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Image retrieval behavior of medical students

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Abstract:

BACKGROUND: The first step to properly designing image retrieval systems with the aim of meeting the needs of students and researchers is to be fully aware of their behavior in the face of these systems and image resources. The purpose of this study is to identify image retrieval behavior of medical students.

MATERIALS AND METHODS: This study is an applied research that has been done by descriptive-survey method. The statistical population of this study is 816 general (clinical) medical students who are studying in the fourth and fifth years. Using Morgan and Krejcie table, the number of statistical sample members was 265 who were selected using random sampling method. Research data have been gathered using a questionnaire (researcher made) and then analyzed using SPSS22 software.

RESULTS: The findings showed that 78.1% of students consider the use of images in class presentations or scientific reporting as the most important reason. According to 73.6% of respondents, the highest rate of image search is in the form of videos. About 76.2% of them consider general search engines to be the most common source for receiving images. For this purpose, only 3.8% of students refer to the librarians. Among the databases from which medical images can be obtained, the most well-known source was the Springer website, which 30.6% of respondents were familiar.

CONCLUSION: The process of meeting the image-seeking needs is influenced by various individual, social, and other factors. This study can improve this process by providing the necessary suggestions to medical students, for eliminating barriers and problems in accessing reliable resources and visual information they require, to clarify the necessity of promoting technical knowledge to search accurately and to help for finding solutions to medical and treatment educational centers to have access to reliable and up-to-date information.

Keywords:

image retrieval, image retrieval behavior, information behavior, medical students

Introduction

From time immemorial, the image has always been regarded as an effective source of information in many disciplines, including medicine, law, journalism, education, and even daily life.[1]

In the past, the production and distribution of images was limited, but today, with the advent of new technologies, there are no such restrictions. With the growth and development of the Internet, search engines in recent years have done a lot of research on the subject of image retrieval at the request of users. Although the use of images has been highly regarded in the digital space, research on user image retrieval behavior is insufficient.[2] This issue needs to be further explored in many disciplines. For example, the use of images in the field of medicine for the purpose of education and research is very common. Therefore, the issue of image retrieval is very important and necessary for the relevant colleges and information centers. New medical education programs focus more on self-study and problem-based learning, and this has led students to turn to Internet search methods because the Internet is a simple, inexpensive,

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and accessible resource.[3] Therefore, it is necessary to promote students' information literacy in a way that improves their access to valid and reliable data. To achieve this goal, students' information behaviors should be studied so as to be improved. The term information behavior refers to the conscious effort of human beings to improve their level of knowledge.[4] Therefore, it can be said that the study of information behavior is very necessary in various fields, including medicine.

Some researchers have examined the needs and behaviors of different users when searching for images. However, few studies have been done in the field of medicine.

The reasons for retrieving medical images on the Internet among medical professionals stated as follows: the use of images in education, research, and treatment, the educational role of images as a tool, the advantages of image retrieval, the importance and special characteristics of medical images, as well as such motivations as personal, educational, and research preferences.[5] In another study, findings indicated that the accuracy of these two types of search engines (i.e., general and specialized search engines) has no statistically significant difference.[6] Regarding the problems and issues related to image retrieval by search engines, the study revealed that Google, Yahoo, and Bing search engines could not recognize many features of the Persian language and its spelling. Of course, Google's ability in this area is greater than its competitors.[7] In a comparative study about the retrieval of radiology images and the accuracy of their ranking in general and specialized radiology search engines, the results showed that general search engines performed significantly more accurately.[8] The information behavior of postgraduate students was studied and the findings showed that due to their unfamiliarity with specialized databases and lack of contact with librarians, they prefer to use general search engines.[3] A survey on image retrieval behavior of architecture students revealed that the main purpose of architectural experts in searching image is to obtain creative ideas and learn about the characteristics of architectural structures. Another study indicated that students are not skilled enough to search, select, and use images. While investigating content-based search methods in large medical databases, researchers concluded that more advanced tools were needed to increase the accuracy of image retrieval in medicine.[9] Another study indicated that adding more descriptions to titles can improve the relevance of medical image search results.[10] A survey on students regarding health data demonstrated that the most important sources to obtain health information related to high-risk behaviors were "the internet" and "virtual social media." In addition, the most important criterion for the evaluation of information was "the trueness and correctness of the information."[11] The findings of another study showed that the high cost of information sources, lack of response from treatment personal, and lack of trust in website information were the most important barriers for health information seeking.[12] Researchers indicate that most people do not know the databases that exist in their professional field and do not have the necessary skills to search for images in these databases. Due to the rapid developments that are taking place in the medical sector and also the need to use new methods to access reliable and timely information, since the situation of medical students in this area has not been addressed, our goal in this study is to investigate and determine the needs of medical students in the field of image search and to review of methods and issues they face.

