usually the second method is more logical and less costly (4).

Despite the importance of informatics, there has not been a specific study on the status of informatics use in hospitals' nursing management; and most surveys have taken into account the service provision or they have studied management in general. A review study was done by Sadeghi and Yaghmaei aiming at defining the implication of informatics in nursing education, research, and care. The published articles indicated a considerable attention to its use mostly in education, research, and clinical decision-making while in management it was less noticeable (11). Determining the existing status and detecting possible deficiencies and obstacles can bring about a modification to improve the quality of management and provision of nursing services.

2. Materials and Methods

The present study was conducted through a mixed method. All the hospital wards under the supervision of nursing, as well as nursing management unit and computer system users of an educational hospital were considered as the research population. Data collection was performed using the observational method based on checklist of observations consisted of five demographic questions and eight questions about the use of information technology (informatics) in organizational management which all were made by the researcher. The answer to each checklist question was divided into 3 choices of observation and quick access, transfer, data adjustment and analysis, and

the others. Score 1 was given to "using a computer to have observation and quick access"; score 2 was dedicated to "data transfer"; and "data adjustment and analysis" had score 3. In order to determine the validity, the checklist was given to ten experts and professors and their opinions were considered. In addition to the legal approval of project design and getting the license from the Ethics Committee, coordination and correspondences related to entering the research environment were carried out and the research process was explained. Moreover, participants were assured that the information was used confidentially and only for the research objectives.

In the first step, after getting the permission from related authorities, the management software installed on the computers of each ward was observed using a checklist. The observation considered programming, organizing, directing, controlling, and monitoring the nursing tasks and working process. For instance, does informatics play a role in determining the number of human resources, facilitating the shifts, or final calculation and summing up after running the program? Is the program in the sequence of other programs? Can others use the results? By asking additional questions from users, the issues that seemed vague were resolved. The data obtained from the observation and checklist was provided by the researcher in a descriptive report and it was sent to the head nurse for review and fixing possible defects. The participants were those who had a history of at least 1 year of working with computers and information technology at the hospital. At the last step, the reconstructed data was provided to the managers and educational instructors of the hospital's IT unit. In addition to accomplishing the descriptive report, some of these head nurses were interviewed. Usually in the case of concurrency, the interviews were conducted before the data was given to the interviewees. Data from the quantitative part was organized and analyzed using SPSS16 software and appropriate statistical methods and qualitative data was analyzed using the conventional content analysis method (Diagram1). Ethics approval of this study was obtained from the Semnan University of Medical Ethics Committee (IR. SEMUMS. REC.1393.584214).

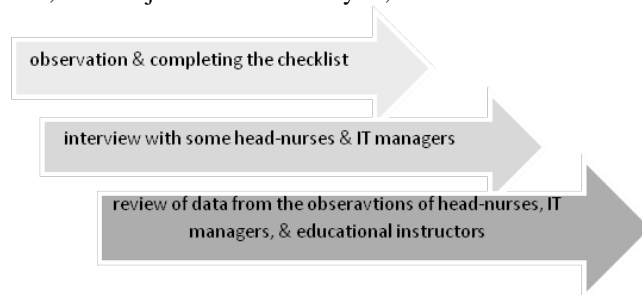


Diagram 1. Stages of research on computer use in nursing planning & services

3. Results

Twenty eight computers from different wards were directly observed and assessed including general inpatient ward (ward No.5), ICU ward (No.4), surgery ward (No.2), ER ward (No.2), and the nursing office. Data collected from checklist based observation was organized by the researcher in a descriptive report, and in order to fix the possible defects it was sent to related head nurses, four directors of Information Systems Management, and one of the educational instructors. Besides, eight nursing managers and health information technology managers were interviewed. 81% of nursing managers had nursing bachelor's degree, and the rest were graduate or

postgraduate of master degree in nursing. All of them had at least two ICDL skills. The mean age of participants was 43 years and their mean working experience was 21 years. The findings showed that there were generally 3 computer systems or at least 2 computers in each inpatient ward of the hospital. One of the computers (no.1), which was provided to the head nurse, was equipped with automation networking, HIS system, the Internet connection, CD player and USB port. Another computer (no.2) was allocated to the management and daily routines which was equipped with the Internet connection but by it's HIS system was mainly used. Use of the third computer was sometimes due to HIS system, but it was mainly used for recovering the medical images (Table1).

