





Analysis of requirements for developing a telehealth-based health management platform in Iran

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ABSTRACT

Introduction: The COVID-19 pandemic has had a profound impact on Iran and numerous other nations, resulting in a surge in infections and fatalities. In response to the COVID-19 crisis, a range of policies and initiatives were enacted, including the deployment of telehealth services. This study aims to outline the requirements for establishing an all-encompassing platform capable of delivering telemedicine services in Iran.

Material and Methods: This cross-sectional study was carried out using a researcher-made electronic questionnaire during the period of July to August 2022. All experts in the field of medical informatics and health information systems based in three provinces (Kermanshah, Kerman, and West Azerbaijan) were contacted to fill out the questionnaire, 15 participants completed and returned the questionnaire. Data were analyzed by SPSS using descriptive statistics.

Results: The requirements for the design and implementation of the systems could be divided into internal (technical and infrastructural, security-legal, and environmental), and external categories (technical and infrastructural, and security-legal). The majority of internal and external requirements were related to technical and infrastructure aspects, accounting for 83% and 95%, respectively.

Conclusion: Telemedicine development tools are available to enhance healthcare services in Iran, but there is a need to strengthen the infrastructure and technical equipment to enable the utilization of this technology for improving therapeutic and educational objectives within the healthcare system.

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INTRODUCTION

Access to high-quality health services is needed to maintain the health of society. The health system has always taken effective steps to improve the level of health and improve its clinical and financial results in order to benefit from the latest achievements and technologies [1]. Telemedicine has been one of the technologies that have increased the effectiveness of healthcare by reducing patient burdens, such as the need to travel for specialized care services (such as visits to offices), improving continuity of care, and enabling remote healthcare for conditions like

COVID-19 [2]. In developing countries, which often face numerous challenges such as limited financial resources, scarcity of doctors and specialists, inadequate road and transportation facilities, telemedicine can provide a viable solution to enhance the quality of health services [3]. For this reason, nowadays, healthcare companies have taken steps towards friendly, efficient, and robust remote medical systems [4]. Additionally, these companies have utilized telemedicine technology in various forms, including teleconsultation, tele-education, remote home care, teleradiology, and telesurgery [5].

Despite the numerous benefits of telemedicine systems and technological advancements in this field, there are always obstacles and challenges to implementing and adapting to telemedicine systems. Some patients, specialists, and medical organizations are among the inhibiting factors in the development of telemedicine [1]. Some healthcare professionals, although in need of new technologies such as telemedicine, still resist accepting it [2].

Furthermore, integrating these systems with existing hospital systems may pose challenges and, at times, may not be feasible [3]. Legal considerations such as patient privacy and maintaining the confidentiality of medical data are also among the significant obstacles in implementing telemedicine systems [4]. A survey study conducted in 2012 identified some cultural, managerial, technical, and regulatory barriers to implementing telemedicine systems [5]. In several studies, technical requirements have been reported as an important factor in the implementation and non-utilization of telemedicine systems [6-12]. In addition to the mentioned barriers, developing countries also face challenges in establishing telemedicine systems due to inadequate communication infrastructure, such as a lack of suitable internet speed [13].

The current century has witnessed the transformation of the COVID-19 disease into a global crisis. The meaning of crisis is a sudden, increasing, and unpredictable event that requires extraordinary and fundamental measures to deal with it. During this crisis, significant economic and social damages have affected people worldwide [14, 15], and the health sector and patients have not been exempted from this. During the COVID-19 pandemic, many in-person patient visits were canceled in order to reduce virus transmission and protect the health of healthcare providers and the general public. By creating a telemedicine platform, it is possible to overcome many of these obstacles. A telemedicine platform is a technological infrastructure that enables virtual, private, secure, and high-quality medical consultations [16]. Today, there are multiple telemedicine platforms available for healthcare providers and patients [17]. Telemedicine platforms can be established in numerous provinces or states of a country and serve medical institutions at all levels [18, 19]. So far, telemedicine platforms have achieved real-time collaboration between medical institutions from different regions or countries in areas such as pediatric problems [20], skin diseases [21], neurosurgery [22], and diabetes [23]. Considering that each country has different organizational structures, insurance policies, information technology infrastructure, economic situation, culture and distinct values, the factors affecting telehealth may be different. Therefore, before designing and implementing a telemedicine platform and considering the importance of telemedicine

during the current pandemic in Iran, this study intends to outline the requirements for establishing an all-encompassing platform capable of delivering telemedicine services.

