Original Article

Preconceived Stakeholders' Attitude Toward Telepathology: Implications for Successful Implementation

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Abstract

Introduction: Telepathology is a subdiscipline of telemedicine. It has opened new horizons to pathology, especially to the field of organizing consultations. This study aims to determine the capabilities and equipment required for the implementation of telepathology from the viewpoints of managers, IT professionals, and pathologists of the hospitals of West Azerbaijan, Iran. **Methods:** This is a descriptive-analytical study conducted as a cross-sectional study in 2015. All public and private hospitals of West Azerbaijan were selected as the study sites. The population of the study was the managers, directors, pathologists, and IT professionals of the hospitals. The study population was considered as the study sample. Data were collected using questionnaires. The validity and reliability of the questionnaires were assessed, and data were analyzed using SPSS (Statistical Product and Services Solutions, version 16.0, SPSS Inc, Chicago, IL, USA). **Results:** The mean awareness of the study population of telepathology in the studied hospitals was 2.43 with a standard deviation of 0.89. According to analysis results ($F = 7.211$ and $P = 0.001$), in the studied hospitals, the mean awareness of pathologists, managers, directors, and IT professionals' of telepathology is significant. In addition, the mean awareness of pathologists is higher than that of managers, directors, and IT professionals, and this relation is significant ($P = 0.001$). According to IT professionals, among the influential dimensions of the implementation of telepathology in the studied hospitals, the effect of all dimensions, except hardware capabilities, was above moderate level. **Conclusion:** According to our findings, stakeholders believe that the implementation of telepathology promotes the quality of health-care services and caring patients on the one hand and decreases health-care costs on the other hand. Therefore, it crucial and important to consider users' viewpoints into the process of implementing such systems as they play a vital role in the success or failure, and the accurate estimation of required sources, of the systems.

Keywords: Attitudes, feasibility, implementation, telemedicine, telepathology

INTRODUCTION

Over recent years, information and communication technologies have been advanced and experienced great evolution in the health-care environment. The changes are remarkable in innovative technologies for telecommunications shifting the manner we provide health-care services.[1,2]

Telemedicine is an approach to providing healthcare and medical services to all individuals of society, especially those who live in far places with no access to specialists or may lack physical power to go to doctors. It is a new and broad topic in the field of health and medicine.[3] Telepathology is a subdiscipline of telemedicine received considerable attention in recent years and opened new horizons to pathology.[4]

The American Telemedicine Association defines telepathology as one of the subdisciplines of medical sciences which has used telecommunication application in recent years. Telecommunication is "the electronic-based multimedia communication across a network of pathology-related information, between 2 or more locations for end-cases, between pathologists and/or qualified laboratory personnel, and may include involvement by clinicians and/or patients."[5,6] In other words, telepathology interprets transmitted digital histologic images while physically separating them from the derivative glass slides.[7]

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This system provides all patients with the best diagnostic services in terms of geographical and socioeconomic conditions. In addition, it provides patients with emergency services in centers which lack pathologists or even in centers where the pathologists, themselves, need help. Immediate access to consultation services in suspicious conditions and assisting pathologists to complete their diagnosis operation are other advantages of the system. Finally, telepathology may have wide applications in the continuous education of medicine, promoting efficiency, examining and approving the certificate of pathologists, and other laboratory specialists.

There are few studies on telepathology in Iran so that there are only two scientific papers; one of them reviews previous consultation cases,[8] and the other one compares the results of telepathology of some samples between Iran and Germany.[9] In the area of the feasibility studies on the implementation of telepathology, there is only a scientific paper titled "feasibility study on the implementation of telepathology in Tehran hospitals in 2012."[10]

Pioneer countries have acquired valuable experience regarding the use of this technology. On the other hand, the elimination of healthcare and medical service system problems, and the promotion of their quality have been identified as necessary actions to be made in Iran. In addition, the Ministry of Health and Medical Education emphasizes the implementation of telepathology, and there are few studies on this field so that Iran needs a series of initial studies to identify conditions and specialties with higher success chances. Considering above discussions, the implementation of this system demands an essential and comprehensive plan as well as an efficient and effective management. Thus, it appears necessary to identify required capabilities, the weakness and strength of hospitals and the opinion of stakeholders. To this end, this study aims to determine the capabilities and equipment required for the implementing telepathology from the viewpoints of managers, IT professionals, and pathologists of the hospitals of West Azerbaijan, Iran.

