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Evaluating Nurses Acceptance of Hospital Information Systems: A Case Study of a Tertiary Care Hospital

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Abstract. This study aims at evaluating hospital information systems (HIS) acceptance factors among nurses, in order to provide suggestions for successful HIS implementation. The study used mainly quantitative survey methods to collect data directly from nurses through a questionnaire. The availability of computers in the hospital was one of the most influential factors, with a special emphasis on the unavailability of laptop computers and computers on wheels to facilitate immediate data entry and retrieval when nurses are at the point of care. Nurses believed that HIS might frequently slow down the process of care delivery and increase the time spent by patients inside the hospital especially during slow performance and responsiveness phases. Recommendations were classified into three main areas; improving system performance and availability of computers in the hospital, increasing organizational support in the form of providing training and protected time for nurses' to learn and enhancing users' feedback by listening to their complaints and considering their suggestions.

Keywords. Hospital Information Systems, Acceptance, Satisfaction, Nurses.

Introduction

Hospital information systems (HIS) are comprehensive, integrated and specialized information systems designed to manage both the administrative and clinical aspects of hospitals and healthcare facilities. They are considered one of the most important focal points on which the delivery of healthcare depends [1]. Despite the proved evidence that HIS have the potential to improve health of individuals and performance of healthcare providers, yielding improved quality, cost savings, and greater engagement by patients in their own healthcare, healthcare professionals and hospitals' adoption, acceptance and utilization of HIS is still low [2]. The response of healthcare professionals to the use of hospital information systems is an important research topic that can explain the success or failure of any HIS development and implementation project [3]. HIS research often focuses on IT design and implementation, but may be not enough on how end users react to already implemented HIS. The fit between HIS and clinical work will lead intended users to accept or reject the HIS, to use it or misuse it, to incorporate it into their routine or work around it. This is why many researchers have been trying to explain delayed or unsuccessful implementation of HIS by exploring the problem of acceptance or resistance of healthcare professionals'

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towards these systems [4]. The effect of information technology knowledge, experience and skills of healthcare professionals, current status of computerization and availability of computers in hospitals, and professionals' attitudes, in terms of their positive or negative beliefs about computerized systems and HIS in the healthcare environment are considered among the major barriers to the successful implementation and use of such systems. Training of healthcare professionals is needed to enhance positive attitudes about HIS and build confidence in the benefits of these systems [5]. Most research on HIS acceptance has focused on physicians and very less is known about nurses' acceptance of HIS technology and its different functionalities, despite nurses are usually the largest population among all healthcare professionals in hospitals [6]. Some challenges to acceptance and use may be temporary and visible only during the initial adoption and adjustment phase that immediately follows implementation. Other challenges to acceptance and use may arise only after extended use of the technology by users [7]. The implementation and utilization of the hospital information system at King Faisal Specialist Hospital and Research Center, Saudi Arabia have been facing many challenges. Among these were the resistance, acceptance and satisfaction of the HIS by end users; mainly nurses. The Health Information Technology Affairs (HITA) department decided to conduct a survey to explore and evaluate HIS acceptance by nurses and investigate the influential factors that might affect acceptance levels.

1. Methods

The Health Information Technology Affairs developed a questionnaire to collect objective quantitative data from nurses about their acceptance of the currently operational HIS. The questionnaire contained five sections of questions; the first section included demographic information, such as age group and total healthcare experience. The second section included ten statements regarding general HIS assessment, the third section included four statements regarding accessibility and availability of computer terminals in the hospital, the fourth section included three statements regarding the HIS and the patient care and the fifth section included six statements regarding the nurses satisfaction with the HIS. The questionnaire sections from two to five used the classic five Likert scale format; strongly agree, agree, neutral (neither agree nor disagree), disagree and strongly disagree. One final open ended question was added to ask nurses about their suggestions to improve the HIS performance, acceptance and satisfaction among nurses.

2. Results

The researcher used SPSS – statistical package for social sciences to perform statistical analyses including descriptive and inferential statistics. The total number of valid responses was 244 participant nurses. Regarding the age group distribution; 3 nurses were less than 25 years old (1.2%), 85 were 25 to 35 years (34.8%), 99 were 36 to 50 years 99 (40.6%) and 57 were over 50 years old (23.4%). Regarding the total work experience of the nurses in the hospital; 55 had less than 2 years of experience (22.5%), 56 had 2 to 5 years (23.0%), 76 had 6 to 10 years (31.1%), 43 had 11 to 15 years (17.6%), 7 had 16 to 20 years (2.9%) and 7 had over 20 years of experience (2.9%). Table 1 shows HIS acceptance factors sorted ascending by nurses' responses.

Looking into the inferential statistics of the results; the age group had a statistically significant effect on many of the acceptance and satisfaction factors evaluated, showing that older nurses accepted and were satisfied with the availability, performance and function of the HIS, in general, more than younger nurses. Younger nurses, 35 years or less, were specifically unsatisfied with the availability of computers, speed and responsiveness of the HIS performance and confirmed that using the HIS increased the time spent by patients in the hospital and slowed down the healthcare processes.

The total years of experience of nurses in the hospital had also a statistically significant effect on most of the acceptance and satisfaction factors evaluated, showing that nurses with longer experience, more than 10 years, accepted and were satisfied with the availability, performance and function of the HIS, in general, more than nurses with shorter experience, 10 years or less. Nurses with shorter experience were specifically unsatisfied with the HIS performance speed, user friendliness of the HIS and comprehensiveness of the downtime procedure and their preparedness for it. They also shared young nurses in their concerns regarding the unavailability of computers and the increased time spent by patients in the hospital due to using the HIS.

