Information needs, sources and seeking behaviour of physicians and residents during clinical decision-making and patient care process: A qualitative study

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Abstract
The aim of the present study was to investigate the information needs of physicians and residents during the clinical decision-making. The research has been performed with phenomenological approach and using semi-structured interview based on critical incident technique with 28 physicians and residents of the educational health care centers of Birjand city South Khorasan province, Iran. The results showed that the information needs of physicians and residents were mostly related to diseases, diagnosis, prescription, treatment, disease follow-up, learning and self-updating, education and research. The information sources utilized were categorized into three main themes of human sources, electronic sources and print sources. The barriers against their information seeking were personal, organizational, technological, skill related, nature of information seeking, and barriers related to information sources. The present study provides a clear picture of the information needs, the information resources and the barriers to finding information for physicians and residents, therefore, the results of the present study can help medical libraries to improve their collection of resources and services to support the information needs of physicians and residents. It also paves the way for designers of information systems in creating systems that suit the needs of physicians in every stage of clinical decision-making and helps libraries in solving the challenges of finding information for physicians.

Keywords
information needs, Birjand city physicians, Birjand city resident doctors, clinical decision-making, information seeking behavior, information resources

Introduction

Medicine is a field that is highly dependent on information (Naeem and Bhatti, 2015) because physicians work in an environment that is always confronted with unforeseen issues and uncertainty-based decisions, which increases their need for information compared to other specialties (Zhou and Piramuthu, 2010). According to some studies, experienced physicians need two million pieces of information to manage their patients (González-González et al., 2007). On the other hand,

since medical information is rapidly becoming obsolete, physicians need to keep up with the latest developments and findings in this field so that they can use more useful and efficient methods in medicine and diagnosis and treatment of patients. On the other hand, medical

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developments occur so rapidly and the experiences of experts have shown that new methods are being invented every day in the diagnosis and treatment of diseases (Naeem et al., 2013) and perhaps a treatment is regarded appropriate for a special disease, but it is discarded after a while. In addition, access to clinical information enhances physicians' self-confidence in clinical decision-making (CDM), develops practical skills, and expands better approaches to patient care (González-González et al., 2007). Therefore, considering the insufficiency of physicians' previous knowledge and experience to deal with clinical problems and provide high-quality medical services to patients, it is necessary to update information and keep up with the latest medical findings (Shahid et al., 2021).

One of the situations in which physicians need to collect up-to-date information, interpret and design interventions accordingly during the clinical practice process, is CDM, which is of particular importance in patient care, to the extent that strengthening CDM ability reduces medical errors and patient mortality and increases the ability to diagnose the disease and improve patient safety and health (Woda et al., 2017). Identification and understanding of situations and factors require in-depth scrutiny and analysis, and they need to gain information about them in information sources during the CDM process. Also, it is important for medical science libraries and information centers to have a full understanding of the information needs of their target community so that they can support them effectively and efficiently and take steps to meet their information needs. Therefore, the aim of the present study was to analyze the information needs of physicians and residents of Birjand educational and medical centers in order to gain a deep understanding and analyze the information needs of this group that play an essential role in promoting health and welfare of patients. The present study seeks to address factors leading physicians and residents to search information in information sources during their CDM and patient care. Therefore, the interview question was asked based on CIT, participants were asked to think and remember the time when they needed to search for information sources to solve a clinical problem and use the information received to resolve their clinical problem.

Research questions

1. How is the work day of physicians and residents in educational health care centers of Birjand city?

2. What are the information needs of the physicians and residents during their recent clinical decision-making process?
3. What sources of information do the physicians and residents consult to resolve their information needs?
4. What are the barriers to information-seeking of the physicians and residents?

Literature review

There have been many international studies on the information needs of different groups. However, this literature review focused on studies that have been conducted with the participation of physicians and residents, including the research by Cogdill et al. (2000) which assessed the information needs and information-seeking behavior of 15 physicians and their students using telephone interviews. The results showed that the physicians' questions while dealing with patients were related to diagnosis, pharmacotherapy, epidemiology, and general management more frequently. Also, Green et al. (2000) analyzed the information needs of 64 residents in an educational clinic using interviews after visiting 401 patients. The results showed that residents' most common areas of information need when dealing with patients were related to treatment (38%) and diagnosis (27%), among others. In another study, Bryant (2004) investigated the information needs and information behavior of 58 family physicians in a quantitative and qualitative manner. The results showed that physicians' information needs were related to clinical care, information updating, patient education, drug information, knowledge gap, uncertainty and curiosity more frequently.