METHODS

Survey questionnaire

Three survey questionnaires were developed to collect data from directors and hospital managers and pathologist and IT professionals. The questionnaires were developed by reviewing previous relevant works followed by consulting with some experts of this field to adopt and localize the questionnaires in accordance with the specifications of the studied local hospitals.

The questionnaires asked the respondents to estimate open- and close-based questions. For each questionnaire, the items were carefully selected considering the study context. For example, the pathologists' questionnaire addressed items regarding human resource, educational and information requirements, hardware and software capabilities, and legal infrastructure, for example, whether there are experts to advice in difficult cases, whether the pathologists desire to use telepathology in their work, or whether they wish to participate in designing and implementing telepathology process.

In addition, the directors of the studied hospitals were covered by items regarding human resource, educational and information requirements, hardware and software capabilities, and legal infrastructure, for example, whether there are human resources in the field of telepathology in hospitals, or whether it is possible to arrange effective training courses to provide young pathologists with necessary skills enabling them to work with telepathology system.

The first part of the questionnaires consisted of items about the demographic information of the participants (e.g., gender, age, and work experience) and the second part contained 40 items, of which 5 items[1-5] were scored using Likert 5-point scale (25 points) to measure the knowledge and awareness of the study population of telepathology; followed by 35 separated items for each group (questions 6–40) scored through selecting one of three available options (70 Points). The three questionnaires consisted of both identical and different items (see in tables in result section). To increase the chance of questionnaires in serving their purpose, their face validity was assessed by gathering 9 professionals' opinions with backgrounds in health informatics, pathology, medical records, and statistics. Furthermore, to determine the reliability of the questionnaire, test-retest reliability technique was employed. Subsequently, the questionnaires were distributed twice within 10 days among 30 individuals who were out of the original sample. Overall reliability (correlation score) for three questionnaires was obtained to be 0.98, indicating a good reliability for the questionnaires enabling them to achieve the research objectives.

Study population

The study population consisted of all pathologists, hospital directors, and IT professionals working in West Azerbaijan province, Iran, in 2015. The studied population consisted of 33 directors, 29 pathologist, and 28 IT professionals.

Data collection

The questionnaires were distributed in February 2015. The physicians and nurses were contacted by e-mail and telephone, and they were asked to complete the questionnaires.

RESULTS

Table 1 shows the trait of the studied directors, IT professionals, and pathologists. Regarding the educational and occupational characteristics of the pathologist, 20 of them (100%) were pathology specialists, whereas 11 directors (33.3%) were physician, and 11 directors (33.3%) were specialist and subspecialists, and the remaining 11 directors (33.3%) had M.S or lower certificates.

According to results, the mean age of cases was 43.7 and most of them were 35–49-year-old. In addition, the average work experience of cases was 10.81 years [Table 1].

Table 1: Characteristics of the pathologists, IT professionals and directors in the final study population

Variable	Hospital directors, frequency (%)	IT professionals, frequency (%)	Pathologists, frequency (%)
Sex			
Male	32 (97)	18 (64.3)	20 (69)
Female	1 (3)	10 (35.7)	9 (31)
Age			
20-34	8 (1)	10 (35.7)	5 (17.2)
35-49	19 (57.6)	15 (53.6)	16 (55.2)
50-70	6 (18.2)	3 (10.7)	8 (27.6)
Age average	8.366±46.06	9.812±43.7	9.812±43.7
Experience in job			
1-10	28 (24.2)	16 (57.1)	18 (62.1)
10-20	14 (42.4)	14 (14.3)	8 (27.6)
20-30	9 (27.3)	4 (14.3)	2 (6.9)
30 and more	2 (6.1)	5 (14.3)	1 (3.4)
Experience in job average	8.55±17.90	6.07±7.39	8.577±10.81
Type of activity			
Diagnosis	1 (3)	3 (1)	16 (55.2)
Treatment	2 (6.1)	-	13 (44.8
Education	3 (9.1)	1 (3.6)	-
Management	27 (81.8)	6 (21.4)	-
Research	-	1 (3.6)	-
Others	-	17 (60.7)	-
Type of employment			
Permanent	26 (78.8)	8 (28.6)	11 (37.9)
Promissory	1 (3)	2 (7.1)	6 (20.7)
Contractual	4 (12.1)	17 (60.7	7 (24.1)
Others	2 (6)	1 (3.6)	5 (17.2)
Education			
Associate degree	1 (3)	5 (17.9)	-
BSc degree	6 (18.2)	19 (67.9)	-
MSc degree	4 (12.1)	4 (14.3)	-
Medical doctor	11 (33.3)	-	-
Specialized doctor	8 (24.2)	-	29 (100)
Subspecialized doctor	3 (9.1)	-	-

