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Gastroenterology and Hepatology Experts' Views about the Current Information Retrieval Systems and Determining the Characteristics of the Optimal System from Their Point of View

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Abstract

Objective: The ideal goal of any information system is to supply and deliver the information that users need. The aim of this study is to determine gastroenterology and hepatology experts' views about the current information retrieval systems and determining the characteristics of the optimal system from their point of view.

Methods: This is qualitative research that has been done phenomenologically. The study population 14 gastroenterology and hepatology experts. The data collection tool was a free interview in a non-structured way. Colaizzi's descriptive phenomenological method was used to collect data.

Results: The problems were classified into 3 categories, 15 general themes, and 31 sub-themes. The optimal information retrieval systems were classified into 4 categories, 12 general themes, and 41 sub-themes.

Conclusions: The success of information retrieval systems, especially in the field of medical sciences, depends on considering various dimensions that not paying attention to them can lead to dissatisfaction of end-users of the system and ultimately the failure of the retrieval system. Therefore, it is suggested that information retrieval system design be done by developers under the characteristics of the optimal information retrieval system by gastroenterology and hepatology experts

Keywords: Information retrieval systems, Gastroenterology, and hepatology, Information needs

Introduction:

The information needs of the user are the focus of the providers of information systems and services. The ideal goal of any information system is to supply and deliver the information that users need. The importance of this issue cannot be ignored; because the whole process of transferring information and knowledge depends largely on accurately identifying what the user needs. Therefore, the function of information systems is to try to satisfy the information needs of its users (2).

In this regard, and parallel with the study of information needs, one should look for what people do when trying to meet their information needs. In designing an information retrieval system, the goal is to tailor job demands to the knowledge and skills of the system users; therefore, each group considered specific tasks and resources. To interact effectively, the methods needed to accomplish a particular task must be compatible with the user's conventional cognitive characteristics. The tasks and procedures of information retrieval systems must be constructed in a logical manner and in a manner that is consistent with the needs of the user and meets their knowledge expectations. Therefore, the proper design of systems requires careful analysis of the task and activity pattern of system users(3). This is the same emphasis that Colthau puts in explaining the need to explain the cognitive domain in his information model (4).

Despite the great need, attention to information retrieval systems in the field of Gastroenterology and Hepatology has little history.

However, research has been done on the use of technological systems in diagnostic processes as well as intelligent retrieval of medical images (in clinical records); In 1985, for example, a system was developed by researchers at the University of Warsaw in close collaboration with medical professionals, who piloted a natural language information retrieval system that addressed the digestive tract as a branch of internal medicine (5). In another system, a web-based interface was designed for image retrieval and a cluster analysis system (6).

Due to the importance of personalized information retrieval services and systems, the vacuum of a clinical and research information retrieval system and the tools needed to meet the information needs of experts in this field is evident. Therefore, this study aims to determine gastroenterology and hepatology experts' views about the current information retrieval systems and determining the characteristics of the optimal system from their point of view.

Methods

This is qualitative research that has been done phenomenologically. According to the purpose of research in determining information needs and expectations of specialists and researchers from a comprehensive system of specialized information retrieval in the field of gastroenterology and hepatology and the need to discover and explain their views as end-users of the system to provide future system requirements, qualitative methods, and Special phenomenological method is one of the most important and best methods to achieve this goal; Because in the phenomenological method, phenomena of any kind are studied and their descriptions are taken into account before any evaluation, interpretation or value judgment, considering the manner of their manifestation(1). The study population was specialists and researchers in the field of gastroenterology and hepatology. Given that purposeful sampling is commonly used in phenomenological research, researchers continue to interview participants until they believe that they have reached a point where they do not have a clearer understanding of the experience in subsequent conversations with participants. In this study, the number of samples was determined after interviews and reaching information saturation. Therefore, 14 gastroenterology and hepatology experts were interviewed. Participants included 9 males and 5 females. Due to the need to pay attention to the opinions of experts in various clinical and research dimensions, participants in terms of education include 12 gastroenterology and hepatology specialists and 2 researchers in the field of gastrointestinal cancers. Interviews with more samples than the ones available in the main research environment were determined from Gorgan and Gonbad hospitals and interviews were conducted with gastroenterology and hepatology specialists working in these centers. Due to the need to discover all the deep dimensions of information needs and the expectations of gastrointestinal researchers from a comprehensive system of retrieving specialized information in the field of gastroenterology and hepatology, the data collection tool is a free interview in a non-structured way. The choice of unstructured method by the research team was since in this approach, it is anticipated that all aspects of the professional experiences of the studied samples will be discovered and the opportunity to express all their wishes will be provided.

