

Nurses' experiences and viewpoints about the benefits of adopting information technology in health care: A qualitative study

Jamileh Farokhzadian

Kerman University of Medical Sciences

Reza Khajouei

Kerman University of Medical Sciences

Arie Hasman

Amsterdam Universitair Medische Centra

Leila Ahmadian (✉ ahmadianle@yahoo.com)

Kerman University of Medical Sciences <https://orcid.org/0000-0002-6487-2209>

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Abstract

Introduction

Nurses are the largest users of hospital information systems in any health care system. Hence, collecting nurses' experiences and viewpoints about benefits of integrating IT into health care can help managers facilitate nurses' adoption of IT. This study explored the experiences and viewpoints of nurses with IT integration into health care and their adoption of IT.

Methods

This study was conducted with a qualitative research approach. Participants included 14 nurses from four hospitals, affiliated to a large medical university, who were selected using a purposive sampling method. Data were collected through semi-structured interviews and analyzed using the conventional content analysis of Lundman and Graneheim.

Results

Six categories in the study reflected the nurses' experiences and viewpoints about benefits of integrating IT into health care. These categories included improving the quality and efficiency of medical services and care, facilitating the communication management in the technological environment, improving information documentation, management, and monitoring, improving resource management, improving management performance and policymaking, and facilitating pathways of organizational and professional growth.

Conclusions

Understanding of nurses' experiences and viewpoints about IT can contribute to the adoption, to overcome the barriers, and to develop appropriate strategies to orient nurses towards the benefits of IT in health care settings. Health care managers are recommended to investigate the experiences of nurses with IT in their hospitals and organize courses to orient hesitant nurses toward adopting IT.

Introduction

Since the beginning of the third millennium, information technology (IT) has been identified as the most important development throughout the world. In a dynamic environment, IT has also dramatically affected the health care pattern at all levels [1]. Nurses are the largest group of IT users in any healthcare system, and their adoption is critical to integrate IT successfully [2]. Use of IT has had positive effects on many nursing care aspects including time management, time spent on patient care, documentation time, information quality and access, quality of documentation, knowledge updating and utilization, nurses' autonomy, intra- and inter-professional collaboration, nurses' competencies and skills, nurse-patient relationship, assessment, care planning, and evaluation, teaching of patients and families,

communication and care coordination, quality of care, nurses and patients' satisfaction, patient comfort and quality of life related to care, and staff empowerment [3].

Despite well-documented benefits of integrating IT into healthcare, several studies reported that nurses did not adopt such tools completely [4–6]. There are still some barriers (e.g. underutilization and reluctance to use IT, sabotage, nurses' resistance to IT implementations, and unfavorable attitudes toward IT) to the successful interaction of nurses with IT systems in health care, and fitting IT into the workflow of nurses is challenging [6–8]. The lack of adoption of these systems can result in the failure of IT implementations, or suboptimal user-system interactions, which in turn lead to user's frustration, inefficiency, and a potentially negative impact on patient outcomes [9].

It is noteworthy that IT adoption can be reinforced by facilitating factors such as minimizing nurses' discomfort about IT, exploring and understanding nurses' experience about the benefits of integrating IT to their practice [6, 10]. On the other hand, the literature showed that IT adoption varies greatly among different types of organizations and countries and is also affected by cultural, socio-organizational factors, and demographic features such as hospital size, type of hospital (whether it is educational or not), ownership, location or area (urban or rural), budget, IT staff, and awareness of the benefits of IT [11–13]. Therefore, qualitative studies presenting nurses' experiences and viewpoints about the benefits of adoption of IT to diverse contexts will be worthwhile [14].

Several qualitative studies in various countries explored nurses' experiences and viewpoints with IT implementation, facilitators of and barriers to the use of IT. The nurses mentioned both negative and positive experiences and viewpoints with IT implementation. Lack of training and awareness about the potential benefits of IT contributed to the negative experiences of the nurses. Researchers concluded that managers had to refine policies to reflect benefits of IT in nursing practice. Further research also should be conducted to confirm patterns of nurses' adoption to IT in different contexts [2, 15, 16].