The mean and standard deviation of the pathologists' awareness in the studied hospitals were 2.91 and 0.58, respectively. In addition, the maximum and minimum scores of managers' awareness of telepathology components were in "the applications of telemedicine in care sector (2.39)" and "studying book and scientific texts on telepathology (1.58)," respectively. The mean and standard deviation of the managers' awareness in the studied hospitals were 2.15 and 0.93, respectively. The mean and standard deviation of the awareness of IT professional in the studied hospitals were 2.27 and 0.92, respectively.

According to data analysis, the mean awareness of pathologists, IT professionals, and managers and directors are 2.91, 2.27,

and 2.15, respectively, with a standard deviation of 0.58, 0.92, and 0.93, respectively. In addition, the mean awareness of cases of telepathology is 2.43 with a standard deviation of 0.89 [Figure 1]. According to analysis results ($F = 7.211$ and $P = 0.001$), in the studied hospitals, the mean awareness of pathologists, managers, directors, and IT professionals of telepathology is significant. Therefore, the null hypothesis indicating that "there is no difference between groups" is rejected. In other words, there is a difference in the awareness of telepathology between managers, directors, and IT professionals. In addition, there is a significant difference in the mean awareness of telepathology between managers, directors, and IT professionals ($P < 0.05$). Furthermore, the mean awareness of pathologists of telepathology is higher than that of managers, directors, and IT professionals [Table 2].

The results of this study showed that pathologists believe that the maximum score of the implementation of telepathology in terms of legal requirements belongs to the feasibility of consolidating it with other current procedures and processes (2.59), whereas the minimum score belongs to the existence of complete and comprehensive codes for being accountable against diagnosis errors and relevant consequences (2.24). The mean score of the feasibility of implementing telepathology in terms of legal requirements was calculated by pathologists to be 2.41 with a standard deviation of 0.48 [Figure 2].

According to pathologists, the maximum score of the feasibility of implementing telepathology in terms of human resource belongs to "the interest in adopting technology in the work" (2.79) while the minimum score belongs to "the existence of specialist human resource in the telepathology field in the center they work" (1.72) [Table 3].

According to IT professional, the maximum score of the feasibility of implementing telepathology in terms of legal requirements belongs to "having a plan for controlling the level of access to the clinical records of patients (2.61)" while the minimum score belongs to "the existence of log system (2.21)" [Table 4].

The mean score of the implementation of telepathology in terms of legal requirements was calculated by IT professional to be 2.46 with a standard deviation of 0.52 [Figure 2].

According to managers and directors, the maximum percent of the feasibility of implementing telepathology in terms of legal considerations belongs to "the existence of a rule for being accountable against diagnosis errors and relevant consequences (1.82)" while the minimum percent belongs to "the formation of an executive team and relevant work groups for establishing telepathology" (1.39) [Table 5].

In addition, according to managers and directors, the maximum score the feasibility of implementing telepathology in terms of human resource belongs to "the ability of hospitals in informing pathologists of the advantages of working in a telepathology network (1.79)" while the minimum score belongs to "arranging telepathology workshops for pathologists

Table 2: ANOVA for the awareness of pathologists, directors, and IT professionals of telepathology in the studied hospitals

Variable	Change resource	Sum of squares	Degree of freedom	Mean squares	F	P
Awareness	Between groups	10.032	2	5.016	7.211	0.001
	Inside groups	60.519	87	0.696		
	Total	70.552	89			