Colaizzi's descriptive phenomenological method was used to collect data. After the interviews, the text of all the interviews was implemented exactly, and then the important sentences and concepts were extracted and the main and sub-topics were drawn. After analyzing the text of the interviews, the codes obtained from the initial analysis were written separately and merged into organized categories and different codes to form more general categories; That is, codes that had a single subject became one of the main themes. To ensure the accuracy of the participants' experiences and to remove the ambiguity, the interviews and the extracted themes were approved by the interviewees in two stages. First, the implemented transcripts of the interviews were sent to the participants, and any ambiguities or explanations were resolved. After extracting the interview codes, the extracted codes and themes were reconfirmed to ensure that the opinion of the participant was conveyed.

Results

The results of the analysis of the interviews are presented in two parts: the problems of the current information retrieval systems and the characteristics of the optimal information retrieval systems (Table 1). In the section on problems of current information retrieval systems, problems were classified into 3 categories, 15 general themes, and 31 sub-themes. In the characteristics section of the optimal information retrieval systems, the mentioned items were classified into 4 categories, 12 general themes, and 41 sub-themes.

Problems in accessing information were raised as one of the most fundamental issues. Sub-categories of this topic were access costs, lack of free access to information resources, and the filtering of many scientific resources. Lack of timely and facilitated access to resources is an influential factor in the use or non-use of information retrieval systems and motivations affecting it.

Relevance of retrieved resources was raised as another problem in current information retrieval systems. Relevance as one of the most important features of any retrieval system is considered by clinical specialists and there was a great deal of dissatisfaction with this situation. These topics included lack of proper sorting of results, presentation of irrelevant information by current retrieval systems, and insufficient relevance of recovered resources. Among the suggestions for designing the optimal system and solving these problems, the need for a numerical grading system to solve the problems of unrelated retrieval of resources based on such options like the frequency of keywords and the possibility of filtering results based on the percentage of relevance, the need for a combined filter based on study type and the relevance of the results (for example, meta-analysis with 80% relevance).

Other issues with current information retrieval systems include the complexity of the system and the difficulty of using it. Complexity is an influential factor in not using existing systems and there is a difference between the views of retrieval system designers and the lack of attention to the search habits of clinical specialists in this regard. The topics covered in this group are the difficulty of advanced searches, the time-consuming of advanced search, the difficulty of designing a search strategy, and the enormous complexity of current information retrieval systems. To solve this problem, suggestions of the optimal system such as the need for a simple interface and information retrieval system were presented.

The comprehensiveness of the information retrieval systems was also mentioned. According to experts in the field of gastroenterology and hepatology, one of the problems of current retrieval systems has been the lack of comprehensiveness in providing all available scientific content. This problem was presented in two contexts: retrieval of different results from different databases as a factor creating uncertainty and incompleteness of resources by current retrieval systems.

Another concern of gastroenterology and hepatology experts regarding information retrieval systems was the content of the resources. In this regard, insufficient attention to the inclusion of guidelines in current retrieval systems, insufficient attention to procedures in current retrieval systems, and lack of clinical advice in most current retrieval systems were extracted as topics.

Other characteristics of an optimal retrieval system include the need for non-article resources such as procedures and guidelines and multimedia resources to perform practical tasks such as endoscopies, etc., the importance of all journals due to the possibility of publishing very important articles in lower credibility journals, the importance of all sources, especially case reports, the insignificance of books due to the antiquity of its contents, as well as the need for a module to provide the latest updates to the guidelines of reputable international gastroenterology and hepatology associations were mentioned.

The lack of intelligence of the system was another problem. This lack of intelligence was expressed in several areas, including the lack of intelligence of current retrieval systems, the lack of semantic search capabilities in current retrieval systems, and the intolerance of errors in current data retrieval systems in

case of typographical errors. Corresponding to these problems, the characteristics of the optimal system including the need to consider the ability to intelligently identify errors, especially in spelling and typographical errors, the need for automatic detection of synonyms and integrated search of topics by the retrieval system, and the need for semantic and intelligent search by the retrieval system.

False Drop was cited as another problem with current data retrieval systems. Retrieving too many articles as an annoying factor and unwanted search results in current retrieval systems were two dimensions of this problem.

