Original Research Article

Perception of data quality and electronic health information system acceptance, reliability and satisfaction: A study at tertiary care hospital in Saudi Arabia

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Abstract

Electronic health information systems (EHIS) are considered a backbone for healthcare planning and quality services. This study was designed to explore the acceptance, reliability, and satisfaction of the end users' experience with the hospital electronic health information system. We also investigated the perception of data quality by the users who were directly involved in data entry. We conducted a questionnaire based cross-sectional survey to collect quantitative data from different EHIS users. The questionnaire contained six sections: demographic user information; general HIS assessment; accessibility and availability of computer terminals in the hospital; EHIS and the patient care; user satisfaction with the HIS and perception of data quality. Desktop computers were available throughout the hospital, but the hospital was lacking handheld computers or computers on wheels. Participants of the study were satisfied with the data entry and retrieval process but they were lacking job training related to troubleshooting. EHIS users were not aware and prepared for the downtime of the system and procedures were also not clear to them. Regarding the perception of data quality, most of the participants responded that data is of adequate quality. There is a need for proper technical support and enhance the hospital's networking speed for better response. Laptops and hand-held computers are the need of time for data entry in critical situations and during wards visit. This can also enhance the quality of data, and reduce the chances of data loss.

Introduction

Innovative electronic health information systems (EHIS) are robust, automated, and advanced information systems for handling healthcare administrative, financial and clinical data. These significant systems play a vital role in documenting all aspects of patient care including medical services, evaluations, procedures, follow-up and critical medical decisions [1,2].

Health information systems can enhance health care provider efficiency by providing quality and cost savings healthcare services [3,4]. Different studies documented EHIS implementation and adaptation issues. The most reported issues were

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related to progress notes and other time-intensive components that forced medical professionals to spend extra time in data entry processes and exploring productive ways of using the EHIS [5,6]. This significant factor of time cost increased the resistance to use EHIS by physicians that undermines the potential for quality improvement [7]. IT firms are trying to boost EHIS usability by providing significantly advanced technology, such as voice recognition, tablet computers, wheel computers, or mobile hand-held devices. The development of user-friendly artificial intelligence (AI) based applications are a breakthrough in the medical industry that forced the software industry to think more censoriously about the application in healthcare domain [8].

During the implementation phase of electronic health information systems, most of the issues arise at the transition phase when healthcare professionals have to toggle between the paper base and electronic systems during the patient care process. This factor also slows down the workflow, takes more time to enter data from external systems manually and increases healthcare professionals' resistance to EHIS use [9]. Another issue during this phase is the inadequate electronic data exchange and integration between different EHIS modules and other electronic systems. Typically, EHIS systems need many difficult complimentary adjustments and support during the modification and final optimization procedure. EHIS developers, physicians and other healthcare professionals carry out several challenging and time-consuming practices to configure, adapt and augment the EHIS product until new technology benefits are achieved [6,9]. Electronic health information systems' development and implementation within the health system need coordination with data quality teams and end-users who directly interact with these systems [10,11].

Data quality is essential in planning and maintaining healthcare services. Indeed, structured quality data is the cornerstone of every healthcare organization [12,13].

King Fahd Central Hospital is also trying to implement the electronic health information system in all departments in full capacity and improving the data's reliability by enhancing the quality of data. The hospital is using an electronic health information system since 2015 in full capacity. Nevertheless, there are many challenges related to system usage, data quality, reliability, and integration.

We designed this study to explore the acceptance, reliability and satisfaction of the end users' experience with the electronic health information system. We also investigated the perception of data quality by the users who were directly involved in data entry.

Materials and methods

We performed this study from September 2020 to December 2020 at King Fahd Central Hospital, Jazan, Saudi Arabia. The study's targeted population was about 1606 hospital staff members. The participants were selected conveniently.

We conducted a cross-sectional survey and a questionnaire was adopted [14] to collect quantitative data from EHIS users. The questionnaire contained six sections: Demographic user information; General HIS assessment; Accessibility and availability of computer terminals in the hospital; EHIS and the patient care; User satisfaction with the EHIS and Perception of data quality attributes.

