

## Data Quality Evaluation of Hospital Information System: A User Perspective Study

### Majid Valizadeh

Ph.D. in Medical Physics, Department of Basic Sciences, School of Medicine, Zabol University of Medical Sciences, Zabol, Iran.

### Seyyede Fatemeh Tabatabaei

M.Sc. in Health Information Technology, School of Allied Medical Sciences, Zabol University of Medical Sciences, Zabol, Iran.

### Zinat Shaban

B.Sc. in Health Information Technology, School of Allied Medical Sciences, Zabol University of Medical Sciences, Zabol, Iran.

### Zahra Galavi

B.Sc. in Health Information Technology, School of Allied Medical Sciences, Zabol University of Medical Sciences, Zabol, Iran.

### Jebraeil Farzi ✉

Ph.D. in Health Information Management, Department of Health Information Technology, School of Allied Medical Sciences, Zabol University of Medical Sciences, Zabol, Iran. E-mail: jebraeilfarzi@yahoo.com, ORCID: <https://orcid.org/0000-0003-2889-909X>

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### Abstract

**Aim:** To offer high-quality healthcare services, individuals need to utilize high-quality information. The present study aims to evaluate the data quality in the hospital information system (HIS) at a selected educational hospital.

**Method:** This descriptive and cross-sectional study was conducted in 2018. The statistical population consisted of 202 users of the hospital HIS at Amir-al-momenin Hospital in Zabol. The respondents were selected using stratified random sampling. Data were collected using a researcher-made questionnaire. Then, they were analyzed through SPSS-20 and descriptive statistics.

**Results:** It was found that 45 of the respondents stated in the comprehensibility of the hospital information, while 76 considered the hospital information not very understandable. Moreover, 34.7% believed that the hospital information would be rapidly accessible when needed. The average scores of the dimensions were found to be 5-8.5, and there were significant, positive relationships between all the dimensions under the study ( $P$ -value $<0.05$ ).

**Conclusion:** Findings suggest that only a small number of staff had complete information on the HIS and associated subsystems. Other respondents lacked sufficient awareness of the HIS or were unaware of its existence. The authors suggest that the needs of users be evaluated before designing a HIS system in order to ensure that it will meet those needs. Despite the use of HIS subsystems in all the units of the hospital under study, respondents had insufficient information on how these subsystems could be used.

**Keywords:** Hospital Information System; Hospital; Data Quality; Information Quality; Evaluation

Information is a backbone component of healthcare services in the current information era (1). It is a valuable asset for an organization (2). From a systematic organization perspective, information is the input of the system and influences its output quality (3). Healthcare organizations are no exception and need information. It is necessary to use efficient information systems in order to attain objectives, efficiency, and effectiveness, provide high-quality services, and improve customer satisfaction. Health data refer to the organized data of a patient or a group of patients (4).

Health organizations, particularly healthcare centers, need a hospital information system (HIS), considering the massive amount and diversity of data (5).

HIS is a computer system used as an electronic patient information management instrument. It plays a key role in providing high-quality healthcare services.

Hence, customer satisfaction with HIS is crucial and strongly impacts evolution of the system (5). These systems can support healthcare providers to make clinical decisions, and enhance clinical service quality and safety to minimize medical errors and cost(4, 6). Quality in such systems is typically related to customer satisfaction (7).

Quality is a customer-based concept. ISO describes quality as the entire features of an entity to obviously meet the requirements of users (customers) (8). Treatment institutions under the national health organizations have realized the importance of high-quality information to offer high-quality healthcare services. They attach importance to using timely, accurate, and complete data in terms of supporting patient care, medical supervision, healthcare management and planning, and accountability (7). Concerning the effect of usable data quality on patient care decisions, Shortliffe argued that physicians should have proper and accurate medical knowledge so that they could utilize high-quality data regarding patient care. Physicians who cannot solve the problem may not be ensured to provide high-quality care, despite high-quality data and accurate, efficient medical knowledge (9).

Several researchers evaluated the quality of health data. Ghazisaeedi et al. found that the information systems of public hospitals under the Tehran University of Medical Sciences had an average performance of 20-60% regarding instruction management (10). Ahmadi et al. found that the average score of the criteria of information system appropriateness was 3.04 (out of 5) (11). Joseph et al. reported that hospitals with a high use of health information system showed acceptable information quality

in a significant number of measures and strategies (12).

It can be said that maintaining and enhancing data quality is of great importance, particularly in the realm of hospitals as they seek to provide healthcare through treatment (9). Moreover, an HIS should consistently meet the information demands of users, particularly at the peak of the hospital workload (5). Hence, the present study evaluates the quality of data in the information system of Amir-al-momenin Hospital in Zabol, Iran.

## Method

This was a descriptive and cross-sectional study conducted at Amir-al-momenin Hospital, Zabol, in 2018. 202 employees (including nurses, secretaries, medical record employees, and paraclinical employees) were selected as participants using stratified random sampling. Each department at the hospital was assumed to be a stratum. A questionnaire was developed based on the work of Yang in 2006 (13) to collect data. All of 13 dimensions in the questionnaire were defined in Table 1.