The credibility of the resources recovered from the current systems was a concern of clinical practitioners. The uncertainty of the validity of the sources, especially regarding the application of studies during clinical processes and the hesitation in applying the recommendations, were expressed as reasons for distrust in retrieval systems.

The need for a communication mechanism between researchers to exchange experiences and even critique published studies and its absence was another issue and concern of experts in the field of gastroenterology and hepatology. The lack of a mechanism to establish and facilitate communication between researchers and authors through information retrieval systems can be considered one of the main problems of almost current retrieval systems.

The diversity of search methods in different databases and the need to learn all of them was raised as another problem. Therefore, what is desirable for gastroenterology and hepatology specialists is an integrated system that once learns the necessary training in this regard and does not need to learn different ways to use different systems.

The weakness of the filters of the current retrieval systems, especially in the case of diseases and drugs in gastroenterology and hepatology, was also mentioned. Since gastroenterology and hepatology have their issues, general filters cannot meet the needs of their users. Many current information systems generally do not have adequate clinical filters; therefore, designing a retrieval system with filters for gastroenterology and hepatology was another category considered by experts in this field.

Failure to specify sources based on the level of clinical evidence in the evidence pyramid, especially regarding the clinical applications of the current retrieval system, was one of the most important problems. Therefore, determining the level of clinical evidence was proposed. Due to the great lack of time of clinical specialists, especially during clinical interventions, and the need for reliable information at the time of treatment, determining the level of evidence to trust the findings of sources and the ability to make decisions based on these levels was a key factor.

The existence of a specialized information retrieval system in the field of gastroenterology and hepatology was the need of almost all interviewees. Special attention to research and clinical requirements in the predicted system and special requirements in this field justified the need for this system.

Table 1. Problems of current information retrieval systems

Category	Inferred concepts	Extracted themes
Access	Difficult access to information resources	<ul style="list-style-type: none"> Resource filtering or insufficient access to many resources Lack of free access to information The cost of access to scientific resources
Structure of information retrieval systems	Relevance	<ul style="list-style-type: none"> Lack of optimal sorting of results Providing irrelevant information by current retrieval systems Insufficient relevance of recovered resources
	The complexity of the system	<ul style="list-style-type: none"> Advanced search difficulty Advanced search time consuming The difficulty of designing a search strategy The enormous complexity of current information retrieval systems

Table 1. Problems of current information retrieval systems

Category	Inferred concepts	Extracted themes
	Intelligence	<ul style="list-style-type: none"> Lack of intelligence of current information retrieval systems Lack of semantic search capabilities in current information retrieval systems Failure to tolerate errors in current information retrieval systems in case of typographical errors Lack of concept search system (e.g. thesaurus) in most databases
	False Drop	<ul style="list-style-type: none"> Recovering too many resources as an annoying factor The false drop of information retrieval in current retrieval systems
	Communication and interactive networks	<ul style="list-style-type: none"> Lack of mechanism to establish and facilitate communication between researchers and authors through information retrieval systems
	Classification	<ul style="list-style-type: none"> Lack of accurate subject classification of resources in information retrieval systems Lack of attention to specialized classifications in the field of gastroenterology and hepatology
	User interface and training problems	<ul style="list-style-type: none"> The variety of search methods in different databases and the need to learn all of them The complexity of the interface of current information retrieval systems
	Filters in current systems	<ul style="list-style-type: none"> Weakness of filters in current retrieval systems for diseases and drugs in the gastroenterology and hepatology
	Possibility of advanced searches in evidence-based information retrieval systems Dividing current information retrieval systems into two parts: clinical and research	<ul style="list-style-type: none"> Lack of advanced search in clinical information retrieval systems such as Uptodate Lack of division of current information retrieval systems into two parts: clinical and research
Content of retrieval systems	Comprehensiveness	<ul style="list-style-type: none"> Retrieve different results from different databases as a cause of uncertainty Lack of comprehensiveness of resources by current retrieval systems
	Resource content	<ul style="list-style-type: none"> Insufficient attention to the inclusion of guidelines in current retrieval systems Insufficient attention to procedures in current information retrieval systems Lack of clinical guidelines and recommendations in most current information retrieval systems
	Resource validity Attention to levels of clinical evidence	<ul style="list-style-type: none"> Uncertainty of validity of study results Failure to specify sources based on the level of clinical evidence in the evidence pyramid