MATERIAL AND METHODS

Study population and sample

The present study was a cross-sectional study. The studied population included medical informatics and health information system experts in the three provinces of Kermanshah, Kerman, and West Azerbaijan. All experts in the field of medical informatics and health information systems based in three provinces (Kermanshah, Kerman, and West Azerbaijan) were contacted to fill out the questionnaire, 15 participants completed and returned the questionnaire. Given their significant involvement in the design, implementation, and establishment of telemedicine platforms, we selected them as the primary participants in this study. After submitting the approval obtained from the ethical committee of Kermanshah University of Medical Sciences (KUMS), the questionnaire was sent to the emails of all medical informatics and health information system experts in these provinces.

Questionnaire development

The data collection instrument employed for this study was a custom-designed questionnaire created by the researchers. After consulting with five medical informatics professionals and reviewing various relevant literature [1-3], the questionnaire was created. These professionals had seven years of average work experience in the medical universities in Iran. Finally, the questionnaire was organized into four sections:

1. Demographic Information and General Telemedicine Questions: The first section included three questions about the demographic background of the experts and five general questions about telemedicine.
2. Technical and Infrastructural Requirements: In the second section, respondents were asked to assess technical and infrastructural requirements.
3. Security-Legal Considerations: The third section focused on security and legal aspects related to the implementation of a telemedicine platform.
4. Environmental Factors: The fourth section covered environmental factors crucial for the launch of the telemedicine platform. Respondents provided their feedback on the second to fourth section on a 5-point Likert scale (very much, much, no idea, little, or

very little)

The first section included demographic information of experts (three questions) and five general questions about telemedicine. Respectively, the second, third, and fourth section included technical and infrastructural, security-legal, and environmental items necessary for the implementation and launch of the telemedicine platform. Items were designed with five questionnaire response options (5-point Likert scale: very much, much, no idea, little, very little).

Each item had an internal or external nature that was not mentioned in the questionnaire (Fig 1). These natures were determined by the members of the research team in a one-hour face-to-face meeting. For the design and implementation of these systems, the number of internal and external requirements was equal (14 items). Internal requirements refer to necessary facilities in hospitals, healthcare centers, etc. External requirements refer to necessary facilities outside hospitals, healthcare centers, etc.

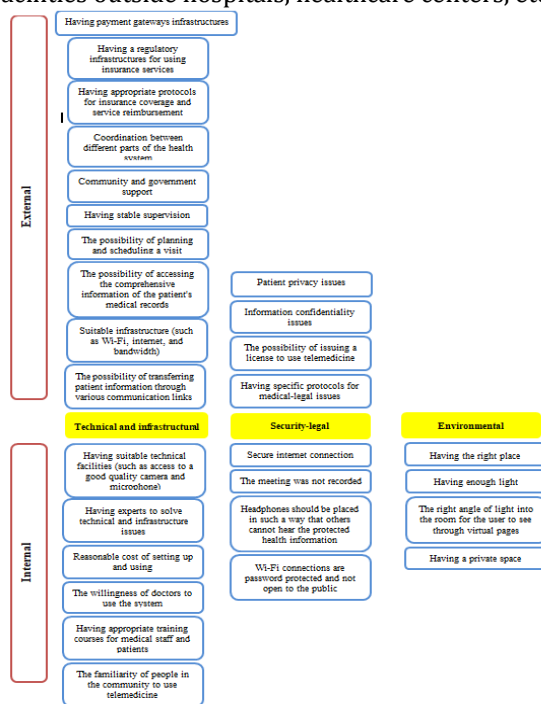


Fig 1: Internal and external requirements for designing and implementing telemedicine systems