Although the studies mentioned the surveyed nurses' experiences and viewpoints about adoption of IT, its barriers and facilitators, there is insufficient knowledge regarding the nurses' experiences and viewpoints about the benefits of IT adoption in Iran. Also, previous studies on nurses' experiences demonstrated that adoption of IT varied in different contexts and cultures. Since Iranian hospitals have now implemented IT this is a good time to study nurses' experiences and viewpoints about the benefits of IT integration in healthcare using a qualitative approach.

Methods

Design and settings

This study was conducted using a conventional, qualitative, content analysis method. The content analysis approach is typically used to investigate and clarify the concepts, words, and phrases within a text.

The study settings were four hospitals affiliated with the Kerman University of Medical Sciences in the southeast of Iran. Authorities of this university select appropriate e-Health applications for the hospitals. The hospitals have more than 20 years of experiences of using IT and are among IT pioneers in Iran. They were accredited as modern hospitals in the Kerman province. They have implemented a comprehensive Hospital Information Management System (HIS) to automate hospital management tasks such as cost management, resource management, medication management, office automation, accounting, nurses and physicians' performance assessment, and patients' registration. Currently, the HIS is implemented in nursing stations, pharmacy, laboratories, radiology, outpatient departments, and inpatient wards.

Normally, after the implementation of a HIS, nurses receive both medical informatics and regular computer training informally and formally. Also a short training is provided in the departments when new functionalities are released. Moreover, proper implementation strategies including educational sessions, distribution of users' manuals, and small gatherings help increase the HIS acceptance in hospitals. Hospital managers also created IT departments. IT staff who was working in the IT departments of the hospitals and had enough knowledge of all aspects of e-Health applications consulted the nurses during the development of the HIS.

Sample

A purposive sampling method was applied, and 14 nurses (clinical and educational supervisors, head nurses, one quality improvement officer, and clinical nurses) were selected to participate in this study. The sampling process was based on the principle of maximum variation to capture rich and diverse perspectives and experiences. Therefore, nurses with different genders, ages, years of work experience, degrees, positions, and clinical wards were enrolled. The sampling process was continued until data saturation was reached, and no new information was obtained anymore. All of the selected interviewees had several years of experiences in their professions. They were normally working with IT such as a HIS and most of them also have been working with paper-based systems for several years.

Data collection

Data collection was performed through open-ended semi-structured interviews. Initially, a few questions were designed and asked to create a friendly atmosphere. The interview questions sought to capture nurses' experiences and viewpoints about the benefits of IT in health care. Some of the raised questions were: what are the benefits of IT in health care? Does health care improve when using IT? How? Do you think that IT has changed health care? If yes, please explain the changes due to the use of IT compared to the paper-based system. Interviews with nurses were conducted in their hospitals after receiving their consent. The interviews took 40–65 min in a quiet room near the ward or another location based on the participants' preference.

Data analysis

The data were analyzed based on instructions proposed by Lundman and Graneheim [17]. Accordingly, each interview was immediately transcribed and read several times so that the researcher achieved a general perception of the content. In the next step, the primary codes and meaning units were determined. Afterwards, the codes were merged and classified based on their similarities. Finally, the hidden concepts and contents were extracted from the data.

The trustworthiness of the data was determined using Lincoln and Guba' criteria, including credibility, confirmability, dependability, and transferability [17, 18]. To ensure the credibility of the findings, the researchers were constantly in working on the data, and were in contact with the participants for one year. Furthermore, the primary condition for an in-depth interview is trust-building. Therefore, summaries of the interviews and results were presented to participants, and they were asked to confirm the contents. The codes and methods of categorization were continuously reviewed by the co-researchers. The encoding process and access to categories were checked by some faculty members specialized in qualitative research.

Results

A total number of 14 nurses participated in the study. Table 1 represents the demographic information of participants.