In a study of the information-seeking behavior of residents in Brazil, Martinez-Silveira and Oddone (2008) stated that most of the residents' needs were related to pharmacotherapy (44%) and diagnosis (29%). Also, the motivations that have forced residents to search for information in the last 30 days included uncertainty (71%) and exposure to rare medical cases (71%). According to a study by Naeem et al. (2013), five reasons for physicians' use of the hospital library included continuing education or study for the classroom or conference (47.9%), patient management (25.9%), teaching (12.5%), being up-to-date (2.11%) and research (7.6%). In a web-based study, Sakai et al. (2018) investigated the information needs of three groups of physicians (n = 275), residents (n = 55) and

nurses (n = 268). The results showed that the information needs of physicians and residents included the priority of medical and diagnostic information, respectively. In another study, the information needs of physicians were measured regarding rare diseases. The results indicated that general practitioners had the minimum and specialists had the maximum knowledge and awareness about rare diseases (Vandeborne et al., 2019). Demergazzi et al. (2020) also investigated the information needs and information-seeking behavior of Italian neurologists in a mixed exploratory study. The results showed that most of the neurologists' questions related to the three main issues of treatment management (71%), pharmacological information (67%) and diagnostic processes and strategies (42%).

The clinical information seeking behavior of physicians was examined through a systematic review in the paper by Daei et al. (2020). The results indicated that the common strategies used by physicians for seeking information included keyword, Boolean, similar words, and advanced search. The information sources used by them included consultation with colleagues, journal papers, Internet websites, textbooks, and databases. Haliso and Nwogbe (2020) investigated the effect of using health information in clinical decision-making of 107 Nigerian physicians. The results showed that physicians do not use health information resources in making informed clinical decisions. Most of physicians used information to improve clinical safety practices.

The information needs of family physicians were also inspected by Van der Keylen et al. (2020) in a systematic review. In that research, the information needs were classified into five major groups including information needs before to search, access needs including the factors that inhibit or facilitate retrieval of information, quality needs of the information to hand, utilization needs of the information available, and implication needs for everyday practice. Also, in another study examining the information retrieval of family physicians in Arabian countries at the time of patient care in an online and quantitative way, it was found that most questions of physicians have been related to the dose and side effects of drugs, while the fewest were related to patient training. Also, almost half of the participants found the information is useful, relevant, and nonbiased (Antoun et al., 2022).

Results of literature review show that the information provided by them is general because it comes from quantitative studies and the answers are within the framework of the questions asked by the researcher. Therefore, it is necessary to conduct a qualitative study that investigate the information need of specialist physicians and residents in real clinical-decision situations based on the real experiences of participants.

Methodology

The research has been done qualitatively with a phenomenological approach. Phenomenology deals with examining the lived experience of people (Creswell and Poth, 2007). The critical incident technique was also used along with this approach in order to obtain rich information. In this technique, the individual is asked about one or more critical events regarding the activity under analysis that participants experienced personally and a series of related questions is answered (Hughes, 2012). CIT allows the person to focus on a particular clinical situation when recounting their narrative and to recall their most memorable and important experience (Gremler, 2004). Concurrent use of these two methods real help obtain reports from the participants' experiences and minimize the researcher's prejudices and assumptions when analyzing the results (Vianden, 2012). The study population included 28 physicians and residents of educational and medical centers of Imam Reza (AS), Waliasr (AS), Razi and Iranmehr in Birjand City, South Khorasan province, Iran, who were selected by purposive sampling method. The sample size was 28 people (13 women and 15 men) including 17 physicians specializing in urology, pediatrics, infectious diseases, ophthalmology, ENT, psychiatry, radiotherapy and oncology, traditional medicine, physical medicine and rehabilitation and four subspecialties in pediatrics, blood, cancer and pediatric heart, as well as 11 resident students in pediatrics, internal medicine, neurology, cardiovascular and neurosurgery. More than one person participated in the interview in some specialties. Inclusion criteria was to have expertise in one of the medical fields and to have work experience in hospital wards.

The study setting included 27 hospital wards and only one interview was conducted in a physician's office. After obtaining the individual's consent, the appropriate interview time and place were determined and the topic of the interview was briefly explained before the interview. The interviewee was also reassured that their identities and statements would be

kept confidential. After obtaining permission to record the statements of the interviewee, the interview began. The sampling process was continued until reaching theoretical data saturation, that is, when no new data or information was obtained. Finally, the sample size reached 28 people. The average interview duration was 50 min.

Data analysis was carried out using seven-step Colaizzi's method (Morrow et al., 2015). First, the recorded interviews were listened to several times and typed in a Word file, then studied several times to gain an understanding of the whole phenomenon. Afterwards, important phrases were extracted, the meanings of the important phrases were formulated, and the formulated and related meanings were placed in the main categories. In the fifth step, a detailed description was written for each theme. In the sixth stage, the basic structure of the phenomenon was developed and finally, for validation purposes, the results were returned to the participants.

