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Information needs of selected information systems users in 10 Isfahan teaching hospitals

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Title: Information needs of selected information systems users in 10 Isfahan teaching hospitals

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Abstract:

Background: Since effective decisions making requires accurate accessible and timely information in hospitals, the present study was conducted aimed to investigate the information needs of users of the selected information systems in 10 teaching hospital in Isfahan.

Methods: The present applied study was conducted by qualitative method using a content analysis approach to identify the selected information system's users during 2023. The participants included all users of GHASEDAK, AVAB and SEPAS information systems in Isfahan teaching hospitals, which selected purposefully from different levels such as senior and middle management level and various departments such as information technology, human resources, medical record and financial unit with maximum variety. Then it was conducted 43 interviews so that data saturation was reached, the data were collected by semi-structured interviews and entered MAXQDA version 10 and analyzed by content analysis.

Results: The information needs of the medical record managers, senior managers, financial managers, human resources managers, medical equipment staff, IT manager, clinical supervisors, head nurses and the statistician were divided in 19 groups including process data, clinical data, personnel data, administrative and statistical data, financial data, technical data, functional data and error report, management data and statistical reports.

Conclusion: In this survey, it was identified various information needs for the selected information systems' users in Isfahan teaching hospitals. Hence, the hospital contract party software companies might benefit from these results to develop the information systems in next step with considering the information needs of the users.

Keywords: Information need, hospital information system, user.

Introduction: Today, information has become a main and effective factor of the business in organizations and even people's life, and with the development of technology, storage and transmission of information has been considered in such a way that it is the key and vital factor of the organization and the importance of electronic information has also doubled today. In this way, IT can be the main element of the business structure for transferring and processing the information needed to make decisions (1). To achieve objectives such as efficiency, effectiveness, improving service quality and client satisfaction, access to appropriate information is considered as a reliable way. Since in the health system, timely access to medical records plays a key role in planning the appropriate treatment and making correct medical decisions (2), equipping the management with

a reliable information system that enables the management to make appropriate decisions. For planning, organization and control, it has become a basic need in the information age. Today, in addition to routine information systems, managers are also faced with many information systems with a large volume of data not meeting their information needs. The first step to meet the information needs is to identify and evaluate the information needs. The information needs are information presented to meet occupational or research needs, and meeting such needs is determined by the recipient of the information (3). Hospital information system (HIS), are comprehensive systems for electronic management of collected data and enable data analysis and reporting. The objective of HIS is to achieve the best possible process for patient care and admission through electronic data (4).

The information needs of hospital information system users are identity data (national code, place of birth certificate issuance, home phone number, level of education and occupation of the patient) (5) and social data of the patient, which is one of the information needs of admission users. Also, medical data is one of the information needs of physicians and insurance data is one of the information needs of insurance unit users (6). A user is the one who uses the information system and plays an important role in determining the objective and process of the available data (7). In the health sector, HIS data can be used for all groups of patients and hospital personnel, and it can be said that the users of these systems are the personnel of medical records, operating room, financial unit, laboratory, pharmacy and even physicians, nurses and managers (8-10).

Different parts of HIS should be designed in accordance with the tasks and needs of the users, so that regardless of how an information system is designed, if the system does not meet the expectations of the users, it will be neglected and even viewed as sabotage. It will be seen that the motivation to use information systems increases in users when they believe that the information system they are using can meet their information needs (11).

Nazemi (2014) stated that the important part of designing information systems is understanding the needs of users, whose benefits include increasing efficiency and work quality, increasing user satisfaction, and reducing training and support costs (12).

A study by Pouyan et al. (2017) on financial information system, which is considered as one of the most important HIS, showed the indicators of adequacy of the accounting information system in meeting the information needs of managers are the weaknesses of the system. Therefore, it is necessary to evaluate and strengthen the accounting information system to meet the information needs of managers and update the information of managers (13).

A study by Kahoui (2012) showed that most nurses and emergency medicine physicians need several information elements such as the time of the patient's first visit, the time of the first procedure, the last condition of the patient, the type of treatment performed, and the type of para-clinical procedure performed in the emergency information system (14).