Table 1
Demographic information of participants

participant	gender	age	position	Work experience	degree
1	f	40	Head nurse	15	master
2	f	44	Head nurse	18	master
3	f	39	Clinical nurse	15	bachelor
4	m	37	Clinical nurse	9	Bachelor
5	m	40	Clinical nurse	17	Bachelor
6	m	33	Clinical nurse	10	Bachelor
7	f	30	Clinical nurse	5	Bachelor
8	m	27	Clinical nurse	2	Bachelor
9	f	47	Clinical nurse	25	Bachelor
10	m	55	Clinical nurse	30	Bachelor
11	f	42	Officer of quality improvement	21	Master
12	f	49	Educational supervisor	28	Master
13	f	40	Educational supervisor	21	Master
14	f	45	Clinical supervisor	23	bachelor

Table 2 shows the six categories and 21 subcategories that emerged from the data analysis, which are described in the following.

Table 2
The categories and subcategories of data

Categories	Subcategories
1.Improving the quality and efficiency of medical services and care	<ul style="list-style-type: none"> -Reducing clinical risks and error -Increasing staff safety -Improving decision-making efficiency -Maintaining continuity of care -Improving workflow (work process) and planning care
2.Facilitating the communication management in the technological environment	<ul style="list-style-type: none"> -Improving inter-organizational communications -Improving and expanding the intra-organizational communications
3.Improving information documentation, management, and monitoring	<ul style="list-style-type: none"> -Benefitting from simultaneous documentation and care -Increasing data and documentation accessibility -Increasing integrity of information -Creating a precise and secure archive of documents and information
4. Improving resource management	<ul style="list-style-type: none"> -Reducing workload and paper work -Saving non-nursing staff -Being purposeful and optimizing activities -Saving time and costs
5.Improving management performance and policy making	<ul style="list-style-type: none"> -Reinforcing a dynamic and responsive structure -Improving accreditation and audit -Facilitating the staff' performance evaluation
6. Facilitating pathways of organizational and professional growth	<ul style="list-style-type: none"> -Creating aspiration to improve the informatics competencies -Enhancing virtual training and facilitating the training process -Developing Technology according to the needs of healthcare providers

1. Improving the quality and efficiency of medical services and care

Reducing clinical risks and error

According to the participants, the care provided through IT was more accurate and had a higher quality. Nurses indicated that they felt peace of mind by using this technology, since it gave them a sense of control over the patients' condition and status. The impression of the nurse showed that IT reduced care risks and errors.

“When the patient's blood group is recorded as O⁺ in the HIS, errors of the laboratory staff are largely prevented.” (p 12)

Another important IT application is the medical error reporting system. “When an error occurs, we fill in the online error reporting forms. The error analysis authority collects all forms and shares online corrective error strategies with all wards.” (p3)

Application of IT also has decreased medication errors and improved drug management.

“In the past, medications were prescribed manually; therefore, errors and omissions of medications were possible, but now in case that drug pharmacies make a mistake in delivering the drugs, HIS helps us to understand errors and omissions.” (p1)

Increasing staff safety

In this regard, IT improves safety and peace of mind of the healthcare staff. Considering access to integrated information of the patient's status provided by HIS, a feeling of confidence and peace of mind is induced in nurses. They have control over the situation, because all documentations are available and these documents cannot be manipulated or deleted from the HIS.

“Previously, when paper documents were lost, we could not prove where they were lost, and we were blamed. Now, with IT we have solid documentations that are not lost. For example, a CT scan was made in the emergency section, but it was lost in the surgery ward. The IT unit determined that the CT scan was removed from the patient profile in the internal medicine ward; so, the emergency department personnel were acquitted.” (p1)

Improving decision-making efficiency

The decision-making process of the healthcare team is optimized with the help of valid information. Technology plays a major role in providing the required information. For example, application of IT can reduce the time needed to transfer information to the healthcare team, including nurses and physicians. As a result, decisions are made with maximum efficiency and in a timely manner.

