# Nurses' Viewpoints on Barriers and Facilitators to Use Hospital Information Systems

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**Abstract.** In this qualitative study, we explored the nurses' experience in using hospital information systems (HIS) to identify barriers and facilitators of using this system. We interviewed twenty one purposefully-selected nurses who have experience in using HIS and analyzed the data using conventional content analysis. We identified 17 facilitators and 12 barriers classified into main themes. Lack of support for nurses, their resistance, any force for using HIS, perceived difficulty of using HIS, inadequate system quality, data loss, discontinuity of information in different systems are the main barriers. However, considering nurses' perspectives, pilot implementation of HIS, training, planned implementation, appropriate financial and non-financial incentives, adding new and appropriate functionalities, increased ease of use and usability, easy access to information, improved data quality in HIS, and saving nurses' working time through using HIS result in increased adoption the system to use.

**Keywords.** hospital information system, nurse, barrier, facilitator, use, adoption

## 1. Introduction

Expansion of application of information technology has led hospitals to use information systems to receive, transmit, retrieve, process and display data [1,2]. One of the most widely used of these systems is the hospital information system (HIS), a comprehensive and integrated system for controlling clinical, and administrative data of hospitals, supporting patient care, and creating electronic processes [3,4]. Studies have shown that the use of information systems in the health sector results in benefits such as cost savings, time saving, reducing medical errors, reducing waiting time, reducing mortality, managing side effects of medications, improving the workflow, improved quality of service and timely access of healthcare providers to patient information [5-11]. However, implementation and

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use of these systems have always faced several limitations and barriers. According to the studies, the most important barriers include financial, technical, and organizational barriers. In addition, user behavior and attitude to use is also important [11-13]. Identification of barriers and considering facilitators for adoption of information systems in clinical environment is essential [14,15]. Exploring the experiences and opinions of hospital information system (HIS) users such as nurses who are the large part of the professional providers in the healthcare systems have a major impact on the process of implementing information systems in hospitals [3,16,17]. Exploring nurses' experiences on working with these systems to identifying challenges and facilitators of HIS adoption will lead to quality improvement and adoption of these systems [3,17,18]. Although numerous studies have examined nurses' satisfaction with HIS, evaluating HIS from the nurses' perspectives, their expectations and attitude towards HIS in Iran [1,3,5,7,19,20]. However, the barriers and facilitators of implementing this system have not been qualitatively explored from the nurses' point of view. Therefore, the purpose of this study was to identify barriers and facilitators of implementation and use of HIS from the nurses' perspectives.

## 2. Method

This qualitative study was conducted through the conventional content analysis approach of semi-structured interviews with nurses. The interviews were conducted with nurses who had experience of working with hospital information systems and were interested and consented to participate. We reviewed relevant literature to develop the initial version of the interview guide and the validity of the questions was assessed through interviews with four faculty members and the necessary modifications were made. We used the purposive, non-random, and snowball sampling methods to select and interview nurses which was continued until data saturation. Finally, 21 nurses who work in teaching hospitals affiliated with Iran University of Medical Sciences were interviewed (45 minutes for each interview). All interviews were recorded using two recorders and were transcribed immediately after interviews. The transcribed notes then were given to the interviewees for confirmation. Participation in the interview was completely voluntary and the consent form was obtained before each interview. Conventional content analysis was used to analyze the data. After reading the interviews, we coded the nurses’ statements finally; we aggregated and classified codes according to similarities and differences. The codes were determined by one researcher and then controlled by the second author and modifications were made through group discussion, if there was any disagreement.

## 3. Results

All interviewees were female and most of them had a bachelor's (66%) or master’s (34%) degree. Among them, 33% were the supervisor of clinical wards. Thirty eight percent of participants had more than 10 years experience in working with HIS. In addition, 71% of nurses were younger than 40 years and 38% had less than 10 years of working experience.

In the following sections, we discuss the identified themes and sub-themes accompanied by some related sample participants' statements.

### *3.1. Facilitators*

We classified facilitators into five main themes and 17 sub-themes (Figure 1).