Findings

In response to the first question, the occupational context of the physicians and residents was similar, and in one working day they dealt with different activities including visiting patients, diagnosing, treating, following up patient status, presenting in operation room, performing educational and research affairs, giving consultation, and studying.

In answer to the second question, the analysis of the interviews showed that physicians and residents needed information were as follows.

Knowing about diseases

One of the information needs of physicians and residents in library information resources was to know about diseases, especially rare and special diseases, which they said in this regard:

"In the case of rare syndromes that we rarely find, … We consult with colleagues or discover it for the first time with the help of information sources" (Physician 2).

"If the case is complex or it is the first time that we are facing a disease which requires comparison against the latest information" (Physician 6).

"A special disease comes I no longer remember. We usually use online sources for such cases" (Physician 3).

Diagnosis

Clinical diagnosis is the main and important task of physicians and a cognitive process, along with fact-finding and decision-making (Haliso and Nwogbe, 2020). Diagnosis depends on information received from various sources. Information sources are items used by physicians and residents in the diagnosis stage for various purposes. The following are some of the sub-categories and related quotes of the interviewees.

Need for information about diagnosing diseases: One of the information needs of physicians and residents was to obtain information regarding disease diagnosis and they said in this regard:

"In the case of diseases that we face a diagnostic problem, sometimes we may consult with laboratory references or a colleague about the diagnostic methods of the disease or with relevant specialists and colleagues and ask for help for our patient" (Physician 2).

"I needed information about patients many times, both at the stage of diagnosis and …" (Physician 7).

The recent real experience of one of the physicians who searched for information sources to diagnose the disease is as follows:

"There was a man with ocular hypertension. There was no evidence on the cause of this eye pressure. I did not find any explanation for this pain. I searched, and told him to bring his tests, which showed that they may also have systemic symptoms. Also, that hypertension was due to an illness that could be due to droplets or due to exercise or overwork and some pigments are released inside the eye and ocular hypertension occurs without any signs in favor of such pathologically high pressure in his examination. I knew the cure and I was skeptical about the diagnosis" (Physician 5).

Knowledge of new diagnostic methods: One of the information needs of the interviewees was to gain new knowledge of the diagnostic method, and a number of residents and physicians stated in this regard:

"Yes, very much. I often use Google Scholar and Uptodate database for new articles in our field. For things that are new, new knowledge is constantly used in clinical discussions. I use the information in Uptodate database to diagnose and …" (Physician 6).

"There is some information that becomes up-to-date over time… For example considering diagnostic methods, diagnostic information becomes up-to-date for newer methods that is available in books and papers" (resident 4).

Evaluation of diagnostic methods: From the perspective of one of the residents, he searches library sources to evaluate the usefulness of the diagnostic method. He describes his recent clinical experience in this regard:

"It always helps. We refer and wanna see how much this diagnostic method helps us and how much it helps the patient, and this amount of help is evaluated based on the its cost-benefit and harms." Its harms and the problems should be assessed accordingly. We refer to it every day, and last time was yesterday when my had a bladder problem. He referred and underwent treatment and he was offered a place to take a urodynamic bladder test. I had to search to more information sources. Since there is not at least one urodynamic bladder test center in our area. I retrieve my information: What are the uses, what is the method of use, how much is the costs of this treatment, is there any related center the area near our place of residence to send my patient, and other related matters that can at least help. Is it really needed that my patient is treated in an outpatient manner, and if so, how much it can help?" (Resident 4).

Etiology of diseases: Knowing the symptoms of any disease is one of the necessities for timely and rapid diagnosis of the disease. Therefore, disease etiologies and awareness of its symptoms lead physicians and residents needed to search for information. Some of the interviewees said in this regard:

"I had one case of hyponatremia; the professor asked us to search for its cause. I referred to Harrison's internal medicine and studied it, I could pinpoint the cause" (Resident 4).

The recent experience of one of the residents is as follows:

"One of our patients had mental retardation and was admitted in the ward. He took different drugs, all kinds of neuroleptics and seizures, and so on. His blood sodium was low. We could not find any reason for his low blood sodium level. We asked the internal medicine specialists for advice. They also suggested their own routine drugs. We looked for the etiology of the patient's low blood sodium. That's exactly where the conference discussion and the search came from. I was asked by the physician to go and investigate the causes of hyponatremia. There I went to the library to borrow Harrison's Principles of Internal Medicine and studied it. I saw that lithium causes both hyponatremia through tasteless diabetes in the patient" (Resident 7).

Diagnosis of rare clinical cases: Physicians and residents needed information when they encountered clinical problems that were not normally detectable. A number of residents and physicians stated in this regard:

"Sometimes there are diagnostic methods that are used less frequently, so, we read to see if it is available in our area to use it. The rarest clinical symptoms may be in our patient. We see a series of symptoms and we have to see if there is such symptom in the disease or something else" (Resident 4).