The face and content validity of the questionnaire were confirmed by six experts (three experts in the field of medical informatics and three experts in the field of health information systems). After 10 experts (five experts in the field of medical informatics and five experts in the field of health information systems) completed the questionnaire, Cronbach's alpha and Kuder-Richardson questionnaire were calculated to be 0.875 and 0.90, respectively [24], indicating the reliability of the questionnaire ($r \geq 0.7$) [25]. Finally, after confirming its validity and

reliability, the questionnaire was distributed.

Data collection

The questionnaire was sent to 38 experts through email. Additionally, it was mentioned in the email that it often takes 8 to 12 minutes to complete each questionnaire. The email also included one of the researchers' phone numbers, so that participants may call him/her if necessary and ask any questions. The questionnaire was sent to participants from July 1 to August 30, 2022. Finally, the questionnaires were completed by 14 participants.

Data analysis

Following the completion of the questionnaire by the participants, the responses were recorded in an Excel file. Subsequently, the data was imported into SPSS version 20.0 for analysis. The demographic characteristics of the participants were summarized using frequency and percentage distributions. For the other sections of the questionnaire, descriptive statistics, including percentages, means, and standard deviations, were calculated to analyze the data.

RESULTS

Among 15 recruited participants, nine participants (60.0%) were male. The highest age group was related to the 45-50 age groups (46.6%). Majority of them (53.3%) had between 11-20 years' experience, and (53.3%) were expert in the field of medical informatics (Table 1).

Table 1: Demographic profile of experts assessing requirements for a telehealth-based health management platform in Iran

Variables	Frequency	%	
Sex	Male	9	60
	Female	6	40
Age (Year)	40-44	4	26.7
	45-50	7	46.6
	>=51	4	26.7
Work experience (Year)	5-10	5	33.3
	11-20	8	53.3
	>20	2	13.4
Expert type	Medical informatics	8	53.3
	Health information systems	7	46.7

Participants were mostly familiar with mobile applications as telemedicine tools (66.7%). They preferred audio communication for these services more than other forms of communication (73.3%). The majority of participants utilized these services for counseling with the widespread outbreak of COVID-19 (93.3%). Approximately 67% had a positive attitude towards telemedicine. Further

details are provided in Table 2.

Table 2: Participants’ opinions on requirements for developing a telehealth-based health management platform

Variables		Frequency	Percentage
Which of the following telemedicine tools are you familiar with? (participants could select more than items)	Mobile applications	10	66.7
	Video conference	4	26.7
	Social media	7	46.7
	Nothing	0	0
Which type of communication do you prefer for telemedicine services? (participants could select more than items)	Audio	11	73.3
	Visual	8	53.3
	SMS	1	6.7
	Email	0	0
	Nothing	0	0
When did you use telemedicine services for the first time?	Before the outbreak of COVID-19	7	46.7
	With the spread of COVID-19	14	93.3
	Never	0	0
If the answer to the previous question was "with the spread of COVID-19", then state the reason (or reasons) for using telemedicine services? (participants could select more than items)	In times of emergency	4	26.7
	During quarantine	4	26.7
	To follow up treatment	1	6.7
	To consultation	5	33.3
	To visit	0	0
	Nothing	0	0
In general, what is your view on telemedicine?	Strongly positive	4	26.7
	Positive	10	66.7
	No idea	1	6.6
	Negative	0	0
	Strongly negative	0	0

The analysis of the results showed that the requirements for designing and implementing these systems can be categorized into two categories: internal and external (Fig 2). Among these, the technical and infrastructure requirements were the most prominent, accounting for 83% and 95% in the internal and external categories, respectively.