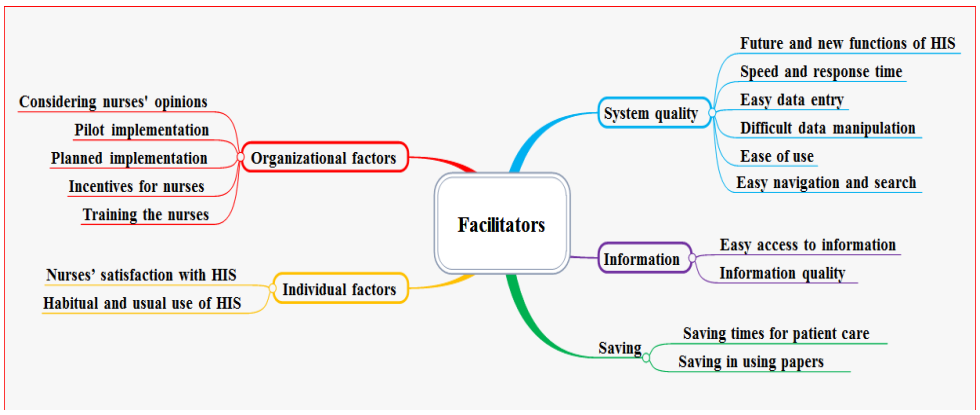


**Figure 1.** Main themes and sub-themes for facilitators to use HIS

*Organizational factors:* Nurses considered several organizational factors for increasing the use of HIS. Some nurses believed that they participated from the needs assessment phase to the pilot and fully implementation of the system and their "*opinions*" were considered by the mangers. They considered it effective in nurses' satisfaction and use of HIS. For example, nurses stated that *"here, nurses suggest about the system and their opinions are heard; for example, we are consulted about the internal portal of the hospital" (P.16)* or *"Surveying the staff has a huge impact on their acceptance and interest in the system" (P.8).* Nurses considered *"planned implementation"* of the system by the organization as a facilitator. According to one of the nurses, *"The system was first piloted in the ICU and then fully implemented in ICU after identifying and solving the problems. They did not mess up the whole hospital functions" (P.7).* On the other hand, nurses considered "*training*" as a facilitator. *"When you learn something, it becomes easier to learn the next thing. The voice technology system has changed a lot now, and the bugs are fixed. Since we knew the basics, it is easier now for us to learn the next changes" (P.4).* In addition, nurses considered "*pilot implementation*" in limited departments as an important organizational factor to encourage nurses to use the system and believed that this type of implementation is essential to system success. *"We have been working for 6 to 7 months as a pilot to add voice technology to our ward or for example, nursing sheets have been piloted here for one year."(P.12)* or *"Nurses must first use software as a test" (P. 14).* Many nurses stated that they need appropriate *"incentives"* to use the system. Nurses found the upgrading of the system and responding to their needs as an incentive. For example,

they stated that *"the greatest incentive and motivating factor for the nurse is to see the time and energy saved by using this system" (P.13)* or *"To encourage nurses to use, managers should think about their outdated systems and its' time consuming process because we have very limited time" (P.20)* or *"we had no financial or organizational encouragement as far as I know" (P.11).*

*Individual factors:* This theme addresses the individual characteristics that have been identified by nurses as influencing factors, including the *"satisfaction with the HIS"* and the *"habit of using it"*. The surveyed nurses believed that their satisfaction with HIS is effective in using of the system. *"I was not dissatisfied with HIS and 90% of nurses I know were satisfied with it" (P.17).* Nurses also believed that the habit of using the system is another factor that nurses cite as an influencing factor on the acceptance of the system. *"We were subjected to this system unconsciously. We worked with it from the beginning and got used to it" (P.4).* Or, *"in this ward, since nurses first started using HIS, they find it desirable and have become accustomed to these conditions" (P.10).*

*System Quality:* This theme addresses search and navigation, data entry, speed, ease of use, and future functions of the system. The "*Future functions*" indicates what nurses expect from the system but are currently not equipped. *"Physicians' orders are gonna be implemented in our system" (P.2)* or *"we don't type too much. We record the reports as a voice and a system is coming to type our voice automatically" (P.13)*. Nurses considered HIS as a time-saving tool. They believed that "*system speed*" saves time and increases time for clinical services *"Voice technology on HIS speeds up and, nurses work very easily" (P.2)* or *"This system makes things easy and speeds up the process. We will be informed of the results of the tests"(P.1)* or *"Nurses have access to a comprehensive system that will obtain the information they need in the shortest time" (P.6). "old data processing systems take a long time that nurses are not interested in using" (P.3).* Nurses believed that "*easy data entry*" is effective in shaping the mentality of nurses. *"We don't type too much. We document the report in voice" (P.1)* or "*typing is actually easier than writing"(P.4)*. Nurses also considered the "*inability to manipulate data*" as a guarantee of security. *"HIS is so that it guarantees the safety of patient information and cannot be manipulated" (P.8).* The nurses also cited *"ease of use"* as a facilitator. *"We can report at any time. We have a very simple task" (P.7)* or *"all of our work is done with this system and much of our work has been made easier" (P.4).* The "*Searchability*" was also an important facilitator. *"Our HIS is easily searchable and the data is retrieved quickly" (P.6)* or "*we want to find a form. It should not take a long time. Someone who wants a CPR checklist should find it with a simple search."(P.16).*