Table 2. Characteristics of the optimal information retrieval systems

Category	Inferred concepts	Extracted themes
Existence of a specialized system	The need for a specialized information retrieval system	<ul style="list-style-type: none"> Need a specialized gastroenterology and hepatology information system
Access	Facilitated access	<ul style="list-style-type: none"> designing Systems in both online and offline Free access to the information retrieval system The need for full access to the text of articles in the information retrieval system The need to send newly published articles to researchers (like push technology)
Structure of information retrieval systems	Embedding intelligent features	<ul style="list-style-type: none"> The need to consider the ability to intelligently identify errors, especially in spelling and writing errors The need for automatic detection of synonyms by the retrieval system The need for semantic and intelligent search
	Classification	<ul style="list-style-type: none"> The need to provide and suggest relevant resources automatically by the system The necessity of classifying articles based on the geographical area of the study population The need to classify sources based on the level of clinical evidence in the evidence pyramid The need for subject classification of multimedia, guidelines, and procedures, and the like The need for subject classification of resources in both research and clinical departments

Table 2. Characteristics of the optimal information retrieval systems

Category	Inferred concepts	Extracted themes
Content of retrieval systems	Filters	<ul style="list-style-type: none"> The need for accurate filters with details of diseases, drugs, etc. in the information retrieval system The need for filters in the geographical area of the study population The need to create a filter based on the validity indicators of journals such as IF, Q, index, and... The need to determine the level of resource evidence and the possibility of filtering resources accordingly
	Structure of information retrieval system	<ul style="list-style-type: none"> Need for an integrated database (with the ability to retrieve data from several major databases) System design in both research and clinical sections Existence of specialized module for pediatrics The necessity of having a procedures module in different subject classes The need for a specialized module of clinical guidelines and recommendations in different subject classes The need to create an emergency information module that is a summary of valid sources for clinical use due to time constraints during treatment or diagnosis The need to create a multimedia module extracted from valid scientific sources Ability to subjectally browse and categorize content based on predefined topics The need for two sections: the ability to search and browse Existence of gastroenterology and hepatology core journals in the information retrieval system
	Relevance	<ul style="list-style-type: none"> The need for a numerical relevance rating system to solve problems of unrelated retrieval of resources based on items such as the frequency of keywords and the possibility of filtering results based on the percentage of relevance The need for a hybrid filter based on the type of study and the relevance of the results (for example, meta-analysis with 80% relevance)
	Communication and interactive networks	<ul style="list-style-type: none"> Existence of an interactive part in the information retrieval system to raise new issues such as cases and scientific discussion in specialized working groups The need to be able to communicate with all authors of the article to facilitate the detection of fake data
	Platform	<ul style="list-style-type: none"> The need to use the pushing approach instead of the need for active search by physicians System design in mobile-based platforms in addition to conventional online forms
	Simplicity	<ul style="list-style-type: none"> The complexity of advanced searches in current retrieval systems and the need to facilitate the search The need for the simplicity of the interface and the search system of the information retrieval system
	training	<ul style="list-style-type: none"> The need for simple and understandable training on how to use the information retrieval system
Resource content	<ul style="list-style-type: none"> Need non-article resources such as procedures and guidelines and multimedia resources to do practical things like endoscopes The importance of all sources, especially case reports, and attention to all types of articles Lack of importance of books due to the antiquity of its contents The need for a module to provide the latest updates to the guidelines of reputable international gastroenterology and hepatology associations Compilation of concise and useful clinical content to increase the speed of its use 	

Discussion

The results showed that the problems of current retrieval systems were expressed in three categories: access, the structure of existing information systems, and content of resources. Also, the characteristics of the optimal information retrieval system were mentioned in 4 categories: the existence of a specialized system for retrieving gastroenterology and hepatology information, facilitated access, the content of resources, and the structure of the system.

One of the problems raised and the important categories mentioned were the problems of access to information resources. In this regard, one of the features of the optimal information retrieval system was facilitated access by overcoming access problems and especially access costs. In similar studies, consistent results have been obtained and the importance of free access to scientific information has been expressed as one of the most important concerns of researchers (7-10).

Relevance of retrieved resources was raised as another problem in current information retrieval systems. Relevance as one of the most important characteristics of any information retrieval system is considered by clinical specialists and there was a great deal of dissatisfaction with the relevance in the results retrieved by the current information retrieval systems. Relevance plays the most important and fundamental role in all aspects of information retrieval, including theory, implementation, and evaluation, and this has been mentioned in many sources in this field (11-16). Other research has also shown that user expectations are dynamic and depend on users' expertise and work environment (17, 18).