“The patient was not feeling well and we informed the physician about the patient's condition directly and the necessary measures were taken within an appropriate time. Although documentation takes a long time in a traditional and manual environment, IT can do this within a few minutes.” (p10)

Maintaining continuity of care

One of the most basic responsibilities of a nurse, as a care giver, is to ensure continuity of care. In this regard, IT leads to continuity of care and reminds about the patients' medical history. Physicians have quick access to the results of diagnostic and laboratory tests and graphs; so, continuity of care is provided.

“Physicians can easily enter the patient's national code at the clinic and observe a CT scan or X-ray report. They can diagnose the disease and start the medications very quickly. Previously, everything was done by hand and it took a few days to receive the para-clinical test results; so, the treatment process was stalled.” (p2)

Another benefit of IT is protection of patients' data during the delivery of shifts, acceleration of shifts' delivery, and reduction of delays in the care process at the time of shift change.

Improving workflow (work process) and planning care

Rapid access to patients' information, including the results of tests and graphs, accelerated the work processes and improved the nursing care and treatment plans. The workflow improved and the care team's satisfaction increased.

“We sent the patient to the emergency ward at night for a test. At the same night, the physician observed the results in her office using the Picture Archiving and Communication System (PACS) and started the medication procedures immediately.” (p2)

“Patients insist upon being discharged after surgery; with the help of IT, we can easily continue their treatments after discharge and prepare the bed for the next patient.” (p. 9)

2. Facilitating The Communication Management In The Technological Environment

Improving inter-organizational communications

Information communication in a healthcare setting is a major challenge, since accurate communication and timely transmission of information are necessary. It concerns the simultaneous communication between care teams in different departments of the hospital. For example, electronic records have created a wide communicational system between therapeutic wards and para-clinical units such as pharmacy, radiology, support, revenue, admission, and discharge. Furthermore, IT facilitated communication with patients and increased their trust in the care team.

“I fill out the equipment breakdown form in the HIS; the equipment authority sees it in his system simultaneously and comes to fix it fast. Moreover, all the personnel in the ward know about the damaged equipment and the time of their fixation.” (p5)

Improving and expanding the intra-organizational communications

Nurses indicated that we reached a stage where all health information of individuals is stored in an e-health record throughout their lives. Therefore, in the case of a treatment requirement anywhere in the country, the individual's profile is accessible through a computer network using the national code. In addition, IT facilitated transfer of information with the Ministry of Health and among other hospitals and healthcare organizations.

“Several electronic systems, such as registration of maternal deaths and reporting of nosocomial infections provide accurate and uniform data for the different levels of health care systems. For example, when a pregnant mother's death scenario is entered into the system from a hospital, the Ministry of Health immediately investigates the case and makes plans at the macro level to reduce maternal deaths. Then, the related instructions are sent to all the hospitals of the country.” (p 12)

3. Improving Information Documentation, Management, And Monitoring

Benefitting from simultaneous documentation and care

Today, information management with technology is considered as the core of nursing care. Simultaneous documentation and care help caregivers to record care events. In the same vein, other IT benefits include providing careful and comprehensive care, reducing the time required to document reports, and increasing the available time to provide direct care to patients.

“The patients' history in their electronic files helps the triage, when the patient has a cardiovascular disease, I will prioritize him/her and inform the physician. I also take emergency measures such as tests.” (p2)

Increasing data and documentation accessibility

If the data are not available in a timely manner, their capture will be useless. All data should be readily accessible at the time of need for clinical, administrative, and organizational purposes. Further benefits of IT include speeding up access to previous records of patients, increasing the accuracy of patients' data registration, increasing the accuracy of data, receiving daily statistics and reports, and reporting on hospital income and expenses.