We distributed paper-based questionnaires to enhance the participants' responses and collected the filled responses within one week. The questionnaire was also translated into Arabic for better understanding among the participants. We circulated a total of 130 questionnaires among the heads of clinical departments, nursing supervisors, pharmacists, and administrative staff who was directly involved in supervision and data entry processes at outpatient clinics, wards and emergency departments. In response, we received 112 filled questionnaires from the participants as the remaining participants did not complete the questionnaire or were not available during the questionnaire collection period. Out of 112 filled and received questionnaires, 87 responses were found valid, while the others were incomplete.

Statistical analysis

We used the IBM SPSS version 25.0 to perform statistical analyses. Descriptive and inferential statistics were conducted. The significance was fixed at p<0.05.

Results

The total numbers of valid responses were 87, showing a response rate of 67%. The percentage of male and female participants was 59% and 41% respectively. The study's maximum participants were nurses (30%) and technicians (28%) who were using the health information system for data recording. The percentage and distribution of other participants are given in **Table 1**. Most of the participants (40%) belong to the age group of 36-55 years, and 43% of participants had 2-5 years of job experience.

We applied the Chi square test to analyze the respondents' acceptance and satisfaction level towards the health information system.

Table 1: Demographic characteristics wise distribution of the study participants

Characteristics		Number	%
Gender	Male	51	59
	Female	36	41
Age (years)	< 25 years	19	22
	25-35 years	29	33
	36-55 years	35	40
	> 55 years	4	5
Job category	Administration	11	12
	Physician/Surgeon	17	20
	Pharmacists	9	10
	Nurses	26	30
	Technicians	24	28
HIS experience in practice (years):	< 1	11	13
	2-5	37	43
	5-8	13	15
	> 8	26	30

Table 2 contains the results related to a general assessment of the Health information system, availability of computers at the health care facility, the performance of Health information systems, and the respondents' overall satisfaction level. We found that computers were available at the point of care and users were satisfied with the overall performance of the EHIS. Users agreed that the system is user friendly and help to improve patient care. According to the respondents, Laptops or computers on wheels were not available in the hospital. Overall, the users were satisfied with the EHIS performance but they were not agreed with the training facilities at the hospital.

Figure 1 represents the participant's understanding of the data quality and its attributes. The 100% (87) of the participants responded that data is of appropriate quality, 97% (85) indicated that data must be complete, 99% (86) indicated that data must be understandable and meaningful, 91% (79) believed that data must be interpretable.

Table 2: HIS user acceptance and satisfaction

Characteristics		Strongly disagree	Disagree	Neutral	Agree	Strongly agree	*X2 (p)
HIS general assessment	HIS fonts and characters are easy to read	0	14	49	24	0	163.31 (0.00)
	HIS improves access to patient information	0	0	36	49	2	
	HIS is user friendly and easy to use	0	2	42	41	2	
	HIS performance speed is acceptable	0	4	47	36	0	
	HIS provides accurate information	0	0	59	26	2	
	HIS provides clear information	0	7	56	24	0	
	HIS provides sufficient information	1	4	24	46	12	
	HIS provides updated information	2	4	34	43	4	
	HIS screens layouts are appropriate	3	12	47	22	3	
	My practice needs are optimized by HIS	0	2	25	54	6	
Availability of computer in hospital	Computer on wheels	11	41	33	2	0	354.69 (0.00)
	Computers are always available when I need them for HIS use	0	20	47	20	0	
	Desktop computers	0	0	9	68	10	
	Laptop computers	49	29	9	0	0	
Patients care HIS performance	HIS improves the quality of patient care process	0	2	41	44	0	122.63 (0.00)
	HIS improves the quality of patient data entry and retrieval	0	0	0	87	0	
	Using HIS decreases time spent by patients inside hospital	0	21	45	21	0	
User satisfaction	Current HIS training materials are helpful	0	11	44	32	0	499.77 (0.00)
	HIS downtime procedure is clear and comprehensive	0	48	27	12	0	

I am prepared for HIS downtime	0	28	50	9	0
I am satisfied with the support provided to HIS users	0	0	0	87	0
I received enough training on HIS	0	0	0	87	0
Overall, I am satisfied with HIS	0	0	87	0	0

*Chi-square test was not statistically significant if p-value more than the level of significance α=0.05