Table 3: Feasibility of implementing telepathology in the studied hospitals from pathologist's point of view

| Item	Available, frequency (%)	To some extent, frequency (%)	Not available, frequency (%)	Mean
Human resource				
You need to consult with other pathologists in preparing difficult specimen	21 (72.4)	8 (27.6)	0	2.72±0.455
You have access to expert specialists to consult with them in difficult cases	12 (41.4)	13 (44.8)	4 (13.8)	2.28±0.702
You are interested in adopting technologies in your own work	24 (82.8)	4 (13.8)	1 (3.4)	2.79±0.491
You are skilled in operating computer	16 (55.2)	13 (44.8)	0	2.55±0.506
You are skilled in working with the internet	18 (62.1)	10 (34.5)	1 (3.4)	2.59±0.568
You are aware of different methods of telepathology and their differences	6 (20.7)	16 (55.2)	7 (24.1)	1.97±0.680
You are interested in adopting telepathology for receiving required consultation	22 (75.9)	4 (13.8)	3 (10.3)	2.66±0.670
You have necessary motivation for working with telepathology system	23 (79.3)	4 (13.8)	2 (6.9)	2.72±0.591
You are interested in participating telepathology training courses	23 (79.3)	3 (10.3)	3 (10.3)	2.69±0.660
You are interested in participating in the design of the process of telepathology implementation	23 (79.3)	3 (10.3)	3 (10.3)	2.69±0.660
There are telepathology specialists human resources in the center you work in	8 (27.6)	5 (17.2)	16 (55.2)	1.72±0.882
In the event of implementing telepathology, you can trust the microscopic and macroscopic imaged prepared by lams and pathologists who work on other centers of Iran and you can provide consulting services to them	13 (44.8)	15 (51.7)	1 (3.4)	2.41±0.568
Educational objectives				
You are interested in adopting telepathology for educational purposes	24 (82.8)	2 (6.9)	3 (10.3)	2.72±0.649
Telepathology affects your continuous training	22 (75.9)	4 (13.8)	3 (10.3)	2.66±0.670
Telepathology may be beneficial for educating newly-entered and young pathologists	24 (82.8)	5 (17.2)	0	2.83±0.384
In the event of implementing telepathology in this center, you can provide consultation services to young pathologists who work in deprived regions of Iran	22 (75.9)	5 (17.2)	2 (6.9)	2.69±0.604
Information needs				
You need to send information, rather than specimen images, in telepathology system	22 (75.9)	5 (17.2)	2 (6.9)	2.69±0.604
You need to send the clinical report of patients along with specimen images to promote the quality of consultation	26 (89.7)	2 (6.9)	1 (3.4)	2.86±0.441
You need to send digital diagnostic images, rather than microscopic and macroscopic images. For example, you need to send X-ray and CT scan images along with specimen images for consultation purposes	23 (79.3)	5 (17.2)	1 (3.4)	2.76±0.511

CT: Computed tomography

in hospitals (1.09)" [Table 5]. The mean score of the feasibility of implementing telepathology in terms of human resources was calculated by managers and directors to be 1.49 with a standard deviation of 0.55 [Figure 2].