Prescription

Drugs play an important role in the prevention, treatment of diseases as well as the recovery of the people. Therefore, having sufficient knowledge about drugs usage, interactions and side effects is essential for the treatment staff. In the present study, drug prescription one of the reasons for physicians and residents to refer to information sources. Subcategories and examples of recent quotes and experiences of physicians and residents are provided below.

Knowledge of the drug dose: Information sources are reliable sources for obtaining information about the drug dose and use. Physicians and residents also used them to remember the forgotten dose or to eliminate doubts about the drug dose. Here is what some of the participants said:

"I recently had forgotten dose of nephrotic syndrome drugs, and I had to look for it… I took this information from up-to-date source" (Physician 16).

"For example, a patient with suspected Guillain-Barré. We administered the IVIG protocol for intravenous immunoglobulin. We looked at its indication to ensure that it is up-to-date. We had doubts about its right dose. We used mobile-based Uptodate" (Resident 1).

Evaluation of the effectiveness and side effects of drugs: According to physicians and residents, any drug prescription should be performed after ensuring that it has no interactions, side effects and cost-benefit and the like. They said about using information sources as follows:

"It always helps to refer to such sources, and we want to see to what extent this … or drug would help us" (Resident 4).

Drug selection: There are different drugs from different companies and brands in the market for each disease, and the effectiveness of each of them may be different, so, the medical staff should refer to information sources to prescribe the most effective and appropriate one. Some of them statements are as follows:

"For diseases that usually overlap with infections, such as ocular cellulitis or pre septal cellulitis, I did a search in Medscape for the right antibiotic" (Resident 1).

Need for information on new drugs: New drugs are always produced for each disease, and it is essential for physicians to become familiar with new drugs and their uses. This is the reason why a number of physicians and residents referred to information sources and they stated:

"Well, we have a disease called trichotillomania and its treatments are mentioned in our textbooks. We proceeded according to those treatments, but the patient is resistant. Finally, as a case resistant to trichotillomania, I searched Cochrane to see what new treatments had been done in clinical trials or meta-analyzes. Fortunately, one or two new drugs, which, for example, had not yet been mentioned in the textbooks, were introduced there, and the positive results were reported and thus we prescribed them for the patient. It happened here that we received a very good response from the patient" (Physician 15).

"I searched about diabetes in children, whether there are any new insulins in the market or synthesized recently, in order to guide patients" (Physician 1).

Treatment

Treatment has been one of the main tasks of a physician and one of the areas of information needs of physicians and residents. The following are sub-categories and evidence presented by physicians and residents:

Choice of treatment: Choosing the best treatment in the face of a therapeutic challenge was another factor that led physicians and residents to search for information in information sources. The experience of one of the physicians was as follows in this regard:

"For example, the recurrent disease was a vertebral tumor. Considering the young age of the patient and the location of the tumor that put pressure on the spinal cord, as well as the history of previous treatment (radiation therapy and surgery), I faced a therapeutic challenge that what is the best treatment? I have found similar cases when searching for research articles online and found cases that have benefited from re-surgery" (Physician 10).

Obtaining information on patient treatment: The information needs of physicians and residents were related to the patient's treatment phase in some cases and they said as follows:

"We had a patient with a disease called shingles (herpes zoster) and I gave him medicine. He came to the clinic again two weeks later. He said that he was not recovered at all. We said let's go and search for the relevant drugs. Is there an alternative other than the ones we know? Well students searched for an article about high-dose gabapentin. Well, then the patient left and came back two weeks later. Well, he responded to the treatment very well" (Physician 3).

"We had a patient who came to the emergency department with a severe kidney infection, very severe diabetes. I searched very much to see what I could do, and we read articles through online sources. I searched for this in our Campbell textbook from PDF book" (Physician 12).

Knowledge of new treatments: As medical research expands, new treatments are being discovered. A physician can have high-quality clinical practice when he/she is familiar with modern treatments. In order to have a more effective performance on the patient's bedside, the physicians participating in the present study, referred to library information sources to be informed about new treatments and stated as follows:

"Sometimes there are a number of diseases that may require new treatments. To familiarize yourself with the new treatments of that disease" (Physician 2).

"I needed to treat and follow up a case. I wanted to be informed about new treatments" (Physician 7).

Searching for treatments of rare cases: One of the problems that physicians have faced during their clinical practice, according to their statements, is the treatment of diseases that could not be cured with known and common treatments, and they needed to search

the sources to find similar cases. The comments and recent experience of one of them are as follows:

> "Recently, I had a patient who underwent an open-heart surgery and, he had an unwanted complication subsequently that is very rare. I had to get help from new information sources for treatment. I did not get the right response from the initial treatments, and finally, according to the search I did, I was able to add a few medicines to the initial treatments and the right response was obtained. The patient was discharged in good condition" (Physician 4).