Materials and Methods

This study is an applied research that has been done by descriptive-survey method. The statistical population of this study is 816 general medical students who are studying in the fourth and fifth years. Using Morgan and Krejcie table, the number of statistical sample members was 265 who were selected using a simple random sampling method.

The reason for choosing this statistical population was that this group of students faces practical problems at the same time as theoretical courses, and their need to search and use images is probably higher than other majors because they are undergoing a clinical course. We used a researcher-made questionnaire to collect data. In composing the final research questionnaire, the works of researchers such as Kalantari *et al*.,[3] Esmaeilzadeh *et al*.,[11] Sedghi,[13] and Safipour Afshar[14] have been used and according to the main and secondary research questions, changes have been made in them. The validity of the questionnaire was confirmed by medical librarians and relevant experts in the health sector specifically physicians. Then, the questionnaire was distributed among a sample group of students, and based on the results obtained using Cronbach's alpha index, the reliability of the questionnaire was confirmed. Cronbach's alpha for this questionnaire was calculated to be 0.85. Therefore, the results obtained from the research questionnaire have the necessary reliability and validity. The data obtained from the survey were analyzed descriptively and inferentially. The indicators measured in the descriptive statistics section are frequency, mean, and standard deviation, and in the inferential statistics section, different statistical tests have been used depending on the type of questions (such as independent *t*-test, analysis of variance, and Spearman and Pearson correlation test). The research data were analyzed using SPSS 22 (IBM, Inc., Chicago, IL, USA) software.

All the collected questionnaires were completed with the consent of the students and they were given the necessary assurance that all the information will be used confidentially and only for this research. The study was approved by the Ethics Committee of Isfahan University of Medical Sciences.

Results

Descriptive statistics show that the age range of students is 24–28 years. About 64.5% of them were female and 35.5% were male. In the following, we will express the research findings based on the research questions and objectives.

The findings show the statistical frequency of respondents based on their intention and motivation to search for medical images (frequency of respondents to the relevant items in the questionnaire). The Friedman test shows that the results of different items have a statistically significant difference in relation to students' intention and motivation to search for medical images ($P \leq 0.001$). According to the data obtained, the first reason for searching for medical images was "class presentations and composing scientific reports" and the last priority was related to "entertainment" [Table 1].

In terms of the type of images that were searched, according to the research findings, the highest priority belongs to videos and the lowest to X-rays [Table 2].

Table 3 shows the results of the research question regarding the type of channels used by students to retrieve medical images. According to this table, the first rank belongs to "general search engines" and the last rank belongs to "specialized databases of medical images."

The findings show that according to the responses received from students, the most important source used by students to search for medical images is "general search engines."

Students are then asked what they will do if the medical image search results are disproportionate. The highest frequency of respondents was related to the item "add, delete, or change keywords and search again" and the lowest frequency was related to the item "asking for help from a medical librarian" [Table 4].

In the fifth question, students were asked how familiar they were with specialized medical image retrieval systems. In this section, some of the main sources of medical image search that can be accessed in the university digital library are questioned. These resources include BMJ learning, Springer, Clinical Key, Anatomy.