Table 1. HIS Nurses Acceptance Factors Sorted Ascending.

Nurses Acceptance & Satisfaction Statements	Score	Answer
HIS performance speed is acceptable	2.0	Disagree
HIS is user friendly and easy to use	2.8	Neutral
HIS screens layouts are appropriate	3.1	Neutral
HIS provides sufficient information	3.2	Neutral
HIS provides accurate information	3.3	Neutral
HIS provides updated information	3.4	Agree
HIS fonts and characters are easy to read	3.5	Agree
HIS provides clear information	3.5	Agree
HIS improves access to patient information	3.5	Agree
My practice needs are optimized by HIS provided	3.6	Agree
HIS General Assessment Overall Score	3.2	Neutral
Laptop Computers	1.4	Strongly Disagree
Computer on Wheels/Flo Computers	1.5	Strongly Disagree
Computers are always available when I need them for HIS	1.8	Disagree
Desktop Computers	2.3	Disagree
Availability of Computers in the Hospital Overall Score	1.8	Strongly Disagree
Use of HIS decreases time spent by patients in the hospital	2.4	Disagree
HIS improves the quality of patient care process	3.2	Neutral
HIS improves the quality of patient data entry and retrieval	3.2	Neutral
Patient Care & HIS Overall Score	2.9	Neutral
I am prepared for HIS downtime	2.2	Disagree
HIS downtime procedure is clear and comprehensive	2.3	Disagree
Overall, I am satisfied with HIS	2.8	Neutral
Current HIS training materials are helpful	2.9	Neutral
I am satisfied with the support provided to HIS users	2.9	Neutral
I received enough training on HIS	3.0	Neutral
Users' Satisfaction Overall Score	2.7	Neutral

3. Discussion

It is very clear from the results of the survey that the "Availability of Computers in the Hospital" had the least acceptance overall score among the four sections of factors, with a special emphasis on the unavailability of laptop computers and computers on wheels to facilitate immediate data entry and retrieval when nurses are at the point of care, especially from the perspective of younger nurses. Many studies discuss and highlight the influence of computers availability on the success or failure of hospital information systems adoption and implementation [8, 9]. Nurses were not satisfied with the downtime procedure and they highlighted that they are not prepared for it; to switch to an alternative manual system in case the electronic system failed, especially from the perspective of new nurses. They said that HIS downtime procedure is not clear and not comprehensive; where many studies highlighted that clearly understood downtime can spare a lot of the unintended consequences or HIS related medical errors, especially in the areas of medications and ICU [10, 11]. Younger nurses agreed that using the HIS might frequently slow down the process of care delivery and increase the time spent by patients inside hospital. This is typically reported; a form of decreased efficiency and increased patient waiting time, mainly in the outpatient settings and during the process of registration and admission especially at the beginning of the HIS implementation or at the transitional phases of updating or upgrading HIS [12-14]. Nurses agreed that the performance of the HIS is slow overall and that this slowness is not acceptable and might lead to more slowness in the process of care delivery and might increase the time spent by patients inside hospital even more. Research work shows that inadequate design of HIS, such as bad or inadequate user interface or poor HIS performance, such as slow response times, will reduce its chances of being accepted by users and implemented successfully [8]. Years of experience and age group both had significant influence on nurses' acceptance of the HIS, where younger and less experienced nurses had lower satisfaction levels. Younger and less experienced nurses thought that the system is very slow, the system is not user friendly or easy to use, and the system provides insufficient information, inaccurate information and sometimes out-of-date information. Younger and less experienced nurses thought that there is a severe shortage in the number and availability of computers, especially laptop computers and computers on wheels. They believed that computers are not always available when they needed them. They also thought that using the HIS increases the time spent by patients inside hospital and does not improve the quality of patient care much. They also reported that they are not prepared for the HIS downtime, the downtime procedure is not clear or comprehensive and that the HIS training materials are not helpful.

4. Conclusions and Recommendations

Using qualitative thematic analysis of the nurses feedback to the open ended question, about their suggestions to improve the HIS performance, acceptance and satisfaction among nurses, we could summarize the conclusions and recommendations into three main areas; improving system performance, increasing organizational support and enhancing feedback mechanisms. On the first area; it is very important to enhance the software speed, responsiveness and increase the availability of computers, laptops and computers on wheels. Screen designs need to be enhanced with more focus on the

sequence and logic of functions, tasks and buttons, some software features need to be more user friendly or user adjusted when possible, such as font size. The conventional methods of data entry, using keyboards, are labor intensive and time consuming, which can be alleviated by using new innovative technologies such as automated voice recognition. The second area includes increasing organizational support of nurses, through providing more training to nurses, more dedicated and protected time during working hours to learn and practice on the system after implementation or upgrade and providing better user manuals and materials for training and also as reference for nurses when they have problems. The third area is enhancing channels of communication and feedback, since many nurses reported that they have been suggesting ideas and sometimes finding solutions for problems but the low communication level and unavailability of reliable feedback mechanisms decreased their chance of successful contribution to HIS improvement. We recommend that this type of study should be expanded to include other hospitals, secondary and even primary health environments.

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