In recent years, an increase in the demand for the use of information systems in Iran Ministry of Health has led to the provision and use of hospital information systems (15), which despite the efficiency and usefulness of these systems, contrary to the expectations, still cannot meet the needs of users (16).

The aim of current study was to identify the users' information needs of the three selected information systems using in the hospitals of Isfahan named GHASEDAK (performance-based payment system) (4).

AVAB (hospital statistics and information system) (17). And SEPAS (electronic health record system) (4).

Methods: The present applied study was conducted by qualitative method. The population included senior, middle and operational managers who used the outputs of GHASEDAK, AVAB and SEPAS information systems among the 10 Isfahan teaching hospitals such as the hospital manager and director, supervisors, and head nurses, financial managers, medical statistics administrator, human resources manager, IT manager, and medical equipment unit manager. Purposive sampling was done and the data was collected by semi-structured interview and analyzed by content analysis. The study inclusion criteria were all users who had at least one year of work experience by using the selected information systems. The study exclusion criteria were personnel who did not have the desire or sufficient time to participate in the interview. Data collection tool was semi-structured interview guide. The interview questions were as follows: What data do you need to perform your daily tasks? What data do you need to perform your weekly tasks? What data do you need to perform your monthly tasks? What are your information needs for making decisions for professional tasks? (Appendix 1)

Before conducting the interviews, the informed consent was provided to participants and, with the knowledge and consent of the participants, the interviews were recorded by a digital audio recorder. The interviews lasted 30-40 minutes on average. The preliminary interviews were reviewed by principal investigator and necessary comments and corrections were applied by the interviewer. To confirm the reliability of the tool, the text of the interviews was sent to several participants, and the accuracy of the data was checked and corrective comments were applied. Finally, the data was entered into the MAXQDA version 10 and analyzed by thematic analysis. To evaluate the results, 4 criteria proposed by Lincoln and Guba, including credibility, transferability, dependability, and confirmability (18), were used.

Results: A total of 43 users were interviewed, whose demographic information are given in Tables 1.

Table 1. Level of education of users by gender

Gender	Diploma	Associate degree	BSc	MSc	PhD	total
Female	**1**	**0**	**18**	**4**	**0**	**23**
Male	**0**	**1**	**14**	**2**	**3**	**20**
Total	**1**	**1**	**32**	**6**	**3**	**43**
%	**1.38**	**1.38**	**76.38**	**12.5**	**8.33**	**100**

The results divided in three categories including as follow:

A) Information needs of the medical record department managers

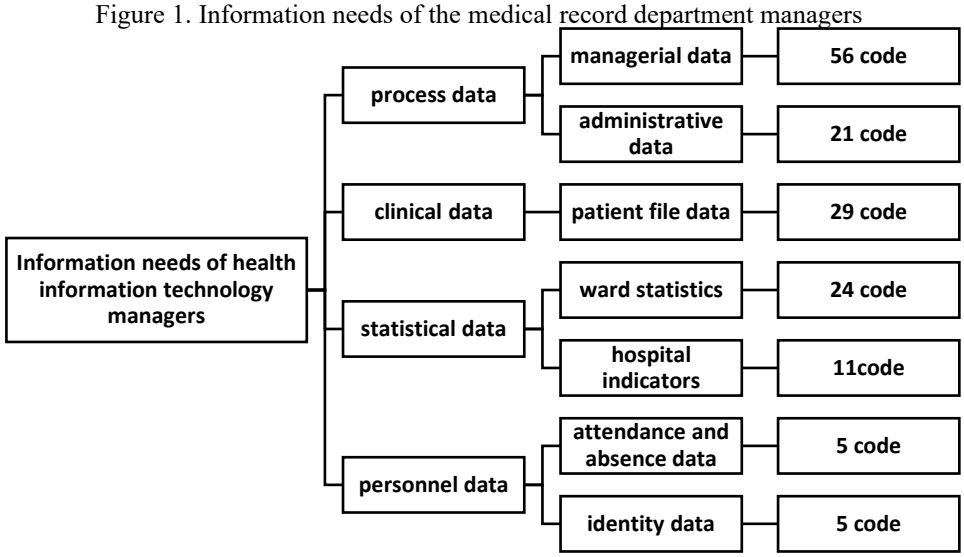
The medical record managers' information needs were divided into 4 groups of process data (management and administrative data), clinical data (patient file data), statistical data (services statistics and hospital indicators) and personnel data (identity, and attendance and absence data) (Figure 1). 151 codes were obtained from the subgroups. By comparing the number of available codes, it was found that the most required data of the hospital MR managers, given his role and responsibility in managing and monitoring information, are process data with management and administrative codes. The most important codes are the report of file deficiencies, the list of duties of the statistician and other personnel of MR department, the statistics of the use of forms and files, the report of the status of file deletion, the report of discrepancies between the system and the paper file, problems related to space and human resources, reports of problems and errors of clinical personnel and medical documents, number of admissions by user, insurance information of patients, familiarization with the difference of departments, job description of clinical personnel and request to print the unit form.