Data were analyzed using descriptive and central statistics, such as mean, standard deviation, and the correlation of the data-quality dimensions based on the Pearson correlation coefficient. The items were included in the questionnaire on the five-point Likert scale. Scores 0, 1, 2, 3, and 4 represented neutral, strongly disagree, somewhat agree, agree, and strongly agree, respectively.

## Results

The demographic details of the respondents are shown in Table 2. As can be seen, the respondents made up 58.4% of women (119). 11.9% of them were between the ages of 25 and 30. Only 12.6% (25) of respondents worked in medical records, compared to 37.7% (76) of respondents who were nurses.

**Table 1:** Data quality dimensions

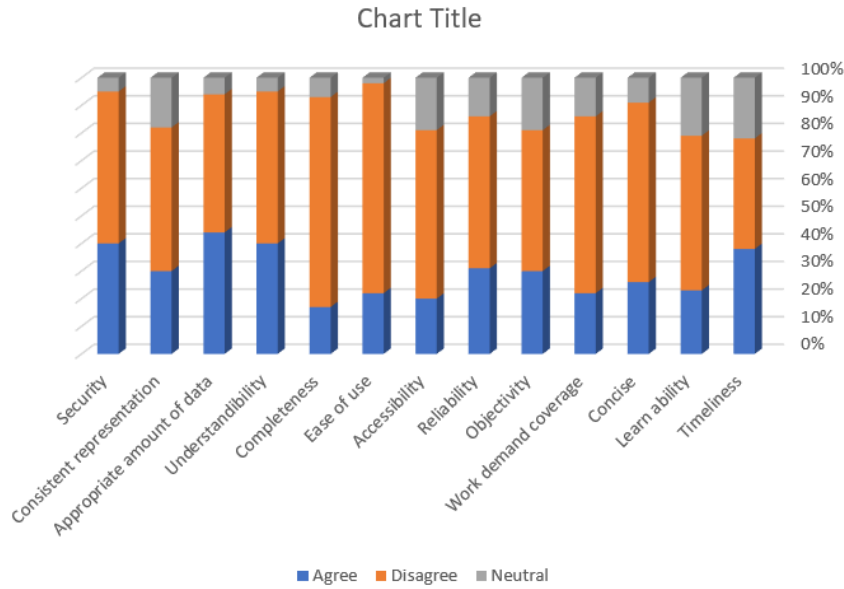
Types of data	Definition
Timeliness	The extent to which year of data is appropriated for the task at hand (14)
Learnability	The capability of the function to enable the user to learn (15).
Concise	The extent to which information is compactly represented without being overwhelming (i.e. brief in presentation, yet complete and to the point) (14).
Work demand coverage	The extent to which data are of sufficient breadth, depth and scope for the task at hand (14).
Objectivity	Extent to which information is unbiased, unprejudiced and impartial (14).
Reliability	Extent to which information is correct and reliable (14).
Accessibility	Extent to which information is available, or easily and quickly retrievable (14).
Ease of use	The degree to which data can be accessed and used and the degree to which data can be updated, maintained, and managed (16).
Completeness	The extent to which data are of sufficient breadth, depth and scope for the task at hand (14).
Comprehensibility	Extent to which data are clear without ambiguity and easily comprehended (14).
Sufficiency of data	The extent to which the quantity or volume of available data is appropriate (14).
Consistent representation	The extent to which data is presented in the same format (17).
Security	The extent to which access to information is restricted appropriately to maintain its security (14).

**Table 2:** Demographic information of participants

Variable		Frequency	Percentage
Gender	Male	83	41.6
	Female	119	58.4
Age	20-25	154	76.3
	25-30	24	11.9
	30-35	12	5.9
	>35	12	5.9
Education	High school diploma	49	24.5
	Postgraduate	23	11.5
	Bachelor	123	60.9
	Master's and higher	6	3.1
career	Nurse	76	37.7
	Secretary	36	17.9
	Medical records	25	12.6
	Para clinical	64	31.8

Figure 1 demonstrates the frequencies of dimensions. As can be seen, 45% respondents agreed with the sufficiency of data in the HIS. This is while 37% agreed that the hospital's

information was easily understandable. Furthermore, 29.7% agreed that HIS could be reliable. 53% believed that hospital information is stored under sufficient security.



**Figure 1:** Frequency distribution of dimensions

The quality of data in HIS was evaluated in thirteen dimensions. It was found that the respondents considered the system satisfactory in terms of accessibility, relevancy, security, comprehensibility, concise representation. Furthermore, significant, positive relationships were found between objectivity and accessibility ( $r=0.62$ ), sufficiency and

accessibility ( $r=0.51$ ), sufficiency and objectivity ( $r=0.5$ ), sufficiency and reliability ( $r=0.42$ ), concise representation and security ( $r=0.46$ ), concise representation and timeliness ( $r=0.45$ ) and consistent representation and security ( $r=0.54$ ) ( $p\text{-value}<0.05$ ). Table 3 reports correlations of dimensions.