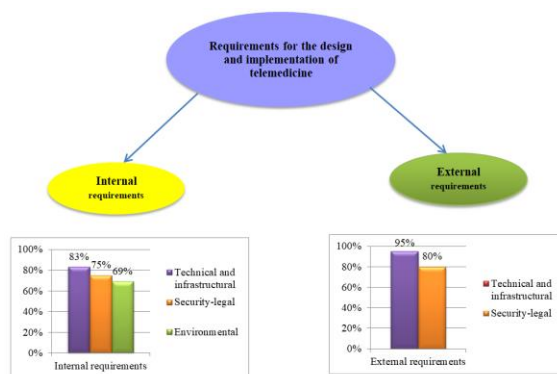


Fig 2: Design and implementation requirements for the design and implementation of telemedicine

Internal requirements

Internal requirements were divided into three technical and infrastructural, security-legal, and environmental categories (Fig 3). The most internal requirements were related to the technical and infrastructure categories in Kerman province (92%).

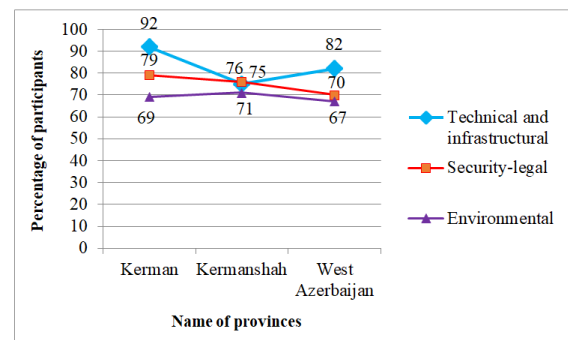


Fig 3: Internal requirements for the design and implementation of telemedicine

Technical and infrastructure requirements

The most technical and infrastructural requirements chosen by the participants were “having suitable technical facilities (such as access to a good quality camera and microphone)”, “suitable cost of setting up and using”, and “having suitable training courses for medical staff and patients”. Among the three provinces, participants in Kerman province emphasized technical and infrastructure requirements more than other provinces (92%).

Security-legal requirements

Participants placed significant emphasis on specific security-legal requirements, with "secure internet connection" and "confidential placement of headphones to protect health information from

eavesdropping" being the most commonly selected. Interestingly, among the three provinces, participants in Kerman province displayed a heightened focus on security-legal requirements, with 79% of participants highlighting their importance more than those in other provinces.

Environmental requirements

Participants displayed a significant interest in environmental requirements, with "having a suitable place" and "adequate lighting" being the most commonly selected. Notably, among the three provinces, participants in Kermanshah province placed a particular emphasis on environmental requirements, with 71% of participants indicating their importance more than those in other provinces.

External requirements

External requirements were divided into two categories: technical and infrastructural and security-legal (Fig 4). A significant majority of the external requirements were associated with the technical and infrastructure category, accounting for 95% of the total external requirements.

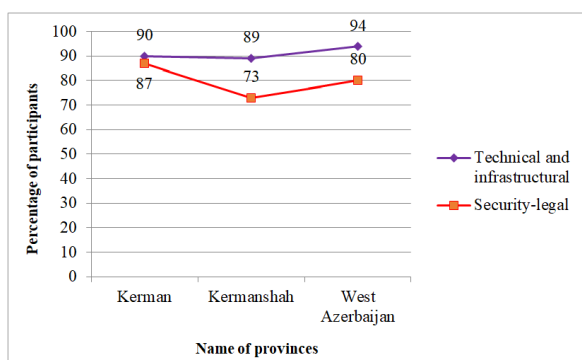


Fig 4: External requirements for the design and implementation of telemedicine

Technical and infrastructure requirements

Participants demonstrated a strong focus on technical and infrastructural requirements, with several key aspects being highlighted. These included "having suitable infrastructure (e.g., Wi-Fi, high-speed Internet, and high bandwidth)," "access to comprehensive patient medical records," "appropriate insurance coverage and service reimbursement protocols," and "regulatory infrastructure for utilizing insurance services." Notably, among the three provinces, participants in West Azarbaijan province emphasized technical and infrastructure requirements more than those in other provinces, with 94% of participants underscoring their importance.