Table 1: Characteristics and applicability of computers in the hospital wards

Facilities	Emergency ward			Men's surgical ward			Women's surgical ward			Men's internal ward			Women's internal ward			Psychiatric ward			Surgery ICU			Internal ICU			CCU			P-CCU			Operating room&*			Nursing office		
Computer's No.	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Automation	*			*			*			*			*			*			*			*			*			*			*			*		
HIS	*			*			*			*			*			*			*			*			*			*			*			*		
Internet	*			*			*			*			*			*			*			*			*			*			*			*		
USB & CD	*			*			*			*			*			*			*			*			*			*			*			*		

* In Operating room (OR) computer no1 use by head nurse for managing process, computer no2 for patients admission and discharge process, computer no3 for drugs and medical supplies for the patient. Meanwhile medical images are accessible in every surgery room on specific monitor.

The results of the observations demonstrated that the users of automation system were only head nurses, while they repeatedly used the HIS system in their daily routines, and they also had to follow the guidelines of accreditation and quality improvement department of hospital. Nurses mainly used the HIS system to interact with different wards and departments, especially pharmacy, laboratory and radiology. Physicians, residents and medical students used a computer system to receive and review medical image and CT. Secretaries also used computers with HIS system for their work interactions. The secretary's use was in fact a complementary to head nurse's and nurse's tasks. In addition to do organizational and daily affairs, head nurses requested general equipment of the ward through this system. However, it was not possible to view the sum of daily, weekly, or monthly queries (Figure1).

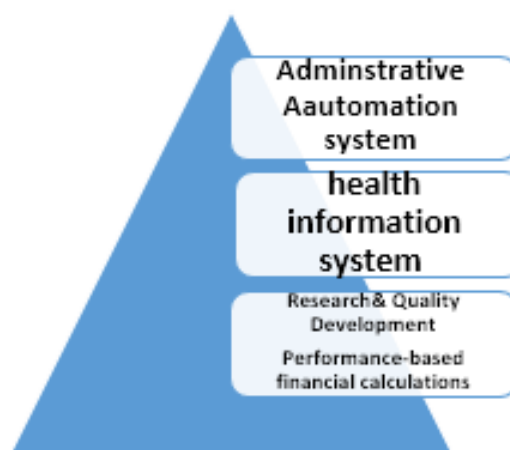


Fig. 1 Main Features and Applications of the Computer System in Hospital Nursing Management

The qualitative data obtained from the interview of participants included three main categories: "The positive perception of information technology use", "The concentration of information technology on daily routines", and "Insufficient use from information technology

potentialities ". They are outlined in the table below (Table 2).

Table 2: Participants experience about use of IT in Nursing Management

Main Category	Subcategory
The positive perception of information technology use	Satisfaction with technical infrastructure
	Satisfaction with facilitated access to essential information
	Facilitated interactions inter-wards
The concentration of information technology on daily routines	Relatively facilitated management intra-ward
	Inadequate preparation of head nurses in the use of data feedback
Insufficient use from information technology potentialities	Organizational disregard in the use of data feedback
	Gradual process of providing concentration and data generalizing

Most of the participants were satisfied with the speed and convenience of working with computers, and they considered the computer system as a factor in facilitating the tasks, but they believed that some tasks were repetitive. According to the experience of head nurses, the automation system was more effective than HIS. The experience of one of the head nurses was as follows:

"Overall, I feel that the automation program is much better and more effective, for example, we are happy that no letter or request is lost, and it can be easily found by its number, date, or other features." (Participant 7)

The dominant approach in designing and using information technology, especially HIS, was to be used by nurses in general tasks and management affairs. Even in many cases, one-way flow of data was evident, and despite the high potentiality of hardware and data software, nurses were not able to organize and analyze the data (Figure2).