Table 1: Frequency percentage of students' intention of searching for medical images and their priority

n	Intention of search	Priority	Mean	SD
1	Learning or study	2	4.37	0.597
2	Diagnosis and detect evidence based medicine	4	4.28	0.618
3	Treatment and clinical decision-making	5	4.18	0.657
4	Research activities	6	3.02	1.131
5	Understanding scientific issues	3	4.29	0.944
6	Create ideas	7	2.88	1.188
7	Class presentations and composing scientific reports	1	4.71	0.610
8	Entertainment	8	2.49	1.268

SD=Standard deviation

Table 2: Frequency percentage of respondents based on the type of images selected and their priority

n	Type of images selected	Priority	Mean	SD
1	Ordinary picture (e.g., signs of a disease	2	4.42	0.630
22	Chart	5	3.49	0.628
33	Video	1	4.64	0.666
44	X-rays	8	3.20	0.625
55	CT scan	4	3.52	0.707
66	MRI	6	3.37	0.650
77	Ultrasound	7	3.29	0.616
88	Microscopic and pathologic pictures	3	3.87	0.870

CT=Computed tomography, MRI=Magnetic resonance imaging, SD=Standard deviation

Table 3: Percentage of sources the students use and their priority

n	Sources for students to search images	Priority	Mean	SD
1	General search engines	1	4.74	0.489
2	Specialized medical database images	6	2.52	1.270
3	Using teachers, classmates, and friends	4	3.24	0.780
4	Printed books and journals	3	3.37	0.656
5	Social network	2	3.67	0.894
6	CDs and DVDs	5	2.61	0.948

SD=Standard deviation

tv primal picture Medscape, MEDtube, WebMD, MedlinePlus, and Mosby's Nursing Skills. The highest level of familiarity was with Springer and the lowest level of familiarity was with Mosby's Nursing Skills.

Another issue of research was to identify the obstacles and problems faced by medical students when searching for images. The frequency of students' problems when searching for medical images is shown that the highest level of students' problems was related to "lack of access to reliable and up-to-date printed sources" and the lowest level of problems was related to "inability to copy or download images from the website."

It is worth mentioning that one of the strengths of our research is paying attention to the need of society to be aware of people's information behaviors in relation

Table 4: Percentage of respondents based on how they deal with disproportionate results of medical image search engine

n	How students deal with disproportionate	Priority	Mean	SD
1	Add, delete, or change keywords and try again	1	4.78	0.458
2	Change website and try again	2	4.58	0.704
3	Use specialized databases of medical images	4	2.34	1.154
4	Cancel and stop the search	3	4.10	1.049
5	Get help from a medical librarian	5	1.70	1.104

SD = Standard deviation

to digital media. Another advantage of this study is in selecting the statistical population from among medical students. Awareness and information of this group of students about image retrieval behavior will help them to retrieve information in the field of health and will see its positive effects both during their studies and during their professional life in the health system of the country. Lack of access to all students in the targeted community to fill out the questionnaire was one of the limitations of this study due to the busy schedule and lack of time that this group of students had due to attending hospitals.

Discussion

Health systems aimed to increase health utilization. Individual's health-seeking behavior is one of the determinants that affect the utilization of health services.[15]

In this research, an attempt has been made to determine the needs of medical students in this regard. Findings indicate that from the perspective of students, class presentations and scientific reporting, comprehension, and learning and study are the most important reasons for searching for medical images. This finding is consistent with the results of studies by some authors.[3,14,16-18] It seems that the most important intentions that students have from searching for images is to prepare scientific articles, learning lessons, and better understanding of the application of lessons. The findings of the study are inconsistent with the results of Ahmadipour *et al*.[19] The reason for this inconsistency was the use of images to develop creative ideas. The findings have shown that the highest motivation for searching for specialized images with the aim of obtaining more scientific and specialized information belongs to medical students. This result can facilitate and improve the access of this group to more efficient methods of image retrieval. The findings also indicate that in terms of image type, the most important types of images required by students are "video," "normal image," and "microscopic and pathological image." These results are consistent with the findings of Kalantari *et al*., Ahmadipour *et al*., and Hersh *et al*.[3,18,19] It seems that the selection of images is done by students based on their needs and medical students also select images according to their professional needs. The highest popularity and application belongs to video and normal images as well as microscopic images because students believe that the transfer of information with these images is easier and more accurate and a large amount of information can be received through them.