According to Table 4, the maximum percent of the feasibility of implementing telepathology in terms of software capabilities belongs to "easily connection to the Internet (82.1%) while the minimum percent belongs to "the procurement of digital cameras for providing high-quality microscopic and macroscopic images from Lams in the pathology department (21.4%)." The mean score of the feasibility of implementing telepathology in terms of hardware capabilities was calculated by IT professionals to be 1.99 with a standard deviation of 0.44 [Figure 2].
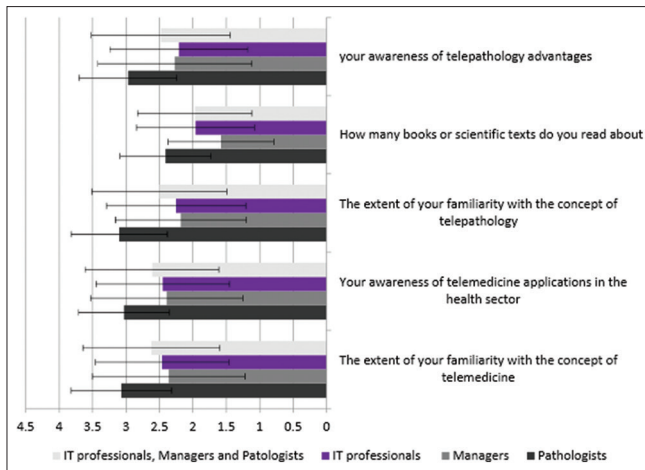
Figure 1: Frequency of the awareness of the studied population of telepathology in the studied hospitals
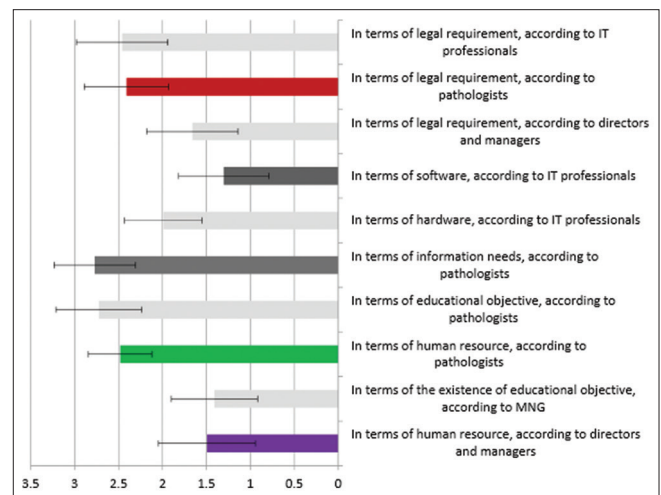
Figure 2: Mean trait of each influential factor of the feasibility of implanting telepathology in the selected hospitals

Table 4: Feasibility of implementing telepathology in the studied hospitals from IT professional's point of view			
Item	Available, frequency (%)	To some extent, frequency (%)	Not available, frequency (%)
Hardware capabilities			
You can connect to the internet in your hospital	23 (82.1)	5 (17.9)	0
You can connect high-speed internet in your hospital through optical fiber	19 (67.9)	0	9 (32.1)
You can connect to the internet in your hospital through wireless connection	6 (21.4)	2 (7.1)	20 (71.4)
You have access to the internet in the pathology department	18 (64.3)	3 (10.7)	7 (25)
The pathology department is equipped with fit bandwidth for implementing telepathology	11 (39.3)	8 (28.6)	9 (32.1)
Your department is equipped with the minimum required bandwidth for arranging video conferences with other departments	7 (25)	13 (46.4)	8 (28.6)
You can connect to telepathology servers abroad	6 (21.4)	5 (17.9)	17 (60.7)
Your department is equipped with digital cameras for providing high-quality microscopic and macroscopic images from lams in pathology laboratory	6 (21.4)	2 (7.1)	20 (71.4)
Software capabilities			
The pathology department of your hospital has its own website	2 (701)	2 (701)	85.7 (24)
The pathology department has special image editing programs such as Adobe Photoshop	3 (10.7)	5 (17.9)	20 (71.4)

According to Table 4, there are few software capabilities in the studied hospitals for implementing telepathology.

According to Figure 2, among the characteristics of each dimension affecting the feasibility of implementing telepathology in the studied hospitals, the effect of all dimensions, except software capabilities, was above moderate level from IT professionals' points of view.

DISCUSSIONS

In countries such as Iran with high population dispersion, no access to professional medical centers and no presence of pathologist in some far and deprived regions, telepathology provides considerable assistance in the rapid diagnosis of diseases, taking accurate treatment techniques and reducing cost and time and reducing costs associated with communication between specialist hospitals of big cities. In developing countries, socioeconomic differences cause inequity and irregularity in providing health-care services. Telepathology bridges this gap. This study is carried out to review stakeholders' opinion on the design and implementation of telepathology to successfully implement telepathology, which is a mere sociotechnical issue, and to avoid the failure of its implementation.