"The form used by the ward secretary to submit ward statistics to the Medical Records Department requires data such as: prior admission dates; transfers from another ward or facility; total figures; discharges; transfers to another ward or facility; deaths occurring before or after 24 hours; occupied bed-days; admissions from the Emergency Department; and stays of less than 24 hours". (P:37)

Then, statistical data (number of transfers, statistics of emergency patients, number of discharged patients, number of inpatients and outpatients, statistics of para-clinical units, statistics of index diseases, number of births, number of deaths, mortality index, statistics of hospital beds, average stay duration, and percentage of bed occupancy) and then clinical data (patient identity information, disease diagnosis code, list of drugs taken by the patient, procedure description, pathology number, file number, patient condition at discharge, and patient diagnosis) are important. Finally, personnel data (attendance and absence data and personnel birth certificate data) with 10 codes are less important.

"We expect to receive complete reports; for instance, when we request patient or physician data, we want the information in full, but the system does not provide it completely."(P:32)

Figure 1. Information needs of the medical record department managers



B) Information needs of the senior hospital managers

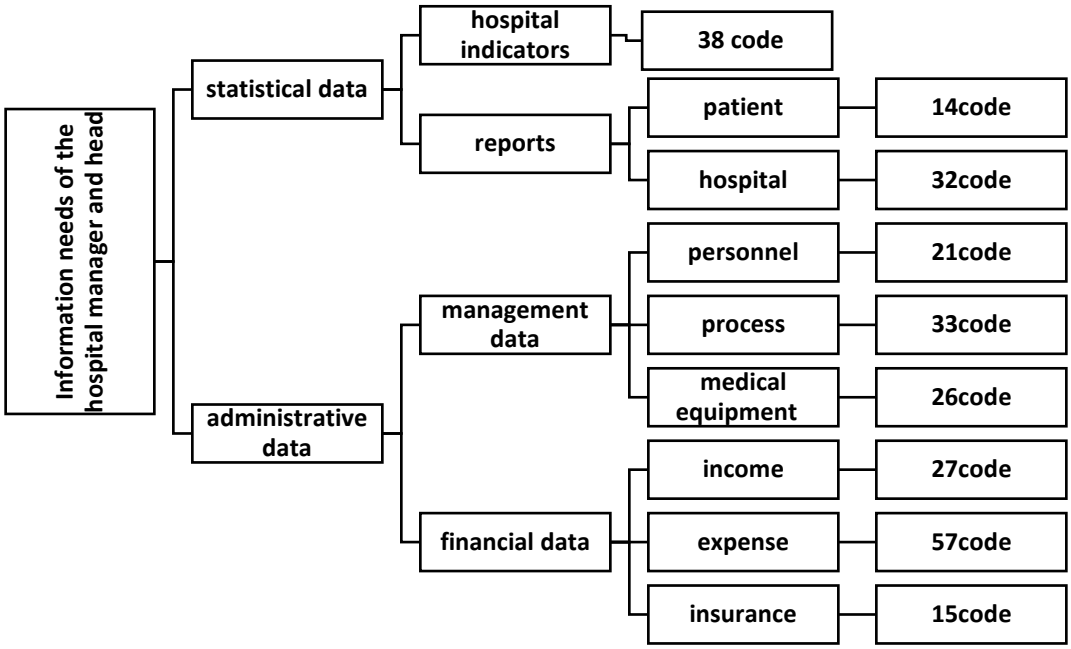
The information needs of senior managers were classified in 2 groups (Figure 2) and 263 codes were obtained. The most informational needs of them are administrative data with 179 codes, most of which are financial data regarding the expense and income, and hospital claims, and then management data such as use of drugs and equipment, list of purchase and incoming and outgoing goods, patient admission problems, memorandum of understanding, familiarization with existing conditions (city, university and patient), familiarization with processes, operational plan of units, analysis of statistical data and graphs of statistical reports, results Monitoring and performance of units, familiarization with accreditation criteria, reporting complaints, needs of departments, and reporting satisfaction of personnel. Then, the statistical data and indicators of the hospital are among the needs of the users.