*Information***:** Nurses believed that their use of HIS depends on the information available and the ease of access to it. Nurses stated that they expect to be able to access the high quality information they need as quickly as possible. *"Nurses should have access to a comprehensive system to obtain the accurate information they need in the shortest time" (P. 7)* or *"connecting the different parts of the hospital, this system enable us to access information" (P.8).*

*Saving***:** Nurses acknowledged that using HIS reduced bureaucracy as well as the time needed to find information and allowed them to spend more time on "*patient care*". For example, *"working with HIS speeds up and nurses can spend more time with patients."*

*(P.14)* or *"it took a lot of time to write in the patient's record but HIS saves a lot of time" (P.6).* In addition, nurses believed that use of HIS result in "*saving papers*" and reducing the paperwork. "*We should have written or signed three sheets before, but this is not the case with HIS" (P.2).*

*3.2. Barriers*

We classified barriers into five main themes and 12 sub-themes (Figure 2).

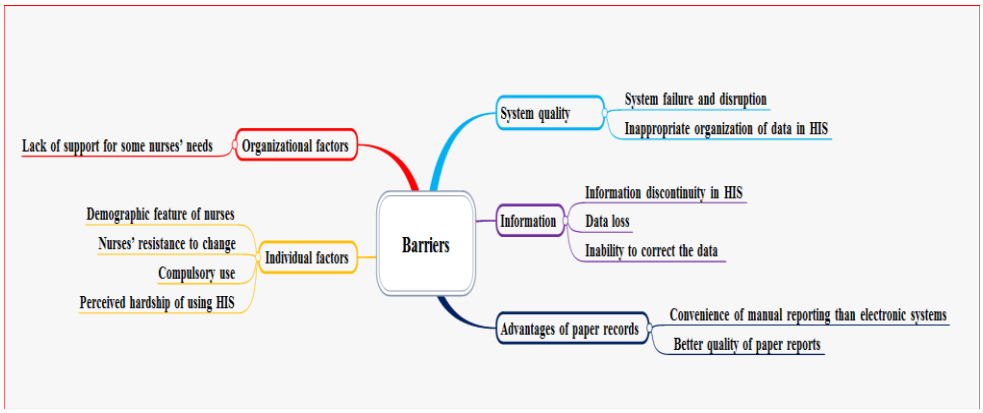


**Figure 2.** Main themes and sub-themes for barriers to use HIS

*Organizational factors:* This theme refers to factors in the organization that negatively influence on nurses' view of system acceptance. This theme includes a *"the lack of support for nurses' needs"*. For example, *"the system is paperless, but it requires a supportive system at all times. When the system crashes in the evenings or nights, no one is accountable."(P.7)* or, *"we should copy some paper forms for the crash time that system doesn't work" (P.9).*

*Individual factors:* Nurses have identified some individual factors that, in their view, can negatively influence on using HIS. Some of the nurses stated that they faced with *"compulsory use"* forced by managers and this may hinder them to use HIS eagerly. For example, *"the system is provided to nurses and they must use it" (P.18).* Participants believed that *"negative perception"* regarding the hardship of using technology can negatively influence user acceptance. *"We had the same idea about the Voice technology. We felt afraid of this technology and thought it was very difficult to tell your story, but not now." (P.14)* or, *"when a new system is coming, people don't like it. They think it's terrible" (P.20).* The theme of *"demographic characteristics"* includes jobs, roles, previous experiences, and age that influence on working with HIS. *"With this new system, everybody has to go to their profile and confirms his/her signature, but the nurse assistants are weak in this regard" (P.17).* Or, *"One of our nurses is 50 years old. I have to prepare all the works and plans and give them to her, because she doesn't learn to use HIS" (P.17)*

or, *"new comers can be a barrier. Specially, if they are relocated from centers in where works are done manually." (P.6).*