**Table 3:** Correlations of data quality dimensions

Dimension	Mean ± Standard Dev.	1	2	3	4	5	6	7	8	9	10	11	12	13
Timeliness	7.35±61.1	1												
Learnability	86.6±32.1	0.719	1											
Concise	65.6±33.1	0.622	0.716	1										
Work demand coverage	93.6±43.1	0.671	0.690	0.716	1									
Objectivity	88.6±36.1	0.596	0.574	0.603	0.565	1								
Reliability	01.7±18.1	0.700	0.689	0.700	0.700	0.610	1							
Accessibility	07.7±39.1	0.533	0.551	0.558	558.0	0.629	0.528	1						
Ease of use	80.6±49.1	0.490	0.488	0.566	479.0	0.536	0.540	0.535	1					
Completeness	62.7±33.1	0.505	0.528	0.551	585.0	0.547	0.518	0.434	0.495	1				
Comprehensibility	12.7±32.1	0.481	0.538	0.545	508.0	0.557	0.445	0.614	0.684	0.523	1			
Sufficiency of data	74.6±22.1	0.424	0.415	0.367	371.0	0.502	0.421	0.513	0.345	0.492	0.439	1		
Consistent representation	87.6±29.1	0.481	0.538	0.545	508.0	0.557	0.445	0.614	0.684	0.523	0.523	0.536	1	
Security	22.7±20.1	0.456	0.429	0.465	458.0	0.566	0.434	0.467	0.423	0.483	0.487	0.430	0.543	1

## Discussion

This study evaluated 13 dimensions of data quality based on the responses of HIS users. They viewed three dimensions, including security, understandability, and sufficiency of data as satisfactory.

Findings indicated that 34.7% of the respondents agreed that HIS was easily accessible when needed. Rouzbahani et al. explored the effects of an HIS on enhancing the quality of medical services at Masih Daneshvari Hospital. They found that communication between hospital departments (81%) was satisfactory. In addition, accessibility of medical information (44%) and facilitation of medical process (61) were found to be relatively satisfactory. The analysis of financial data and budget (1%), clinical research feasibility (19%), clinical guide representation (18%), statistical information accessibility (17%), and financial information accessibility (22%) were concluded to be particularly poor in organizational management. The findings of the present work are in agreement with Rouzbahani et al. (18).

Findings demonstrated that 35.1% of the respondents somewhat agreed that HIS was up to date, whereas 8.4% strongly disagreed. Delvi et al. examined HISs of ten public hospitals under Isfahan University of Medical Sciences. The time and content of dimensions were confirmed at a confidence level of 95%, while the structural dimension was not supported. They concluded that HIS of the organization was satisfactory in terms of timeliness. The findings of the present study were consistent with their research (19).

Moreover, 39.1% of the participants agreed that the hospital information was stored under sufficient security.

Meidani et al. studied the security of HISs. They found that the managerial and physical security of HIS in a case-study on the hospital was poor (i.e., 13.8% and 25.1%, respectively).

Technical security of the HIS was found to be moderate (42.6%). The findings of the present study are in line with this research(20). Results revealed that respondents were not satisfied.

Kimiafar et al. analyzed the quality of information in the HIS of Day Hospital in Mashhad, Iran. They observed that 47.7% of the subjects were dissatisfied with hospital information for helping to make decisions, and 53.2% of the respondents were satisfied with data quality of the HIS. The findings of the present study were in agreement with their research(21). It was found that 30.7% of the participants agreed that data of the HIS were believable, and they were satisfied with HIS.

Azizi et al. (7) investigated the data quality of HIS at a teaching hospital in Mashhad. They reported that 39.3% of the respondents were satisfied with the quality of HIS interfaces. 36.9% were also satisfied with the quality of HIS tasks, 38.2% with the data quality, and 30.4% with HIS performance. Overall, 34.9% of the respondents were satisfied with HIS quality. The findings of the present study are not consistent with their research (7).

## Conclusion

The current study examines the data quality of the HIS at a selected hospital. Even though the majority of hospital information subsystems had been released, research suggests that only admission personnel, clinical ward secretaries, IT professionals, and medical records department staff had comprehensive knowledge of the HIS and related subsystems (e.g., information subsystems for admission, laboratory, pharmacy, medical, and radiology). Other respondents didn't know enough about the HIS either.

In terms of data privacy and timely access to hospital information, it can be concluded that participants were unsatisfied with HIS. Furthermore, they found the data's comprehensibility, ease of use, and sufficiency

satisfactory.

Despite the fact that HIS subsystems were employed in every unit of the selected hospital, the respondents, notably nurses and paraclinical staff, lacked appropriate knowledge about how to use these subsystems. A few respondents also refused to cooperate in answering all the questions or provided insufficient information on HIS. To make sure that an HIS system would suit user demands, the authors advise assessing user needs before beginning design.

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