Security-legal requirements

The most security-legal requirements chosen by the participants were: "issues related to patient privacy", "using specific protocols for medical-legal issues" and "the possibility of issuing a license to use telemedicine". Among the three provinces, participants in Kerman province emphasized security-legal requirements more than other provinces (87%).

DISCUSSION

The analysis of the results showed that the requirements for designing and implementing these systems are divided into two categories, internal and external. Internal requirements were divided into three categories (technical and infrastructural, security-legal, and environmental) and external requirements were divided into two categories (technical and infrastructural and security-legal). If these requirements are not met, they have little chance of success; although carefully designed. The most internal and external requirements were related to technical and infrastructure with 83% and 95%. The highest internal and external requirements related to the technical and infrastructure categories in Kerman province were 92% and 95%, respectively.

The outbreak of COVID-19 was the best time to start providing telemedicine services with government support to care for patients, doctors and even healthy individuals [26-30]. For countries like Iran that suffer from weak internet, scattered population, lack of access to specialized medical centers and have an elderly population that needs special medical care, telemedicine is considered an important factor and helps to quickly diagnose the disease, adopt quick treatment tactics, and reduce time wastage in acute cases [31]. Although the attitude towards telemedicine is positive due to reasons such as providing faster medical care, the possibility of caring for patients in remote areas, and reducing costs [32, 33], and many researchers are eager to utilize it for revolution in the healthcare industry [34, 35]; But the full potential of telemedicine has not yet been realized to serve humanity. The reason for this can be found in several barriers. In our study, these barriers were examined in three categories: technical and infrastructural, security-legal and environmental. In line with our study, several studies have highlighted barriers such as technical infrastructure problems, ethical issues, laws and regulations, weak financial resources, and low Internet speed in some deprived areas [36, 37].

We found some internal requirements for the development a telehealth-based health management platform in Iran. Among these requirements, technical and infrastructure requirements were the main requirements. Technical problems and lack of resources were among the most reported barriers in

our study. Similar to our study, many other studies have also mentioned technical problems as a vital challenge [38-40]. Anthony et al. [41] reported the lack of high-resolution cameras and high-quality signals are the main barriers for these platforms. To use telemedicine, it is important to have a quiet area with appropriate lighting for teleconsultation, especially video type. Some patients also experienced difficulties when using or navigating through various telemedicine platforms and required face-to-face technical support and information technology (IT) support [42, 43].

There are complex challenges to establishing widespread telemedicine services in many hospital departments [44]. Common methods of telemedicine include video, telephone, website, and mobile application technology. Reimbursement was a major barrier to the provision of telemedicine, which was not only insufficient but sometimes non-existent [40, 45]. The future of telemedicine reimbursement remains uncertain [46]. Indeed, virtual visits were not reimbursed in some countries such as Norway, Brazil, Italy, and Egypt [47, 48]. There are still no specific rules and regulations for the reimbursement of telemedicine visits [47]. Furthermore, the lack of specific insurance tariffs for telemedicine services is a major barrier to telemedicine services [49, 50].

The implementation of telemedicine is considered as a technological method in providing medical services, but its acceptance and implementation may face challenges in some communities due to various reasons. In some studies, the technical problems of telemedicine have been stated due to the lack of dedicated information technology infrastructure [51, 52]. While organizational, technological, and social factors play a fundamental role in the acceptance of telemedicine [53]. As observed in our study, a lack of motivation and cultural barriers within the community has hindered the implementation of telemedicine. In some communities, factors such as lack of motivation and lack of familiarity with the benefits of telemedicine have been able to create obstacles for the implementation of this method.

Cultural factors can be influential in this regard. In some cultures and beliefs, in-person visits to a doctor may be considered a more valid method of treatment, and the use of technology in this regard may not be widely accepted. The choice between video and telephone medical consultation can potentially impact the quality of patient care. Video consultations, with their closer resemblance to in-person consultations, may potentially provide higher-quality counseling. However, for conducting video consultations, access to high-speed internet is necessary, as a weak internet connection can result in poor audio and video quality. In the modern era, similar to regular human activities in social and financial domains, healthcare activities have

increasingly become dependent on the internet [54].