In comparison, 94% (82) indicated that data must be accessible and traceable at the minimum time whenever required. All participants understand that the quality of data is essential and critical for any health care organization.
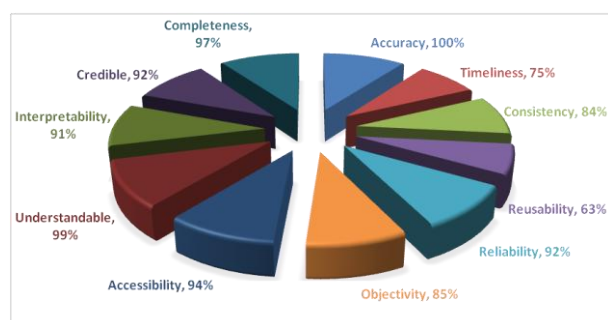

Figure 1. Data quality attributes

Discussion

We conducted this study to evaluate the acceptability and satisfaction level of the health information system (HIS). We had also taken the perception of participants regarding the data quality and reliability. For the development, implementation, and effective management of health information systems, health care professionals' engagement plays a critical role. It supports the health care organizations during and after the implementation process and feedback for its improvement. This engagement process can enhance the health information system's acceptability among health care professionals and the quality of data at the hospital.

The availability of computers on wheels was the least acceptable parameter, and participants were not satisfied with the unavailability of moveable computers and hand-held computers. Although the desktop computers were available at every department and point of contact, laptops and moveable computers were not available for immediate data entry or during the ward visit in a critical situation. Many studies also discussed the same issues in health care organizations where the moveable computers were not freely available [3,15,16].

The maintenance and downtime for system maintenance and system up-gradation were not defined and scheduled in the hospital. Sometimes the downtime was reported due to the internal network of the hospital. Participants were not fully satisfied with the system's speed and sometimes they had to spend much time during the data entry and retrieval process. This can also increase the waiting time of the patients. There was no alternative provided in the hospital that can be used during downtime or service disruption situations. The users had to maintain the manual record for the entry when the system was unavailable. Although the hospital is using third-party software that was responsible for its maintenance and troubleshooting; the management should have some checks for the smooth functioning of the system. This issue can have a serious impact on data quality and reliability, especially in critical situations. Many other studies have also pointed out this issue directly related to data quality, medication errors and incomplete data entry. They pointed out these issues in the outpatient settings while registering and admitting the patients at the hospital [15,17].

Overall, the study participants were satisfied with the electronic health information system's performance and acknowledged that this system helped in data standardization to some extent. Still, there is a need for improvement in the staff's training. Such type of training issues was also identified as a performance indicator in other studies [16,17].

In this study, we observed that the gender of participants did not affect satisfaction level. However, the years of HIS experience, job responsibility and age significantly affected the performance and HIS satisfaction level. Nurses and technicians were mostly satisfied with the HIS performance and found the system user friendly, while physicians' response varied from neutral to satisfied as they were not ready to accept new technology that can delay or slow down the patient care process. Such type of technology adaptation hindrance and avoidance of electronic system evaluation for patient care were also highlighted in different studies [18,19].

Most of the participants were aware of data quality and its importance in a health care environment. As in this study, all participants agreed that accurate data is quality data. In contrast, 99% of the participants responded that the

understandable data is quality, and 97% believed that complete data is quality data. We can compare our study results with the study conducted in Germany, where they found similar results regarding quality data perception **[16,20,21]**.

Conclusions and recommendations

From the results and discussion of the study, we concluded that for quality data generation, acceptance and satisfaction of the health information system, it is essential to improve the EHIS efficiency and availability. In the hospital, there was lack of organizational support in terms of periodic training for the end users. Proper training can reduce patient waiting time and enhance work efficiency. There is a need for proper technical support from the vendor because most of the hospital uses third-party software and is dependent on them for software troubleshooting. The hospital is trying to upgrade the system from an application-based to a web-based system that will enhance the system's remote monitoring and enhance work efficiency.

There is a need to enhance the hospital's networking speed for better response. Laptops and hand-held computers are the need for data entry in critical situations and during wards visit. This can also enhance the quality of data, and there will be fewer chances of data loss.

Limitations

Due to limited time and resource constraints, the study was conducted in one hospital in the Jazan region of Saudi Arabia. Due to this limitation, it may not represent the other hospitals in the region or country. There is a need to explore further the perceptions on HIS software, data reliability and quality.

Declarations

Ethics approval and consent to participate

The ethical committee of Jazan University, Saudi Arabia, approved this study.

Disclosure of relationships and activities

The authors declare that they have no competing interests

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