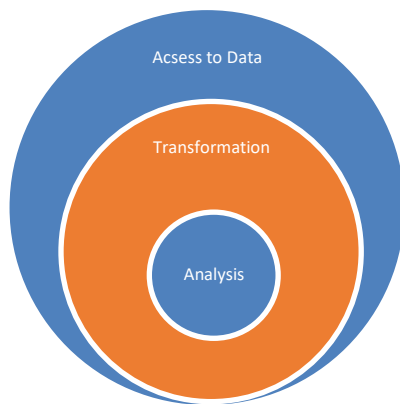


Fig. 2 Use of Information System

The findings from the direct observation and evaluation of the researcher indicated that health information technology was generally used to establish daily interactions, and the researcher rarely encountered the icons and summed and classified data. According to the participants' experience, some of the organized data was usually provided monthly to the nursing office by the health information technology unit and it was sent to the

related ward. The experience of one of the managers IT unit was as below:

"We try to summarize the important data from each ward, such as the number of hospitalized patients, the number of discharged patients, the number of discharge with personal desire, CPR, etc., and send it through the automation message to the nursing office from which it is sent to the wards. In my opinion, supervisors and head nurses do not need to analyze and extract the data anymore and I don't think this is useful. "

On the other hand, head nurses themselves did not have much interest in additional summarized data and they believed that the reported data was sufficient. The experience of one of the head nurses was as follows:

"Some summarized data is monthly sent to us by the nursing office. Actually, I haven't tried to summarize any input data, because I didn't need it. The only thing we need is to extract the working hours of each staff and to calculate his/her overtime hours."

Findings of the present study marked that the nurses and secretaries in the wards did not have access to their work schedule through the computer system. New software was designed and used for programming to which the head nurses had access. But only in 24% of the wards, the program was entered in the computer systems by the head nurse, secretary or other user, and the rest was gradually done by the secretary of nursing office. In addition to matron and supervisors, the mentioned computer program was accessible for the nursing manager to do preliminary analysis and observation. In the case of any change in the work schedule of one of the staff, this change should be inserted in the computer by the head nurse until the next day and then it should be finally approved by the matron. The output of program could calculate the working hours of all the staff and each nurse separately in each ward. However, 80% of head nurses believed that data entering and changing the program was time consuming for them and its main use which was the calculation of total working hours and overtime hours was not reliable. In this regard one of the head nurses declared that:

"Early on they launched the software I had a great interest in entering data, but at the end of the month once or twice I saw that the program was not very reliable, and I had to calculate the working hours manually. I don't use

it anymore and I ask a student or secretary of nursing office to do it."

The findings of the researcher showed that data entry of the designed program was not in line with the manual form. The experiences of nursing managers also indicated the complexity of data entry, monitoring and correction. Even one of the head nurses provided a similar template in Excel and Word, but could not insert it in the technology network and extend it to all computers in ward. Despite the limitations, the matron believed that the use of human resources program and its timely correction could bring rapid calculation and access to staff's overtime data.

Regarding the computer use in quality improvement planning, it was seen that according to the guidelines issued by the quality improvement department the desktop of computers should be accessible, but it did not have a comprehensive organization. No information was found regarding the conferences or programs of quality improvement on the computers of the abovementioned wards. The program of some of the conferences was provided by the automation message system to the head nurses, but informing the staff by the head nurse was unnecessary or occasionally.

Regarding the organization of human resources, there was an organizational chart for different posts and various staff in the hospital's Quality Improvement Unit (Accreditation and R&E) and it was rarely used by the head nurses as needed. Different ways were designed to provide and organize equipment. Necessary equipment for a patient, such as syringes and dressings, was specifically ordered for each patient and sent to the ward by the pharmacy. These orders were made by nurses and head nurses. All the routine equipment of the ward such as serum, betadine, etc., were ordered daily or weekly by the head nurse via the computer system. Making order could be done through pharmacy or drug store. To some extent it was possible to calculate the difference between the number of required orders and the stock, but there was not a reliable output for rapid replacement of shortcomings and head nurse should make a new list to receive the orders. Non-medical materials and equipment required for the ward were ordered by head nurse without time limit and as required through the automation system and finally they were received. Ordered items, unlike consumable supplies, were not available in the monthly or annual list, and they should be provided separately if needed.

Concerning the structural site plan (ward or hospital) and infrastructure facilities plan, such as electricity and water network or sewage, were not fully provided to Quality Improvement Unit, and the head nurses did not have access to them unless in especial cases.