Gaining practical treatment experience: Learning practical treatment cases was another reason that led physicians and residents to use information sources. They have stated in this regard:

> "There have been cases, surgeries, that I did not perform at all during my specialty, but because the case occurred to me and the patient came to me, I read the related information the search, both in the video and PDF format, and do surgeries that I did not have before" (Physician 7).

> "Before many surgeries, maybe because I had less surgery or it is rarer, I see the related educational videos. If there is any plan, I read it as well as any a point in our guidebook" (Physician 11).

Searching treatment facilitators: Physicians also needed to search for information in library resources in order to find easier treatments than the previous difficult one. One of the physicians stated about his practical experience:

> "… I searched extensively across the Internet in order to see whether there is any other method for fixing dislocated jaw; there was one method which is very interesting, and at the same time convenient and tolerable for the patient" (Physician 7).

Disease follow-up

Physicians and residents also needed to search for information sources in the follow-up phase of the disease. They said in this regard:

> "I needed to search for information About the diseases and their follow-ups" (physician 1).

> "I needed to treat a case and I needed to follow it up. It used PubMed and Clinical key more frequently" (Physician 7).

Learning and self-upgrading

One of the motivations for physicians and residents to turn to library resources is to update their information with respect to forgetting such information and recalling information. They said in this regard:

> "We refer to educational resources and highlight and complete our previous information if it has faded" (Physician 2).

> "Yes, there are many times when you do not remember your mindset and you will refer to Uptodate and Medscape" (Resident 3).

The nature of medical science: According to the participants, medical science is a profession in which information search is very important. Some of participants are quoted as follows:

> "There is comprehensive information that a physician should know" (Physician 2).

> "Search is very important to us" (Resident 5).

Dynamics of medical science: The rapid growth and real time updates of medical science have been among other reasons that led the interviewees to refer to information sources. They stated in this regard:

> "In general, the medical science is dynamic" (Physician 11).

> "Medicine is a real time up-to-date science" (Resident 4).

Uncertainty in medical science: According to the interviewees, one of the factors that required physicians and residents to use information sources was the uncertainty and inconsistency between their previous information about a disease and the symptoms of the patient. The statements of the interviewees in this regard are as follows:

> "You cannot say for sure that two times two is four and that is what medicine likes medicine" (Physician 11).

> "It happens a lot, especially in medicine. This is very, very common, because there is a term that is used in medicine and never two times two is equal to four. And the patient never has the symptoms stated in our textbook, for example, maybe recently we had a patient that has some symptoms of a disease, not completely. Then we do a search in information sources. In particular, most of us search in Uptodate. Now there are related articles in other sources, such as PubMed, to which we refer. Accordingly, we find out whether

that these cases are related to rare diseases or it may be the same old disease and only its form has changed slightly and be accompanied by disease" (Resident 4).

Knowledge creation: Increasing and completing information is another reason for physicians and residents to refer to information resources. They stated in this regard:

> "We refer to educational sources and highlight and complete our previous information if it has faded" (Physician 2).

> "For additional studies, if interested, someone will search in information sources and books and tries to increase his/her knowledge" (Physician 2).

Educational needs

Physicians and residents need to search for information in order to be prepared for classroom teaching, as well as to discuss the morning program or morning report with students. Semantic units and subcategories are listed below:

Having discussion with students: Physicians also need information to prepare for discussions that take place with patients during the examination, and they stated as follows:

> "We need information during our work, such as things we discuss with students and each of them has an opinion. I myself may not has up-to-date information or there is a certain disease that I do not remember them and thus search them online" (Physician 3).

Teaching: Teaching is one of the duties of physicians working in educational and therapeutic environments. Therefore, one of the cases in which they refer to and use information resources is to be prepared to teach in the classroom. In this regard, they stated:

> "We are in an educational environment. Science and especially medical sciences are growing. Diagnostic methods, new treatments are invented. We have to, even if we did not have some diagnoses and facilities in Iran or Birjand, but the students should know that it is our duty to be very up-to-date; for example, a new article has discussed something and the students ask about it" (Physician 3).

> "we are in an educational environment, … I teach based on the text" (Doctor 3).

Morning: Morning report is training sessions in educational and therapeutic hospitals that are organized to report on inpatients and actions taken by physicians on the previous watch. Physicians needed information to introduce new treatments in these sessions and they said:

> "Sometimes several people may gather together and have a discussion, for example, using information resources in the mornings makes students familiar with new treatments" (Physician 4).

Conference presentation:

> "We use Uptodate more frequently because it is older and we are more familiar with it, for example, we need to talk about a case for conferences" (Physician 2).