Another goal of the study was to recognize the channels used to retrieve medical images, and the research findings showed that "general search engines" is the most important path for image retrieval by students. These findings are consistent with the results of studies by Mirjood *et al*.[20] In fact, medical students prefer to use general search engines because they do not know about specialized medical information banks and do not have enough skills to use them. The findings of Safipour Afshar, Ahmadipour, Abirami, and Gavaskar support our research.[9,14,19]

The ease of use and availability of general search engines compared to specialized image databases also makes students more willing to use them. On the other hand, students are not familiar with specialized databases and do not prefer to use printed and specialized images because they will face problems such as unavailability, printing limitations, and high cost. Saving time and speed of access also increases students' interest in general search engines. The results of the study indicate that students' reactions to the disproportionate and unsuccessful results of search engines are "add, delete or change keywords and try again," "change the website address and type of search engine and try again" and "cancel and stop searching," while "getting help from a medical librarian" is the last priority. These results are consistent with the studies of Safipour Afshar, Kalantari *et al*., and Ruiz and Chin.[3,14,17] It seems that the reason why students are not inclined to search for images with the help of medical librarians is their lack of familiarity with the role and capabilities of medical librarians. The results of this study are inconsistent with the findings of Abirami and Gavaskar.[9]

Given the importance and sensitivity of the field of medicine, it seems necessary for students in this field to recognize and be aware of image search methods. Given that "receiving guidance and help from librarians" has been the last priority of students' choice, so it will be necessary to create a culture and introduce the capabilities and skills of medical librarians in the field of image retrieval.

In the final section, medical students' familiarity with specialized databases was measured and it was determined that the Springer site was the first source for

image retrieval and the Mosby's Nursing Skills database was at the last rank. This finding is consistent with the results of Vakili Mofrad *et al*., Asadi Ghadikolaie *et al*., Mirjood *et al*. (2015), and Shamna *et al*.[6,8,10,20] It seems that the reason for not referring to these specialized databases was the lack of knowledge of students about them. Of all the databases, visiting the Springer site is significant.

Lack of image retrieval resources was one of the limitations of this study. The selection of medical students as the statistical population of the study is also one of the strengths of this study because the study and diagnosis of image retrieval behavior of medical students will play an important role in the correct transmission of information related to health. Of course, if this research was done qualitatively and through interviews with health experts and students, it would have yielded more valuable and profound results.

Conclusion

The nature of the medical profession makes it highly necessary for students, staff, and researchers in this field to have access to reliable and up-to-date information.

Therefore, from "recognizing their information needs" till "meet to those needs" is very important and this process is influenced by various individual, social, and other factors. On the other hand, among the various sources of information, images are widely used sources of information in the field of medical sciences.

The findings of this study helped us to understand the motivation of students to search for images, types of images searched, search channels, and their reactions to the disproportionate results of medical image searches. Students know the importance of using images to achieve educational goals, but due to little familiarity with specialized databases related to medical images and also how these resources work in the field of image retrieval, they do not get good results. Most medical students do not know the proper way to search databases and do not use their guidance because they are unaware of the role and abilities of medical librarians. As a result, they cannot properly retrieve the required images from specialized databases. The results of this study can improve this process providing the necessary suggestions to medical students to achieve the desired visual content to improve their educational level, also the findings can help students to eliminate barriers and problems in accessing resources and visual information required by medical students with the assistance of medical librarian. There is a need to improve the level of technical knowledge to search accurately and receive specialized information appropriate to the educational goals. This study provides the suggestion in this area.

Due to the knowledge and skills of medical librarians for image retrieval, medical students should be encouraged to use specialized databases by them. It is necessary to hold continuous and planned workshops with the aim of promoting information literacy of medical students. At the same time, it is possible to modify and strengthen the course plan of medical students by adding some practical lessons such as "learning medical databases."