"Another matter I consider important in my role as head of the hospital is the need to know the average figures for hospital revenue and expenses. Having access to such metrics is highly valuable; knowing the average monthly revenue—and even the precise monthly expenditure—is the kind of information I have always wished to have throughout my career, yet obtaining it was difficult and rarely happened in practice. (P:33)

"I need to know the data at the end of the day regarding the number of hospital beds, active beds, and admitted patients, as well as the number of scheduled, performed, and cancelled surgeries; I also need information on bed turnover and bed-night financials for each ward" (P: 33).

"We certainly need indicators such as occupied bed-days and patient counts—knowing how many empty beds we have, the bed occupancy rate, patient discharge rates, the status of patient financial obligations, interactions with insurance companies, the submission of documentation to insurers, file deductions, budget allocations, procurement, expenses, mortality rates, and transfer statistics" (P: 14).

Figure 2. Information needs of the senior hospital managers

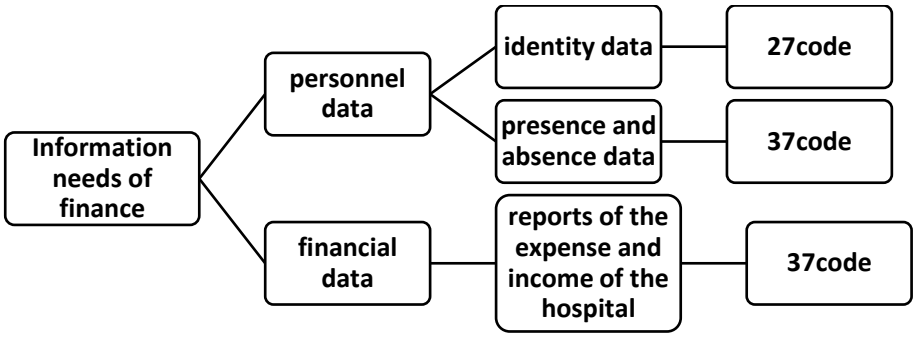


C) Information needs of financial managers

The information needs of financial managers of hospitals, were divided in 2 groups of financial and personnel data (Figure 3). A total of 101 codes were obtained, and since most of the users were responsible for GHASEDAK system, the priority of their information needs was in the field of personnel data (64 codes), including identity and birth certificate data and data related to the presence and absence of personnel. Next, the financial data regarding the expense and income of the hospital and physicians had a lower priority among these users.

"For the GHASEDAK discussion, we need data on the hospital's total revenue, pharmaceutical sales—specifically the cost of medications and the volume sold—and hospital deductions; we require these items" (P: 2).

Figure 3. Information needs of finance



D) Information needs of human resources managers

219 codes were obtained, all of which were included in the personnel data group. Of these, 145 codes are related to administrative data, including information related to personnel orders, employment documents, documentation of actions and requests, and personnel evaluations. Then, attendance data with 44 codes and identity data with 30 codes have less value for this group of users.

"In general, identification details—such as full name, father's name, national ID number, date of birth, insurance type, the department where the staff member works, address, and start date—are the most essential items" (P: 39).

E) Information needs of medical equipment administrator

The information needs of medical equipment unit administrators were divided in 3 groups of administrative, financial and technical data. 210 codes were obtained, of which the most needed information is related to technical data with 125 codes, and information related to the certificate of the manufacturer company with 92 codes and data related to the quality control with 33 codes are prioritized. Then, financial and administrative data are in the next position with equal points.