Patient education: One of the categories extracted from the interviews was about the patient education-related needs of physicians and residents. One physician said in this regard:

> "The patient may be taking medicine, which has side effect. Then he comes to me to decide whether or not to stop this drug. Now it is not a common side effect. Finally, you need to search the internet and see this side effect has something to do with that medicine so that you can use it to guide the patient" (Physician 14).

> "Patients come and say who has said this or that person has said this. Now I don't know what to do. And it causes some confusion; in such cases the up-to-date of Mandell or Harrison book has, we told them to read it so that the case would be resolved and it would not be my own claim rather by the text" (Physician 3).

Research needs

The studied physicians were also active in research fields considering their employment in educational and medical centers, and needed to search for information sources in this field. The following categories and quotations of the participants are as follows:

Investigating the topic: One of the reasons physicians and residents refer to information sources is to study advertising topics. They said in this regard:

> "If I want to investigate a promotional topic, I use Google scholar, science direct, Scopus, and the like by a practical search" (Physician 15).

Submitting a proposal: The proposal is the first step after choosing a research topic. One of the

Table 1. The information resources utilized by physicians and residents to resolve their information needs.

Theme	Subtheme	Evidence
Human sources	Colleagues	"Or in fields with specialists of that field we consult with colleagues and ask help for outpatient" (physician 2).
	Patient's companions	"For diagnosis typically the information I need is indeed the history which is typically taken from parents or…" (Physician 4).
Electronic sources	Guideline	"We eventually use the website of AUA, as well as the guidelines of AUA and EUA of American and European Association" (physician 11).
	Medical internet groups	"There was a group in Yahoo which was related to pediatricians of Egypt. Back then, I used it a lot, and any paper, Journal, or group I wanted to know were well classified there" (physician 3).
	Medical websites	"The American academia and Eyewiki websites are useful for diagnosis and treatment" (physician 5).
	Social networks	"For diagnosis, many times I look in YouTube and for surgery. In the YouTube, I searched massive good scientific information for treatment" (physician 12).
	Databases	"I have searched in PubMed, Medscape, Clinicalkey, Scopus, both for treatment and diagnosis. Nevertheless, it has been mostly for cases requiring treatment" (physician 7). "I even use them for new treatments and novel diagnostic methods I have from the up-to-date" (physician 17).
	Journal papers	"I usually use the New England Journal of Medicine (NEJM), etc." (resident 3).
	E-books	"We use the PDF file of books" (Physician 6).
	Medical thesauruses	"More in ophthalmology … and Eyewiki I did the search at that moment. Very useful for both diagnosis and treatment" (Physician 5).
	Search engines	"Google offers good information, it is very helpful" (Physician 1)
	Medical applications	"From offline up-to-date with mobile" (Resident 8) It has usually been related to drug dosages usually to Pharmaceutical application" (Physician 2).
	Multimedia sources	"Well, information seeking occurs frequently; in many operations, before the operation, possibly because I have operated fewer times or it is rarer, I go and watch its clips" (Physician 11).
Print sources	Print books	"For us, it has been usually for drug dosages and less frequently used drugs, whose dose may have been forgotten by us. Usually to … old books or references we have in the emergency or NICU ward such as Harriet or Redbook" (Physician 2).
	Personal notes	"From inside a synopsis book, my own synopsis" (Physician 13).

In response to the fourth research question, six important themes were obtained as follows (Table 2).

residents said about the possibility of using databases to submit a proposal:

"In fact, when a person needs Clinical Key to present a great proposal, write an article and use other theses" (Resident 7).

Writing an article: Some physicians needed information to write an article and said in this regard:

"Yeah, I published a few articles myself, because in our field, I'm a PhD student, I needed to publish an article. To find out about previous relevant studies, I searched for similar studies very much" (Physician 6).

Conducting a study: Some of the interviewees commented on the possibility of using international articles as their role model for their research in the indigenous context:

"For some diseases, we need to do research ourselves even in different cities of Iran, for example, tuberculosis in the north of Iran is like this, but tuberculosis is different in South Khorasan, but you can use them. They give us general written principles and motivate us. We see what it's like to get a policy from them in your area and do a new study yourself" (Physician 3).

"In research, we need new information even if it is not more than education" (Physician 3).