We also found several external requirements for development a telehealth-based health management platform in Iran. Among these requirements, technical and infrastructure requirements were the main items, while developed countries face more issues related to legal matters such as patient privacy protection [18]. In developed countries, most of the technological infrastructure and related resources are available to implement telemedicine. However, legal issues can pose a significant challenge. For instance, patient privacy, confidentiality of medical information, and security concerns can create challenges in the implementation of telemedicine in developed countries. The laws and regulations related to patient privacy and appropriate use of medical information in these countries can be complex and stringent, which can lead to delays or challenges in the implementation of telemedicine. The Health Insurance Portability and Accountability Act (HIPAA) is a set of standards for safeguarding Protected Health Information (PHI), ensuring the presence and adherence to required physical, network, and process security measures [55].

Telemedicine has created a revolution in medical sciences around the world by putting new capabilities and opportunities in front of the healthcare system. Telemedicine system can be used in cases such as natural disasters and wars, health development in remote areas, control of chronic diseases, air flights, sea travel, and wars [56]. Of course, the use of this technology and the achievement of its capabilities require a comprehensive and comprehensive knowledge of this technology. Proper design of telemedicine and promotion of its widespread use at a national level requires the comprehensive cooperation among system designers and analysts, healthcare providers, managers, policy makers, and key decision-makers within the healthcare system. In Iran, as a developing country and interested in utilizing technology in providing healthcare, the implementation of telemedicine, similar to other countries around the world, faces problems. Indeed, the healthcare system in Iran has had successful practical experiences in implementing remote healthcare services in the past [57]. Therefore, it is essential in Iran to address the lack of specialist in underserved areas, reduce medical costs, and ensure access to healthcare services for all individuals in the society by implementing health care services. Therefore, it is necessary to consider the implementation of telemedicine in national programs and formulation laws and policies. Additionally, considering the existence of telemedicine development tools in the country, the need to strengthen the infrastructure, and allocate sufficient budget in this field, and provide training to individuals on the requirements of remote healthcare. Therefore, with the

improvement of facilities, equipment, and people's awareness regarding this technology, strengthening infrastructure, and formulating national laws for the successful implementation of this technology, alongside benefiting from its advantages, it appears to be an essential and important matter that should be included in the agenda of policymakers.

This study has three limitations. First, we selected a few samples of experts in only three provinces who willing to participate, this may lead to a selection bias. In addition, another limitation was the small number of participants in these three provinces. The reasons for not participating in the research could be related to a lack of interest in the research topic. Despite the importance of users' role in the success of these systems, this research did not focus on the topic of users and usability; because the scope of the subject requires a separate study.

CONCLUSION

Although the actual use of telemedicine was significant during the period of the COVID-19 pandemic, the barriers to widespread adoption of telemedicine became more evident. In Iran, telemedicine should use investment in infrastructure and technical equipment to provide quality healthcare. Additionally, various stakeholders should implement the proposed solutions to overcome challenges during health crises and beyond, as telemedicine provides a suitable platform for exploiting telemedicine tools to reduce morbidity, mortality, and burden on healthcare providers and the health system during the COVID-19 pandemic.

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AUTHOR'S CONTRIBUTION

PA, MS and KB collected and analyzed the data with help and supervision from AM; they also wrote the first draft of the manuscript, which was further developed in consultation with all authors. All authors contributed to the study's conception and design and read and approved the final manuscript. PA is the article's guarantor.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest regarding the publication of this study.

FINANCIAL DISCLOSURE

No financial interests related to the material of this manuscript have been declared.

ETHICS APPROVAL

For this study, the code of ethics with the number IR.KUMS.REC.1401.193 was obtained from the ethics committee of KUMS. It is important to note that participation in the study was voluntary, and participants were not under any obligation to take part in the research.

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