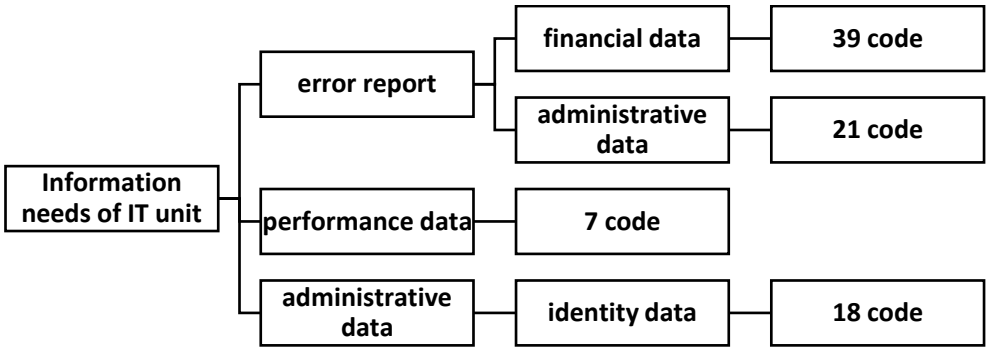
"*The data we require essentially consists of device specifications, including the item name, asset number, repair company, the device's profit and loss, the number of CT scans performed, calibration details, equipment name, serial number and equipment code, manufacturer, vendor, quantity of medical equipment units, model and brand, year of manufacture, and similar information" (P: 20).*

F) Information needs of IT department

The results of interviews with IT unit managers were divided in 3 groups (Figure 4). 85 codes were obtained as information needs. in the error report group with 60 codes, including patient file, disease diagnosis, file error report, unit ticket request to define new data, financial report of SEPAS errors, file codes, and the number of successful and unsuccessful cases of sending files to SEPAS.

"Yes, in the SEPAS system, the financial aspect matters to me—for instance, knowing whether a case that hasn't been transmitted is financially significant enough to warrant follow-up. However, the system doesn't provide this information directly; I have to go into the HIS and check the cases one by one to see which of the unsubmitted ones are financially important—which is time-consuming. SEPAS doesn't offer financial error resolution; it only provides statistical data, not financial details. I can't see the costs there—they are in the HIS—but I have to check them individually" (P: 1).

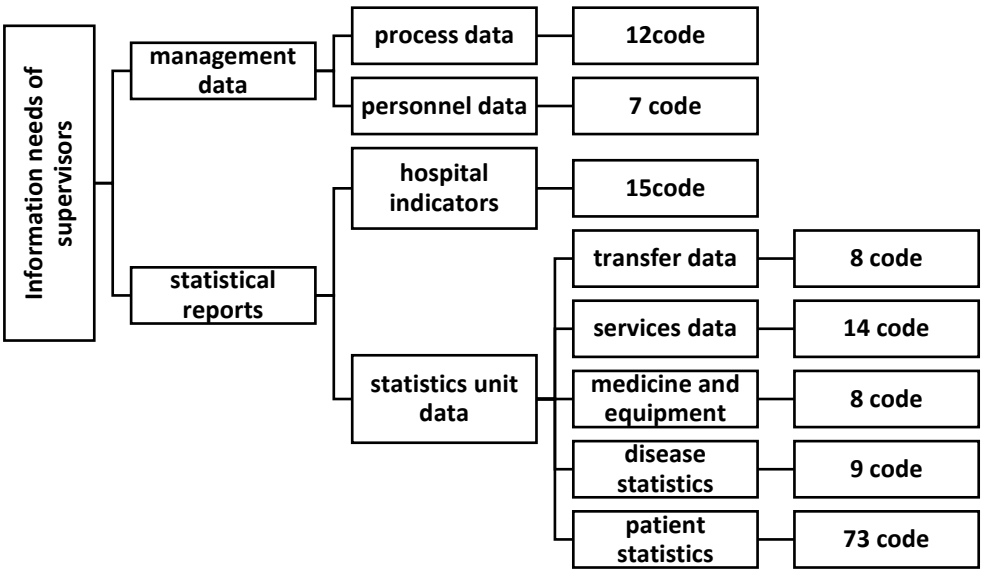
Figure 4. Information needs of IT department



G) Information needs of supervisors

157 codes were obtained from the interviews conducted with supervisors participating in this study in the groups of statistical reports and management data. Meanwhile, data related to statistical reports with 138 codes constitute the most informational needs of the users. These data mostly include the statistics of units, especially in the subgroup of statistics related to patients with 72 codes. Then, the hospital indicators and finally the data related to the services are the next priorities. Other data such as drug, equipment, and disease data are less important in this group of users (Figure 5).