Analysis of interviews in response to the third research question indicated that physicians and

Table 2. The barriers against information seeking of physicians and residents

Theme	Subtheme	Evidence
Personal	Much occupation	"More, since I am busy I use information sources not very frequently" (physician 2)
Organizational factors	Limited working hours	"An educational hospital library should be open 24 h a day, and a person should be present so that we could have access to books and references" (Physician 4)
	Insufficient space	"Hospital libraries have small study hall" (Physician 4)
	Distance dimension	"During residency, the person has no time or space. If the number of libraries was higher, it would be great if any ward had a place for study. If that place is near, because it takes time to reach the place. It would be great if there is place that can call you easily. The library is very far away." (Resident 2)
	Organizational culture	"This scientific challenge still remains in the academic atmosphere of the country; since critical thinking is still in its infancy, and if critical thinking opens its way and forms completely, I would not dare to take a slide with no source from Google and use it for my listeners. If two to three questions I see in academic members that this slide is not reliable or valid, then I would have to turn to reliable sources" (Physician 15)
Technology	Poor computer facilities	"Hospital libraries are poor in facilities, both software and hardware" (Physician 4)
	Problems of internet network	"The Internet speed of the university is very slow" (Physician 13)
		"Our problem is the Internet, which does not support completely, and we often have to go out of the ward" (Resident 2)
Skill	Unfamiliarity with information sources	"If you don't refer to a proper website or if you don't know the websites or don't choose the keywords correctly, you get confused and yet your problem remains unresolved" (Physician 14)
		"Since I mostly search in two to three sources, and actually I also search in PubMed, causing me not to find the answer to my questions in some cases" (Resident 5)
	Insufficient command of foreign languages	"At the level of drug dosage, my English is poor to intermediate. However, if the issue is more serious, I still need help for its translation" (Physician 14)
	Weakness in information seeking	"I never use because I didn't know the search methods" (physician 6)
		"we had problem in search" (physician 6)
	Problem in choosing keywords	"Sometimes for example we could not set the exact Latin terminology or similar terms that would be sometimes used" (Physician 6)
		"If you don't choose the keywords correctly, you get confused, it offers you many results, yet does not solve your problem" (Physician 14)
	Problem of posing the question	"if the design about the question and wording is not good, if the design about that question is not right you may not reach the desired an acceptable answer" (physician 4)
	Problem in finding answers	"sometimes it does not give us the exact thing we desire" (physician 5)
		"the exact thing one wants may not be found" (physician 8)
	Being new and specialized	"now since any new method comes such as use of information

Table 2. (continued)

Theme	Subtheme	Evidence
Nature of information seeking		sources; these are more specialized tasks at least for older colleagues" (physician 2)
	Being time-consuming	"The reason of referring to general sources, is more convenient, they are well-known, we have more access, but if I want to pick up a picture from ProQuest, I need to log into the website of the University, connective VPN, it is not clear whether it is free or not, all complicating the path of search" (physician 15)
Barriers related to information sources	Language barriers	"In one case it only presented the abstract and the entire paper was Chinese" (physician 6)
	Access	"Sometimes you cannot find a full text and at most you have the abstract" (physician 6)
	Cost	"One of the common problems of lack of accessibility to all scientific sources (for example published papers that need international payment" (physician 10)
		"No sometimes I have reached but it has not been very frequent, and mostly due to the files of journals that have been paid based" (physician 16)
	Absence of required sources in the library	"Perhaps, it may not have been my desired journal" (Resident 3).
		"Definitely, practical books are better, typically hospital libraries seem to have more reference books and the books we need, many books that we have to buy from outside, for example prescribing and I did not find them in the library" (Resident 5)
	Credibility	"The originality of the papers in Google scholar was not very high" (physician 6).

residents used different resources to find the answer to their clinical questions and to fulfill their information needs (Table 1).

Discussion

The results obtained from this research indicated that there is considerable variety in information needs of physicians and residents, and their information needs are affected by their occupational context and their specialty area. One of the clinical situations the physicians needed information, was disease diagnosis; according to the experience cited by them, it is one of their daily working processes and one of the important stages of the clinical decision-making process, and has been reported in other studies as one of the information needs for physicians (Cogdill et al., 2000; Demergazzi et al., 2020), the results of all of which are in consistent with this study.

The next information need of physicians and residents was related to treatment of disease, which is the stage following diagnosis, and has been one of the main tasks of both groups in a working day. At this stage, physicians and residents also need to search for information sources for many things, including choosing a more effective treatment, treating rare diseases, discovering new treatments, searching for easier treatments, and evaluating treatments, all of which aim to perform more effective and easier treatment and, in other words, to take steps in favor of the patient. In other studies, the information needs of neurologists have been mainly related to treatment management (Dee and Blazek, 1993; Demergazzi et al., 2020; Green et al., 2000), the highest percentage of information needs and clinical questions of physicians related to treatment (75% and 38%), respectively, which are all consistent with the results of the present study. However, in the aforementioned researches, unlike the present research, treatment has been mentioned in general and the information need has not been analyzed in detail at this stage.