Directing organizational affairs, guidelines and important information were mainly delivered to the head nurses through automation system, and then according to the discretion of head nurses the documents were presented to

other staff in written form or verbally. On the other hand, the correspondence and requests of the nursing managers were sent to the managers or colleagues through the automation system. In the cases of any device breakdown, the head nurse had to report it via another software designed for this purpose. One of the advantages of this software was the ability to adequately integrate and organize, and nursing managers sometimes got related feedback. In this regard one of the head nurses expressed that:

"The software for reporting device breakdown and repair request is very good. We do not have to call anymore. There were even some cases that they told us, for example, your pulse oximeter destroys so often and you need to improve your use."

The findings of study showed that the head nurses used computers to supervise all the activities and to monitor their accuracy. This accelerated and improved their management activities. One of them declared that:

"Computer programs to some extent can help us to monitor and track the tasks, for example, to see whether a nurse sent the request for a test, we can enter the program and monitor the sending status."

Clinical supervisors had access to automation system; and the instructions were sent to them as needed, but for daily routine in directing and supervising affairs they did not use IT at all. The final review and confirmation of human resources program by the matron, made him/her more informed of the status of deployment of human resources in the last 24 hours. According to the director of nursing office, using human resources program has led to a more accurate monitoring of human resources deployment and they could do any changes and modifications in the deployment if needed.

4. Discussion

The present study aimed at assessing the use of computer system and information technology in the management of head nurses in hospital wards. The findings indicate that the use of IT is gradually expanding, but its major management use is now more related to daily routines, access to instructions and rules, as well as reporting and data exchange. Request for any good or equipment and reporting the breakdown is another advantage of using IT, but it does not play a role in organizing affairs. Head nurses are gradually expanding their use of IT. In general, the findings of this study depict that, although the use of information technology in health management is expanding, the gradual development of using extracted data is mostly belongs to higher levels of nursing management, and in nursing and IT managers there are still no possibility and tendency to analyze the data and to use data feedback.

While numerous earlier studies indicated that there were bugs in hardware and software, and it was time consuming (10), and dissatisfaction with IT and computer networks (12) was reported, but in the current study, head nurses were satisfied with the use of technology in hospital wards and its management use.

Unlike the results of Garde et al. which illustrated the use of informatics in all nursing activities (13) the current study showed that the main focus of using IT was on daily routines and intra-ward interactions. Even the results of various studies have shown the use of IT in facilitating the communication, coordination and planning between nursing managers and other health care providers out of hospital (14), and it has even developed partnership between patients and families (16,15). In terms of having access to collected data and using it, despite of many potential possibilities the dominant attitude is still towards unilateral use, responsiveness, and doing daily routines. While in some optimization patterns of hospital management that are being used in Iran, such as clinical governance, the use of data is considered as one of the key elements (17). It may be somehow concluded that providing precise data feedback and presenting written and summarized reports from the current status are not asked from the managers as their responsibilities, and nursing managers did not have a positive attitude towards it.

Despite the fact that clinical supervisors play a substantial role in nursing management, the lack of using information technology in directing and supervising the daily routine of hospital wards is one of the significant disadvantages that must be taken into consideration and be fixed. It should be noted that the use of IT has changed from a technical category into an organizational and framework category (18).

Findings imply that despite the progress in the IT use, still some of the existing bugs including inadequate communication between data elements make repetition. For instance, despite the fact that the output of human resources program at the end of the month includes the sum of working and overtime hours, extracted data should be given to software to calculate additional remuneration. While working flow chart, structure and elements of data and the relationship between information and data elements are considered to be the essentials of an efficient data system (19); however, some studies have reported the increasing success in the relationship between information elements and development of information network and its benefits utilization (20).

Positive points of the current study have been the use of various data gathering methods, as well as the participation of the main stakeholders and using their experiences, but conducting the project just in one hospital has been considered as a limitation in this study. Therefore, it is suggested to conduct the same study in more hospitals

and even concentrate on communication and the use outside the hospital and in intra-network.

5. Conclusion

Generally, nursing managers felt comfortable using the computer system and considered it as a facilitator in doing affairs. Head nurses used the computer systems to access and transfer data in their management process, and detachment between some data was considered as a major problem. Moreover, potential possibilities in data analysis were not fully realized, and even the managers themselves did not really need to have access to the information and analyze classified data.

The use of modern management approaches based on improvement of using data sources by nursing managers, generalizing and concentrating and reconstructing the technology system for integration can bring about more efficacy and development of IT use in nursing management.

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