Figure 5. Information needs of supervisors

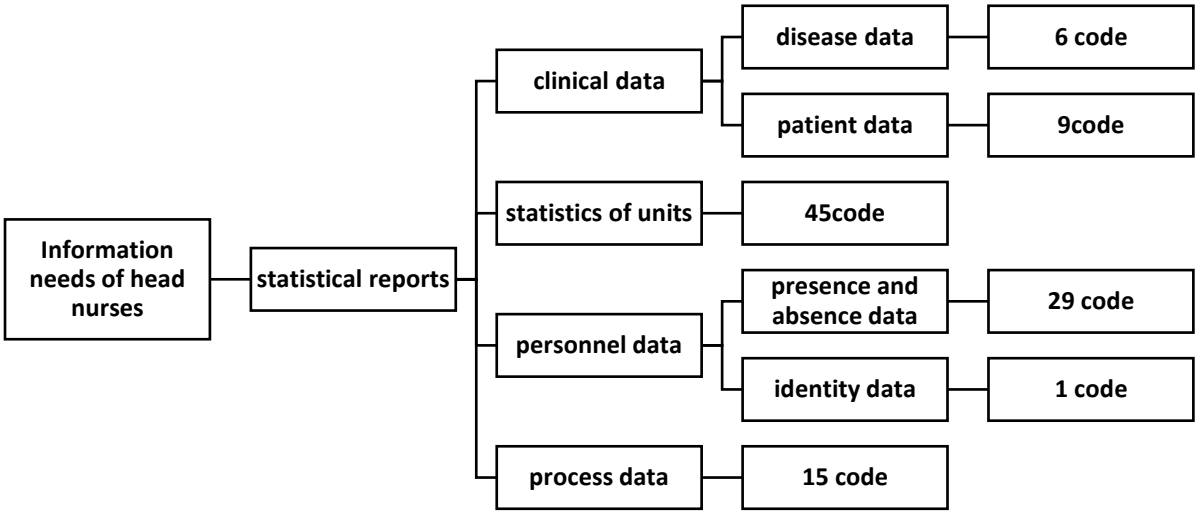


H) Information needs of head nurses

109 codes were obtained from the interviews conducted with head nurses participating in this study. 109 codes obtained were in the group of statistical reports (Figure 6). After grouping, it was concluded that the daily statistics subgroup with 49 codes has the highest point in the information needs of head nurses, then personnel data and finally clinical and process data are prioritized with the same point.

"I need to report statistics on eye infections, patient satisfaction, and surgery cancellations; for this, I require the patient's name, file number, attending physician, surgery date, details of the prior procedure, whether a re-operation was performed, the reason for cancellation, the physician's name, and the patient's identity details. We also submit statistics on admissions, discharges, transfers, and the current patient census to the supervisor at the end of each shift" (P: 38).

Figure 6. Information needs of head nurses



I) The information needs of the statistician

The information needs of statisticians of the studied hospitals were obtained 224 codes in which the inpatient data needs with 144 codes and the subgroup of data related to daily statistics with 91 codes have the highest point in the information needs of the statisticians.

"For instance, bed statistics are crucial to us; the medical records officer needs to know the bed count for each ward—including active beds and extra beds. We need to be aware of all these details, and any changes or relocations regarding beds are significant because they impact my statistics. We have repeatedly requested that they notify us of the bed figures whenever any such changes occur". (P:4)

Discussion: Among the selected systems, the manager of IT uses GHASEDAK only to enter the attendance and absence data and the performance score of the personnel to calculate the reward. AVAB system is used to monitor the statistical reports sent by the statistician. SEPAS system is used to check the errors related to IT unit, which leads to not sending the file.