Prescription is regarded another CDM stage by physicians and residents. However, it is part of the treatment, but because the interviewees mentioned it separately and

the prescription itself included many subcategories, it was considered as a main category. Regarding the importance of searching information in information sources at this stage, it can be stated that drugs are an integral part of health care delivery (Ofori-Asenso and Agyeman, 2016). Nevertheless, any improper prescription can lead to unwanted side effects and endanger the patient's life; therefore, physicians' knowledge of the latest drug information and attention to drug interactions by referring to information sources can help physicians in preventing medical errors and their effective performance in pharmacotherapy. In the present study, physicians and residents have used the information for many purposes, including knowing the drug dose that have been somehow forgotten, evaluating, selecting and being aware of new drugs. According to the study by Martinez-Silveira and Oddone (2008), the most common information needs of residents included pharmacotherapy (44%) (Martinez-Silveira and Oddone, 2008). Pharmacotherapy also accounted for the highest information needs of physicians in the research by Cogdill et al. (2000), and the results of both these studies confirm the results of the present study.

The nature of medical science, was also regarded as another factor that leads physicians and residents to use information sources for disease management in order to keep up with new changes and use new medical findings and achievements considering its dynamic nature and rapid updating. Other studies have referred to this important issue, including the study by Bryant (2004), in which updating, bridging the knowledge gap, uncertainty and curiosity have been regarded as information needs of 58 family physicians. Naeem et al. 2013 also referred to information updating as one of the reasons for physicians using the hospital library (2.11%), which is consistent with the results of the present study.

Physicians and residents also need information to address educational and research needs, which is indirectly related to CDM, but the research participants referred to them as both an information need and a daily activity. Naeem et al. (2013) also referred to continuing education or study for the classroom or conference (9.47%), teaching (5.12%), and research (7.6%) along with other factors as the factors leading physicians to use the hospital library, which are consistent with the results of the present study.

As physicians and residents experienced various information needs at any stage of clinical decision-making, they also employed various information sources. This is justifiable considering the type of their activity and the necessity of having all-round

information under sensitive conditions of confronting clinical problems. Meanwhile, the results suggest that providing the necessary infrastructures for usage of contexts and different information media as well as information resources in line with special clinical situations should be in the agenda of libraries and information centers. In the research by Antoun et al. (2022), the information sources utilized by family physicians were diverse and included textbooks, guidelines, medical websites, medical applications, databases, and consultation with colleagues, which is in line with the findings of the present research.

During their information seeking process, the physicians also faced problems and barriers including shortage of time, which has been mentioned by different studies (Clarke et al., 2013; Kritz et al., 2013). This barrier is justifiable considering the busy nature of physicians' jobs because of the large number of patients and insufficient number of specialists. Technological barriers and especially poor Internet bandwidth considering inadequate opportunity in some cases for saving patients' lives and the immediate need of physicians to information is a major concern which has also been mentioned in other studies including the papers analyzed in a systematic review by Aakre et al. (2019), which requires serious attention. Skill challenge again considering the effect of information seeking skill on the speed of information retrieval is an important point that should be of high priority through organizing educational workshops by libraries in order to empower physicians.

Results of investigating and comparing the categories and subcategories extracted from the present study with other studies, seems to show that in the present study, which was conducted with a qualitative approach and CIT, the information needs of participants were analyzed based on their recent experiences and in the patient bedside, and thus rich and detailed information about the needs of physicians and residents in CDM process has been obtained, which distinguishes the results of the present study from other relevant studies. Besides, CIT is introduced as a useful approach for library and information studies that has also been mentioned in other studies by Sadeghi, Nowkarizi, and Tajafari (2022). Therefore, it is suggested to carry out further relevant research using this approach with collaboration of other groups as well as in other geographical contexts.

The research, like other qualitative researches, has limitations, such as the small sample size, which

makes its generalization difficult, therefore, it is suggested to conduct further research based on the categories and subcategories identified in the current research with a quantitative approach in different geographical contexts and with a larger sample size.

Conclusion

The results of the present study showed that the physicians and residents in most CDM stages, ranging from the early stages of dealing with the patient, diagnosis, prescription, treatment, disease follow-up as well as patient education need to search for information in information sources. In addition, part of the reasons of information needs among them has been related to the nature of medical science, which is a dynamic science and information dependent; definitely, there is uncertainty in the science causing physicians and residents to be constantly learning, upgrading, and improving their professional knowledge in order to keep up themselves with latest medical findings. In order to resolve their information needs, they have employed various information sources and faced some challenges; considering the necessity of their awareness about information sources, having the skills required for optimal exploitation of information sources, online access to up-to-date and credible scientific evidence, and presence of a high-speed Internet network necessitate special attention by policymakers and libraries considering the sensitivity of their daily activities and the necessity of easy as well as timely access of physicians to information sources.

The results of the study also provide a clear picture of the information needs of physicians and residents, which can pave the way for libraries and medical information centers and health professionals to decide for increasing access to up-to-date and relevant information to satisfy the information needs of physicians and residents. Besides, using new technologies, specialized information resources can be designed tailored to the information needs of these groups and for each CDM stage.

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