According to data analysis results, in the studied hospitals, the mean awareness of pathologists, IT professionals, and directors and managers of telepathology is 2.91, 2.27, and 2.15, respectively, with a standard division of 0.58, 0.92, and

Table 5: Feasibility of implementing telepathology in the studied hospitals from manager's point of view				
Item	Available, frequency (%)	To some extent, frequency (%)	Not available, frequency (%)	Mean
Human resource				
Telepathology workshops are held in your hospital for pathologists	1 (3)	1 (3)	31 (93.9)	1.09±0.384
Your hospital is able to aware its pathologists of the advantages of acting in telepathology network	9 (27.3)	8 (24.2)	16 (48.5)	1.79±0.857
Your hospital has sufficient specialist staff in the field of telepathology	6 (18.2)	8 (24.2)	19 (57.6)	1.61±0.788
Educational objectives				
Effective training course are held in your hospital for young pathologists to provide them with sufficient skills for working with telepathology systems	1 (3)	5 (15.2)	27 (81.8)	1.21±0.458
Your hospital is able to train telepathology to its pathologists in the form of refresher courses or programs	4 (12.1)	12 (36.4)	17 (51.5)	1.61±0.704

0.93, respectively. The awareness of the cases of telepathology in was 2.43 with a standard deviation of 0.89 indicating a significant difference in the mean score of the awareness of telepathology between pathologists, IT professionals, and directors and managers ($P < 0.05$).

Khoja *et al*. suggested in their study that Pakistan hospital administrators have emphasized the implementation of consultation telemedicine network and taking necessary actions for the implementation of this technology linked with change management. They considered the necessity of the existence of the consultation telemedicine for ongoing implementation of health programs in developing country.[11] This agrees with our results indicating that the managers of studied hospitals believe that this system should be implemented.

Khamrnia's results revealed that the awareness of the managers and supervisors of selected hospitals of telemedicine consulting network is in moderate level.[12] This agrees with our results on the awareness of managers and directors of telepathology in the studied hospitals.

Rahimi *et al*. concluded in their study that the health-care administrators must have a detailed plan for users' participation before the development and obtaining any hospital information systems. They pointed out the real need for the plan by which the success of the system will be assured.[13] Again, our results showed that before the implementation of telepathology, it would be beneficial to collect the opinion of stakeholders about the implementation of such systems through designing essential and comprehensive plans and establishing an efficient and effective management system.

Gozali *et al*. concluded in his study that the knowledge of the health service providers on electronic medical record is in a moderate level.[14]

Sadeghi states in his study that the awareness of managers and directors of telepathology system is above moderate level. The reason may be traced in the fact that the selected hospitals were among leading educational centers in telepathology where the directors and heads of selected hospitals continually participate in educational seminars and congresses about

medical technology, and the majority of such seminars are held under the supervision of these centers. Therefore, it is anticipated that the managers and main decision-makers of the hospitals should have a good and appropriate knowledge on telepathology. Therefore, pathologists, managers and directors, and IT professionals must try to increase their information and perception on telepathology system due to its wide applications and advantages.[15]

According to data analysis, in the studied hospitals, the mean score of pathologists, IT professionals, and directors and managers of telepathology in terms of legal requirements was, respectively, 2.46, 2.41, and 1.66 with a standard division of 0.52, 0.48, and 0.52, respectively. Considering this mean score, that is, 1.5, it can be concluded that the mean score of the feasibility of implementing telepathology in terms of legal requirements is above moderate level from the viewpoints of pathologists, IT professionals, and directors and managers of the studied hospitals. In our study, the highest score of the feasibility of implementing telepathology in terms of legal requirements was allocated by IT professionals. Mahmoodzadeh concluded in his research that the exchange of patients' medical records between two health-care providers increases the risk of unauthorized access to patients' records.[16]

Jalali argues in his study that there is a possibility of the misuse of people personal health records, and the privacy can be disclosed by law enforcement, service providers, and other people.[17]

In this study, the majority of IT professionals believe that there is a program to control access to patients' clinical records through hospital information system. In addition, they believe that their hospitals have formulated a policy for respecting users' privacy in the existing information systems and a policy for data security (Security infrastructure and clinical security). Khamrnia concluded in his study that only 10% of the studied hospitals have required policies and standards for implementing consulting telepathology.[12] In this study, there is no policy and code for ensuring information system security because of the absence of telepathology system in the studied hospitals. Nevertheless, no acute problem is expectable

due to the existence of appropriate security infrastructure for other information system. According to IT professionals, if telepathology is implemented and other security infrastructures are consolidated with telepathology system, there will be no risk. However, there will be some challenges associated with telemedicine and telepathology information security and privacy, especially after implementing this system. Therefore, respecting patients' privacy and treating with their records as confidential records are of high importance, and this should be considered by health-care providers.