Ahmadi et.al evaluated the information needs of medical record managers of the 39 teaching hospitals in Tehran. According to the results, given that 37% of the managers' information needs were not provided by the existing information system, it is necessary to design the management information system in this unit (19). Our study results are consistent with their study. In their study, Farzadi et al. showed the importance of a management dashboard for easy and up-to-date access to the information needed for managers to make decisions at different management levels. Also, in our study, the importance of use of management dashboards were emphasized by top managers (20). Nazemi et al. investigated the hospital accounting software among teaching hospitals in Tehran which concluded that more than two thirds of the participants considered the importance of patients' identity data in that software i.e. the name, surname and the national code the patient admission and discharge data as well as the services data (12). In the present study, most of the participants of the financial unit were users of GHASEDAK system, whose information needs were the hospital personnel data.

The participants in IT unit of the hospital declared that the most information needed to their technical and software support duties is error reports.

The information needs of supervisors participating in this study were administrative data and statistical reports including hospital indicators and patients' conditions.

The study results of Dong et.al showed that the information needs that nurses seeking in HIS include disease manifestations, discomfort complaints, and prescription reviews, such as vital signs, adverse reactions, and electronic prescribing rules for new physicians to learn, which were consistent with the results of present study (21).

In his study, Peltonen nurses' information needs was included the information related to patients, personnel and equipment; and physicians' information needs were identified information related to patient care so that they can be used for the design and development of information systems and support in decision-making (22). In the present study, the most important information needs of supervisors are reports related to patients, which is similar to Peltonen study.

In Malik et al., survey, the information needs, resources and barriers of physicians in primary health centers in Haryana were investigated. The results showed that during patient care, they have access to various information such as medicines, laboratory tests and results and diagnoses, which got part of these needs through the hospital information system (23). In the present study, of health care professionals' need to despite access to patients' information such as diagnoses, laboratory tests result, and medications, the current HIS in our country is still not a suitable information resource to help them to improve the clinical services delivery.

Among the selected systems in this study, statisticians are the main users for data entry in AVAB system, who get their information needs from HIS or in the form of telephone or paper reports from the different departments in the hospital. Mohammadi et.al examined the compliance of HIS of Isfahan University of Medical Sciences with the statistical information system framework and concluded that the average compliance of the studied HIS with the intended framework was 72.73%, the studied HIS was undesired for indicators and statistical reports required by the users, and less than a quarter of the statistics required by the users, which are very important for them, can be obtained from HIS (24), which is consistent with the results of the present study.

Conclusion: Each user in the hospital has different information needs according to their duties. The study results obtained from the interviews with IT managers showed that the most data needed by these users are process data (the subgroup of administrative data). The most important information needs of hospitals managers' administrative data (the subgroup of financial data). The most important information needs of the users of financial system are the hospital employees' data.

The most important needs of the human resources managers are administrative data. The most important information needs of the IT managers are error reports data. The most important information needs of supervisors participating in this study are statistical reports (the subgroup of patient statistics). The most important information needs of head nurses are the daily statistics. The information needs of statisticians are inpatient data.
Users at lower levels are only data importers in selected systems. Users playing management roles need system reports, which can be solved if there are management dashboards. Most of the managers stated that either due to technical defects or lack of training cannot use dashboards. Hence, the hospital contract party software companies might benefit from these results to promote the information systems in next step with considering the information needs of the users.

Abbreviations:
HIS: Hospital Information System
IT: Information Technology

Ethics approval and consent to participate
This article was approved by Isfahan University of Medical Sciences in 2019 with the code Ethics No. IR.MUI.RESEARCH.REC.1399.553 obtained from the National Ethics Committee in Biomedical Research. The project was found to be in accordance to the ethical principles and the national norms and standards for conducting Medical Research in Iran. Prior to conducting the interviews, informed consent was obtained from the participants for their involvement in the study, and the relevant form is attached.

Consent for publication
Not applicable. This study does not contain any identifiable personal information or images of participants

Availability of data and materials
The authors confirm that the data supporting the findings of this study are available within the article and its supplementary materials.

Competing Interests
The authors reported no conflict of interest in this study.

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Authors' contributions
N.T. and H.B. and RV designed and conducted the research study. RV conducted the interviews. N.T. and H.B. and RV wrote the main manuscript text. All authors reviewed the manuscript

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Supplementary Files

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- Appendix1.pdf