“When we want to see the changes of bleeding patient's hemoglobin levels from the time of admission, we simply open the system and compare the test results. However, if we wanted to search the paper files, the test results may be not available, lost, or unordered.” (p1)

Increasing integrity of information

Information management and monitoring have changed hospitals from traditional into modern medical organizations. Registration of all information in the HIS and recording all care processes have ensured

the integrity and uniformity of the information. This information can be used for treatment, research, and planning. Many of these data, such as nosocomial infections and adverse events are sent to the Ministry by electronic systems.

“HIS provides a rich network of information for the hospital to conduct research and managers can calculate a lot of indicators using this information.” (p 13)

Creating a precise and secure archive of documents and information

Participants also pointed out that IT has created a convenient and secure archive for documents, so that information and documentation will never be lost.

“The electronic archive will make it easier to find and view statistics. The paper files may be torn or destroyed by events such as fire. However, in the electronic archive, there is no risk of missing information because the IT department often makes backups of documentation and information.” (p11)

4. Improving Resource Management

Reducing workload and paper work

Participants highlighted the important benefits of IT in reducing paperwork and staff's job load as well as saving paper consumption.

“We had to send a large number of paper requests for blood for the patients of cesarean section daily. Many of these requests were returned due to errors and thus turned into waste. The same problem was about the patient's examinations and X-rays. All these are now electronic.” (p14)

“Since IT was implemented, it was good, because in previous paper work, documents were lost. We used to spend much time to keep the paper documents without strikes and folding, but now we do not have these problems.” (p1)

Saving non-nursing staff

As the findings show, IT saves non-nursing human resources. For example, it reduces staff movement among wards. Previously, most non-nursing personnel were constantly moving between wards to deliver documents. Today, however, information is easily exchanged with IT and most non-nursing personnel tasks are done by IT.

“We used to regularly send nursing staff to take test request with the samples to for example the laboratory requests, but now we can see the results quickly in the HIS.” (p10)

Being purposeful and optimizing activities

Application of IT has reduced many repeated and unnecessary tests and measures. As a result, the burden on family caregivers has reduced.

“Formerly, a lot of patients' X-rays were disposed or archived at a great cost. However, the PACS saves both patients and hospitals' costs. Calculation of expenses is much easier and no service record is eliminated or thrown away”. (p2)

Nurses also believed that with IT, many targeted measures were carried out without time delay and cost.

“Our social workers open the HIS in their room and check which patients need help. So, every day they go to the target patient's purposefully. There's no need to go to every single ward and find the patients who need help.” (p11)

Saving time and costs

Nurses described IT as facilitative factors in rendering care services, speeding up tasks, and saving costs and time for patients and nurses. In addition, IT provides the opportunity for nurses to spend more time with patients.

“Previously, when we wanted to get information from head nurses or sent a letter to them, an individual should go to all wards every day to deliver letters or collect responses. This process was very long and time consuming. Now, by application of IT, the authority can see the letter at the same time.” (p11 and p12)

5. Improving Management Performance And Policy Making

Reinforcing a dynamic and responsive structure

Participants indicated that the provision of enough information and statistics were the benefits of IT for senior managers to make timely, logical, and specialized decisions and policies. They believed that IT led to timely detection of shortcomings, fast access to financial and organizational reports, accurate reporting and accountability to executives, and appropriate communication with financial managers for mid-level and operational executives. Moreover, IT controls performance and strengthens accountability and responsiveness of employees, since records and documents are firmly recorded for all actions with date and time.

“The HIS is an audit system. So, staff pay attention to not lose any sheets of the patient's profile and physicians are committed to protect the graphs and services they carry out, because no service can be eliminated and they must be responsive.”) p3)

Improving accreditation and audit

Furthermore, IT has facilitated quality improvement actions such as auditing and accreditation through the inter-organizational communication network. All data concerning the implementation of work processes, policies, indicators, and reports of patient safety events are recorded and monitored. Then, the relevant documents are used for accreditation and audit purposes.

“We now create a folder called “Accreditation Standards” in the HIS for all departments and share all accreditation actions in this folder. For example, personnel review this folder, complete the forms related to accreditation actions, and send them to us. All personnel can access this information in the folder.”