The mean score of the feasibility of implementing telepathology in terms of hardware capabilities was calculated by IT professionals to be 1.99 with a standard deviation of 0.44. Mencarelli *et al.* argued in his study that structured network for data transmission and guaranteed bandwidth serve as prerequisites for creating an efficient telepathology system.[18] In this study, only 40% of IT professionals' stated that they have a fit bandwidth to run telepathology in their centers and the rest of IT professionals declared they need higher bandwidth. This agrees with Mencarelli's results to some extent.

Hoseini *et al.* explained in their study that in the majority of the studied Anatomical Pathology Laboratory Information System, 77.8% of facilities are semi-automated and 22.2% are analog, and there is no computerized information system in the anatomical pathology laboratories. Instead, the digital camera is one of rare available facilities (33%) used in pathology departments to manage data.[19] In this study, the majority of responders reported that there is no suitable camera in the pathology departments of the studied hospitals. This agrees to some extent with the results of Hoseini *et al.* indicating the existence of limited facilities at similar centers. The results of our study show that the number of software capabilities for implementing telepathology is negligible in the studied hospitals so that according to IT professionals, the mean of the feasibility of implementing telepathology in terms of software capabilities is only 1.30 with a standard deviation of 0.51. Krupinski *et al.* concluded in their study that many technical problems are nowadays being tackled so that telepathology is going serve as the mainstream of pathology laboratory practice.[20] These results disagree with ours. Sadeghi *et al.* argues in his study that there is no software facility in the studied hospitals to implement telepathology. On the other side, the aforementioned studies emphasize the importance of software capabilities in telepathology. It can be argued, therefore, that providing more accurate diagnosis, high-quality consultation, and resource consumption will be challenging issues in telepathology. This agrees with the aforementioned studies. According to the findings on the importance of the application of software in remote health, it can be one of the oncoming challenges of more accurate diagnosis and quality of consultation in the fields of telepathology system and consumption of resources.[21] These results are consistent with our study.

In this study, the directors and managers of the studied hospitals calculated the mean score of the feasibility of implementing telepathology in terms of human resource to be 1.49 with a standard deviation of 0.55. Elahi and Kordani have mentioned that service providers have a positive view about the application and development of new technologies.[22] However, in this study, pathologists tend to use technology in their area of work.

Taheri *et al.* emphasized in their study the existence of a formulated plan about telepathology development, information literacy factors and building the culture of telepathology.[23] Judi *et al.* concluded in her study that the successful implementation of telemedicine depends on strong knowledge base about the human resource.[24]

In this study, the rate of providing pathologists with telepathology training was low. Therefore, hospitals must organize comprehensive training courses to train human resources which are strong enough to implement telepathology.

Conclusion

Developing countries need to benefit from IT systems. To this end, they need to adopt the experience of developed countries. However, different countries have different cultural and socioeconomic structures with each other. Therefore, more studies should be done on the conditions of each country to enable them to manage the implementation of suitable IT systems, here telepathology, and to avoid its failure. Benefiting from stakeholders' opinions and motivating them will affect the successfully implementation of IT systems and will avoid their failure.

Telepathology has wide, diverse, and ever-increasing applications. It provides accurate diagnoses comparable with conventional optical pathologic diagnosis on the one hand and has acceptable diagnosis time on the other hand. In addition, rapid advances in technology continually promote all the aforementioned advantages. This, in turn, offer long-term economic advantages and eliminates lack of time and place limitations. All the mentioned advantages have attracted attentions toward telepathology, as the future field of pathology. Furthermore, considering the importance of telepathology, its significant development in other countries and its wide and beneficial applications, the studied hospitals should take necessary actions to supply required standards and strengthen current capabilities to implement telepathology in their centers. In summary, the findings of other studies indicate the importance of this study on the awareness of telepathology required technical capabilities and human resource on the one hand and the necessity of legal supports for implementing telepathology on the other hand. The general conclusion may be that they emphasize the importance of the implementation of telepathology.

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Conflicts of interest

There are no conflicts of interest.

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