In the category of system structure, issues such as the complexity of the system and the difficulty of using it, and other related issues have been raised. Complexity is an influential factor in not using existing systems and there is a difference between the views of information retrieval system designers and the lack of attention to the search habits of clinical specialists in this regard. Of course, there are different views in this regard. For example, Smith and Kantor (2008) in a study that had challenging results state that the results of their studies have shown that users' judgment and search success is independent of the design of the information retrieval system and between the success of users in search and standard design of information retrieval systems, no significant relationship was found. This is because users constantly change their behaviors during the search according to the characteristics of the system and find a way to succeed in the search. They have come to the important conclusion that the success of the system is determined by the time of use by users and that predetermined criteria are less decisive in this regard (19). Of course, from the result of this research, the importance of the need to pay attention to the dedicated users of the system can be addressed and it was found that considering only the standard features of information retrieval systems cannot be a suitable criterion for a specialized information retrieval system.

In another perspective, simplicity has been a feature of the preferred system for gastroenterologists. This principle has always been the focus of information retrieval studies and is related to the principle of least effort. The principle of least effort explains that in general, the user is looking for a method with the least cost-energy, and one of the most enduring principles in experimental studies is information search, including web search and information retrieval systems. The principle of least effort states that when solving problems, one tends to "minimize the average possible rate of work (overtime), meaning to make the least effort (20-22). In this regard, the need for the simplicity of the interface and search system of information retrieval system has been one of the most important concerns of gastroenterology and hepatology experts. In previous studies and the design of retrieval systems, this component has been predicted as one of the goals (23, 24).

The comprehensiveness of the information retrieval system was also mentioned. According to experts in the field of gastroenterology and hepatology, one of the problems of current information retrieval systems has been the lack of comprehensiveness in providing all available scientific content. In this regard, in other studies, one of the most important criteria is the comprehensiveness of the system in retrieving all resources, which is in line with the views of gastroenterology and hepatology about a desirable system (25-28). Therefore, the necessity of having a specialized system of information retrieval in the field of gastroenterology and hepatology, which includes a specialized collection with maximum comprehensiveness in published scientific texts has been raised.

In explaining the characteristics of the optimal retrieval system, the necessity of a numerical relevance rating system to solve the problems of unrelated retrieval of resources was pointed out. In this regard, Jansen and Rieh (2010) point out that information retrieval researchers have focused on algorithmically matching the retrieved results with the relevant question or relevance feedback. Kokubo et al. (2005) in examining

the relationship between result ranking and user satisfaction, have stated that result ranking is one of the most necessities of retrieval systems to increase user satisfaction (29).

False loss is another issue raised by researchers and experts in the field of gastroenterology and hepatology in the face of current information retrieval systems. Retrieving too many articles as a nuisance and false information loss in current retrieval systems were two dimensions of this problem. In similar studies, the false drop was mentioned as one of the problems of information retrieval systems (30-34).

Failure to specify sources based on the level of clinical evidence under the evidence pyramid was one of the most important problems of the current retrieval system. In this regard, determining the level of clinical evidence of sources was another suggestion of experts. Due to the great lack of time of clinical specialists, especially during clinical interventions, and the need for reliable information at the time of treatment, determining the level of evidence to trust the findings of sources and the ability to make decisions based on these levels was a key factor. Also, the lack of an accurate subject classification of articles in information retrieval systems was another problem in the lived experiences of gastroenterology and hepatology experts and one of their most important recommendations. Similar studies have addressed this issue in the design of their models and addressed the need for information in hierarchical classification (22, 32-37).

The weakness of the filters of the current information retrieval systems, such as the filtering of resources based on diseases and drugs, was also mentioned. Since gastroenterology and hepatology have their issues, general filters cannot meet the needs of their users. In principle, many current information systems do not have adequate clinical filters. In this regard, similar studies have emphasized the need for specialized filters (38, 39).

Conclusion

The success of information retrieval systems, especially in the field of medical sciences, depends on considering various dimensions that not paying attention to them can lead to dissatisfaction of end-users of the system and ultimately the failure of the retrieval system. Therefore, it is suggested that information retrieval system design be done by developers under the characteristics of the optimal information retrieval system by gastroenterology and hepatology experts. It is also necessary to consider the need for a comprehensive specialized information retrieval system and the provision of evidence-based medical implementation infrastructure. The design of this system is an important step in meeting many information needs of specialists and researchers in the field of gastroenterology and hepatology in both research and clinical dimensions.

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