The results of this study can be the basis of future similar studies, for example, there are some suggestions for future researchers in this area: to investigate the role of libraries and medical librarians in meeting the medical students' image-seeking needs and also to compare the problems of medical and nonmedical students in retrieving educational images.

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Conflicts of interest

There are no conflicts of interest.

References

1. Choi Y, Rasmussen EM. Users' relevance criteria in image retrieval in American history. Inf Proc Manag 2002;38:695-726.
2. Enser P. The evolution of visual information retrieval. J Inf Sci 2008;34:531-546.
3. Kalantari A, Jowkar A, Jahani Hashemi H. Information seeking behavior of postgraduate students of Qazvin University of Medical Sciences for retrieval of specialized images and videos. J Payavard Salamat 2017;11:479-89.
4. Mokhtarpour R, Keshvari M. Comparative study of methodological approach to models and studies of information seeking behavior of Iranian researchers. Human Inf Interact 2015;2:43.
5. Kiani M, Mansourian Y. Medical image retrieval in the web from the perspective of experts in medical sciences: A qualitative study. J Health Administ 2013;16:99-108.
6. Vakili Mofrad H, Hariri N, Noshinfard F, Abazari Z. A comparative evaluation of the recall and precision of search engines and meta search engines in medical images retrival. Sci Int 2015 Mar 1;27 (2).
7. Norouzi Y, Homavandi H. Survey of image search and retrieval problems in selected search engines based on the Persian writing styles. library. Inf Res J Fall Winter 2016;5:206-22.
8. Asadi Ghadikolaie O, Asadi S, Nouroozi A, Ehsani R. Comparing the accuracy of general search engines and specialized databases in retrieving radiology images. Health Manag Tratment 2014;5:77-8.
9. Abirami N, Gavaskar S. Content based image retrieval techniques for retrieval of medical images from large medical datasets-a survey. Int J Adv Res Comp Sci 2019;10:50.
10. Shamna P, Govindan VK, Abdul Nazeer KA. Content based medical image retrieval using topic and location model. J Biomed Inform 2019;91:103112.
11. Esmaeilzadeh S, Ashrafi-Rizi H, Shahrzadi L, Mostafavi F. A survey on adolescent health information seeking behavior

related to high-risk behaviors in a selected educational district in Isfahan. PLoS One 2018;13:e0206647.
12. Ghazavi-Khorasgani Z, Ashrafi-Rizi H, Mokarian F, Afshar M. Health information seeking behavior of female breast cancer patients. J Educ Health Promot 2018;7:138.
13. Sedghi S. Relevance Criteria for Medical Images Applied by Health Care Professionals: A Grounded Theory Study: [PhD thesis] South Yorkshire: University of Sheffield; 2009.
14. Safipour Afshar A. Image Retrieval Behavior of Post Graduate Students of Tehran University of Medical Sciences [dissertation]. Tehran: Tehran University of Medical Sciences; 2011.
15. Khajeh A, Vardanjani HM, Salehi A, Rahmani N, Delavari S. Healthcare-seeking behavior and its relating factors in South of Iran. J Educ Health Promot 2019;8:183.
16. Markonis D, Holzer M, Dungs S, Vargas A, Langs G, Kriewel S, *et al*. A survey on visual information search behavior and requirements of radiologists. Methods Inf Med 2012;51:539-48.
17. Ruiz ME, Chin P, editors. Users' Image Seeking Behavior in a Multilingual Tag Environment. Workshop of the Cross-Language Evaluation Forum for European Languages; Springer: 2009.
18. Hersh W, Jensen JR, Müller H, Ruch P, Gorman PN. A Qualitative Task Analysis of Biomedical Image Use and Retrieval; 2005.
19. Ahmadipour F, Hajizeinolabedini M, Asnafi AR. Study on Image seeking behaviour of Iranian Architects at Shahid Beheshti Unviersity. Library Philosophy and Practice. 2019 Dec 1:1-7.
20. Mirjood SH, Ghiasi M, Daliri S, Kouchakinejad EL, Abbasian JA. A comparison of accuracy in specialized medical search and general search engines for retrieving medical image. Educational Development of Judishapur 2015;6(2):130-8.