(p11)

Facilitating the staff' performance evaluation

Managers need valid information to control, observe, and evaluate implementation of duties by personnel, which is facilitated by IT. Moreover, staff's self-assessment and participation in the process of performance evaluation is mentioned as another benefit of IT.

“Previously, a management team evaluated and completed the paper documents, but from this year onwards, an electronic evaluation system has been launched. All staff should upload and submit their self-assessment documents, which are later evaluated by the nursing director. Finally, the results of staff's evaluations are observable in electronic profiles.” (p13)

6. Facilitating pathways of organizational and professional growth

Creating aspiration to improve the informatics competencies

Participants believed that the combination of both technological advances and nursing care experience makes the technology more effective in improving the quality of care. In addition, the health care providers are required to acquire and update their informatics competencies. They upgrade their informatics competencies in various ways, such as learning from colleagues, participating in training courses inside and outside the organization, and participating in own-leadership learning.

“As IT grows throughout the health system, I became more enthusiastic about updating my informatics competencies. I tried to attend educational courses inside and outside the hospital. If I had any problems, I asked my colleagues or the IT department staff in the hospital. The discussion sessions were also useful. Staff could talk about and resolve their problems with IT programs. These sessions helped to increase my informatics competencies.” (p4)

Enhancing virtual training and facilitating the training process

Considering the world's continuous changes, nurses should update their IT knowledge in line with the technological advances and take education seriously to cope with change. Furthermore, IT boosts training in medical professions. For example, electronic exchange of patients' files between different treatment centers, discussions about diagnosis and treatment of patients, and application of patients' information such as results of X-rays at training sessions help the individual and professional development of the health care team.

“In one ward, a patient had a blood transfusion problem; the novice nurse did not know what to do. I told him, on the phone, to refer to the blood transfusion folder, read the instructions on managing blood transfusion problems, and take the necessary action. In other words, by application of the virtual learning system in the HIS, personnel are not always required to attend the classes.” (p14)

Participants also believed that the process of training and completing personnel training records was much faster and less costly with IT.

“I enter the educational program of each month in the system and the personnel signs up for the classes they need. At the end of each class, they receive a certificate that will be placed in their training records. The personnel can access their own educational records anywhere in the world.” (p13)

Developing Technology according to the needs of healthcare providers

The deficiencies of IT will be detected while nurses are using it. Nurses and nursing directors have an effective role in determining deficiencies when developing IT by conducting periodic reviews to detect problems in healthcare due to deficiencies in IT.

“In the previous HIS, some codes, such as bronchoscopy of lung parenchyma, were not defined for our ward. However, the new version added these capabilities. Gradually, defects were corrected and patients and nurses are more comfortable.” (p5)

Discussion

The present study attempted to investigate the benefits and outcomes of using IT by nurses in the healthcare system. The results showed that the positive effects of IT affected the performance, conception, and attitude of nurses.

One of the categories of this study was “improving the quality and efficiency of medical services and care” combined with its subcategories, including reducing clinical risks and error, increasing staff safety, improving decision-making efficiency, maintaining continuity of care, improving the workflow)work process(, and planning care. In agreement with our results, previous studies showed that using IT increased the quality of patient care and improved the standards in healthcare organizations [6, 19] by supporting clinicians in making clinical decisions [20], improving decision making efficiency [21, 22], decreasing medical errors, improving providers’ performance [22], improving work flow [23], supporting

nurses' daily activities [24–26], reducing delays in care at the time of shift change and maintaining continuity of care [22].

Another study reported that other important applications of IT included the patient safety information system and the medical errors reporting system. These systems are considered as essential factors for implementing patient safety plans and reducing medical errors because the most important steps to learn from errors include identifying and recording them accurately as well as learning from previous experiences. Patient safety data can be collected and analyzed by the patient safety information system [27]. The considerable potential of IT in improving patient safety is undeniable, but controversies exist about the theoretically and empirically reported benefits. Considering the paucity of information about the quality and safety improvements as well as cost effectiveness of IT, comprehensive and rigorous set of measures are required at all stages of the life cycle with regard to future IT [28].