*System Quality:* This theme indicates all things that decreased the quality of HIS for nurses. According to the nurses, the main problem of the system is its failure and disruption. For example, "*the system broke down many times, especially in the case of voice reporting. We had many troubles before." (P.12)* or, *"when the system crashes, you can't use it, which is the worst failure" (P.14)*. In addition, inappropriate organization of data in the HIS negatively influence on nurses to find needed data. *"Finding a simple form in HIS is really time-consuming." (P.7).Information:* This theme deals with the issues that may cause disturbance in the process of documentation, storage and retrieval of information from HIS. Nurses mentioned a number of cases that the data entered in HIS had got "*lost*". For example, *"I remembered that a case I recorded the patient medication information in the system, and later the data was not in the system" (P.12)* or, *"if the system crashes suddenly, information will be lost" (P.8).* Furthermore, some problems result in "*information discontinuity*" and nurses' dissatisfaction. For example, *"if the HIS crashes, we have to go back to the previous HIS system or document the data manually, which causes a discontinuity in our graphs and reports" (P.2)*. Or, *"Server problems at night shifts are very problematic. Because IT experts are not present, we have to go to the old system and then information is disrupted." (P.5)*. From the nurses' perspectives, correcting the false data entered and editing it in the system is one of the problems that nurses find it difficult. For example, nurses stated that *"many errors can be corrected during manual documentation but not in the system" (P.4).* Or, *"We are sad. If anyone comes in and speaks, the voice can no longer be changed. The record cannot be changed under any circumstances when it is recorded" (P.7)*.

*Advantages of paper records:* This theme includes the sub-themes of *"convenience of manual reporting"* and *"quality of paper reporting"*. A group of nurses compared the HIS with the manual method and in some cases considered the manual method to be more economical and convenient. For example, *"Using a handwritten document, it is much easier for me to figure out what kind of activity the nurse was doing." (P.6)* or *"Correction in manual documentation is easier." (P.4)* or *"For patients who have been in the hospital for a long time and a lot of information is being recorded, their page in HIS is delayed and this makes it a little time-consuming to record information than paper records." (P.8)* Also, manual methods have been considered better by some nurses in terms of quality. *"I prefer the paper records, its quality is much better." (P.13)*.

## 4. Discussion

The purpose of this study was to determine the barriers and facilitators of HIS use among nurses based on their experiences. The average work experience of the participants indicates that they are fully familiar with HIS. They had also received adequate training on how to operate the system. Also, given their average age and experience with HIS, it can be inferred that they can be able to identify the factors that affect their use, satisfaction and motivation of working with HIS.

The barriers to using HIS were classified in five main themes and 12 sub-themes. According to the findings, nurses believe that lack of support for nurses, their resistance, any force for using HIS, perceived difficulty of using HIS, inadequate system quality, especially in term of system failure and usual crashes, inappropriate data organization, fear of data loss, discontinuity of information in different electronic or manual systems, and difficulty to correct errors in the system negatively influence their use of HIS. Some of the nurses believe that using paper records is more convenient and demographic characteristics of nurses have also negative effects on the use of HIS. Other studies confirm these results [16]. For example, one study indicates that system failures and limited speed increase nurses' concerns about the use of health information technology [1]. Other studies show barriers such as the lack of belief in the benefits of these systems for health care workers; fears, worries, and anxiety about the presence of computer systems in the workplace, disruption, information organization [2], increased workload [5], demographic characteristics [10], user resistance [6], delays in work due to system failure and dysfunction [7] which are consistent with our study on barriers to use HIS among nurses.

The results also show, considering nurses' perspectives, pilot implementation of HIS before fully implementation, user training, planned implementation, appropriate financial and non-financial incentives, increasing nurses' satisfaction with HIS, adding new and appropriate functionalities to HIS to meet their needs, improved system speed and response time, easy data entry, prevention of data manipulation, increased ease of use and usability, easy access to information, improved data quality in HIS, saving time through using HIS may result in the increased eagerly use of HIS among nurses. Other studies indicate that ease of use and usability of an IT system [8], ease of access to patient information [7,9,11], easy information retrieval [13], easier documentation of information [4,5], saved time [4,7,11,14], system speed, cost savings [3,7,11] and meeting the future users' requirements [11] have potential positive influence on use of a system.

Some limitations should be considered. This study was conducted in only teaching hospitals affiliated with one medical university in Iran and may not be generalizable to other populations. In conclusion, we qualitatively explored the nurses' experiences on using hospital information systems to identify factors that may increase or decrease their tendency to use this technology and found the factors that hospital managers and health (nurse) informaticians should consider to increase adoption of HIS among nurses. To increase the usage rate of HIS among nurses, these mangers should develop a team of nurses before a full implementation of the hospital information system to collect nurses' views. Factors related to nurses' training including determining educational content, timing of training, and training method should also be considered. Quality of the HIS and patients' information are important for nurses and managers should pay attention to these factors at time HIS selection and monitoring the patients' information in the HISs.

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