In the present study, facilitating the communication management in the technological environment along with some subcategories, such as improving inter-organizational communications as well as improving and expanding the intra-organizational communications were important perceived benefits of IT mentioned by nurses. Similarly, a study indicated increased patients' trust in the physician-patient relationship and fostered medical information sharing as the result of implementing an electronic health record system [23]. In addition, two studies maintained that IT improved communication between/among wards and staff [22, 29], teamwork [29], communication between providers and patients, evidence-based practices and research utilization [30]. Finally, the improvement of communication positively influenced the workflow and quality of patient care [31].

Furthermore, improving information documentation, management, and monitoring along with its subcategories including benefitting from simultaneous documentation and care, increasing data and documentation accessibility, increasing the integrity of information, as well as creating a precise and secure archive of documents and information were other perceived benefits for integration of IT in healthcare system. The literature showed that IT could manage patients' information, increase the legibility of recorded data, increase patients' security of information and documents, increase data accessibility, and improve accuracy of information and activities [22]. Other studies indicated that use of IT facilitated access to nursing documentation and readability of these documents. Furthermore, it reduces duplicate documentation, enhances completion of nursing documentation and medical examinations, and facilitates the transfer of information during shift work. They also improve patients' data records and help nurses spend more time taking care of patients. Such systems are also useful to conduct related research [24–26].

One of the categories in this study was “improving resource management” combined with many subcategories, including reducing workload and paperwork, saving non-nursing staff, being purposeful and optimizing activities, as well as saving time and costs. These results were in agreement with previous studies that reported the benefits of IT in healthcare such as higher efficiency of services, reduced treatment costs and resources, reduced task time and increased working speed, faster transmission of

lab test orders, reduced staff movement between wards, reduced paper work and consumption, reduced workload, omission of repeated tests and activities, improved review of patients' records to plan their care, improved exchange of information, increased hospital revenue [22], reduced burden on family caregivers [32], and reduced repeated imaging [33]. Another study also showed that the data collected with an information management system were clear, accessible, complete, timely, and relevant. In other words, healthcare professionals could use these data to provide high-quality services, and managers were able to manage their resources, including staff and tools, more efficiently [34]. In the study by Ammenwerth et al. nurses reported reduced reworks of paper documentation as one of the advantages of the electronic documentation system [24]. Controversies exist in the literature about the application of a computerized provider order entry (CPOE) system in Iran. For example, Rahimi et al. reported that most physicians and nurses disagreed that a CPOE system was more efficient and easier to use than a paper-based system [35]. The reason for this discrepancy may be the difference in the studies' environmental conditions. For example, CPOE is still underdeveloped in Iran, and there are problems for integrating the requirements and infrastructures of CPOE. However, researchers in a study highlighted that non-application of modern IT in the patient care process could lead to many problems, such as lack of easy access to information in the records, reduction of efficiency in treatment centers, increase of costs due to repeated tests, reduction of effectiveness of the provided services, lack of high-quality and timely data during treatment services, reduction of patients' satisfaction with health centers, lack of data integration, slow process of detecting prevalence of diseases, decrease in quality of health cares, and failure to analyze or inappropriate analysis of outcomes of the provided services [36].

Another investigated category was “improving management performance and policy-making” with a number of subcategories such as improving accreditation and audit, facilitating of staff performance evaluation, as well as reinforcing a dynamic and responsive structure. These results were in agreement with studies that reported nurses’ adoption of HIS had the potential to influence policy-making and management of nurses who used such technologies at work [14]. Similarly, empirical studies of nurses’ IT adoption showed that IT contributed to improving accreditation, audit, management performance [22], increasing accountability, and responsibility [1]. Another research showed that IT was very advantageous for quality control, quality assurance, process monitoring, and process optimization programs [34]. Another study noted that IT was an important part of the staff empowerment process and improvement of human resource capabilities. Also, IT increases staff’s knowledge, creativity, and quality of performance [37].

The other category found in this study was “facilitating pathways of organizational and professional growth” with subcategories, including creating an aspiration to improve the informatics' skill, improvement of virtual training and educational processes for the staff, and planning for gradual technology evolution. In the same regard, research reported that enhancing computer knowledge was important for the acceptance of HIS and similar technologies. Nurses’ computer competence had a significant positive effect on the participants' attitude toward HIS [14]. Another study found that the application of IT by healthcare providers contributed to gradual system evolution [1] and stimulated users to add useful functions to the system [38]. Moreover, in a study by Zakane et al. nurses argue that the

application of a clinical decision support system increased their knowledge. Participants believed that these systems could be used as continuous training for them [39]. Blank et al. also showed the positive effect of nursing decision support system on the improvement of nurses' skills and knowledge [40].

Limitations

Although this study's results presented valuable information about nurses' viewpoints and experiences of benefits of integrating IT into health care and their adoption of IT, the study still has limitations. First, this study explored benefits of IT based on the experiences of nurses working in the health care system of ..., and it is difficult to know whether the findings are transferable to all professional groups. Also, other benefits may be perceived in different cultural and organizational contexts, with other groups, e.g., physicians, and even from a multidisciplinary perspective. Second, this study did not focus on negative experiences or viewpoints of nurses with IT. However, the nurses did not mention negative aspects during the interviews. Future studies should endeavor to overcome the shortcomings associated with this study. Third, we did not compare nurses' perceptions of paper and electronic system; a quantitative study design can supplement a qualitative study to explore the benefits of integrating IT compared to using paper systems. Such mixed-method studies will increase the reliability of the outcomes and will help researchers achieve comprehensive results and enrich insights.

Conclusions

In the 21st century, IT has become a critical resource to improve health care across the world. Therefore, it is very important for researchers to study the clinicians' experiences about the benefits of IT in clinical settings. Given the experiences of nurses, integrating IT into health care improves the quality and efficiency of services, facilitates the communication management, improves information documentation and resource management, improves management performance and policymaking, and also facilitates pathways of organizational and professional growth. The insights presented in the study can increase nurses' understanding of IT importance.

Implications for Practice

The results suggest that the managers and policymakers of the health care system invite nurses from the studied hospitals to present their positive experiences and use them to develop appropriate strategies and policies for improving IT adoption among nurses and other medical professions. When nurses are hesitant or have a negative feeling, managers can organize courses for orientating a positive direction. Furthermore, researchers can explore motivators that enhance nurses' adoption of new IT in the research area and other contexts. Probably, providing users with positive feedback, technical support, and good training programs can help designers facilitate adopting of IT. Regarding the expansion and specialization of nursing, nursing informatics experts should be recruited to promote the services provided by nurses in educational, research, clinical, and managerial areas.

Abbreviations

IT

information technology

PACS

Picture Archiving and Communication System

HIS

Hospital Information Management System

Declarations

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Availability of data and materials

The data are available upon request to the corresponding author after signing appropriate documents in line with ethical application and the decision of the Ethics Committee.

Authors' contributions

JF, RK, AH, and LA contributed to conceiving and designing the research. The data were collected, analyzed, and interpreted by JF, RK, and LA. JF, RK, AH, and LA contributed equally to writing and revising the manuscript and approved the final manuscript.

Ethics approval and consent to participate

This study was approved by the Ethics Committee affiliated with Kerman University of Medical Sciences (IR.KMU.REC.1395.435). Then, oral and written informed consent was obtained from the nurses before recording the interviews. The nurses were informed that participation in the study is voluntary. Furthermore, nurses were ensured about the information confidentiality. The researchers also asked the nurses to call or send an e-mail in the case of having any questions or misunderstanding.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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