

Telemedicine: Between Reality and Challenges in Jeddah Hospitals

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ABSTRACT

Background: Telehealth system is defined as the use of electronic information and telecommunication technologies to support and promote long-distance clinical health care, patient and professional health-related education, public health and health administration. The main aim of this study is to assess difficulties and limitations in hospitals that have healthcare system in Jeddah ,Saudi Arabia from applied new techniques such as Telehealth and if they have tendency to use this technique or not . This study also aims to determine the association between increase in quality of healthcare system and new techniques applied such as Telehealth system by literatures reviews. **Methods:** A cross-sectional study was conducted in 114 medical providers who worked at hospitals in Jeddah, Saudi Arabia. The medical providers were interviewed using paper-based questionnaire as well as electric-based questionnaire, data collected and analyzed by using SPSS. **Results:** Interested participants in technology were high by 59%, participants actually interested to implement advanced Telehealth Technologies by percent of 84%, and respectively that factor of lack of awareness were a major factor by 90%, factor of this technique may take a new health care system and it may being a time consuming and take a lot of money and training 71%, this previous percentage and frequency also present factor of resistance in both medical social and community. 63% saw that it is hard to get someone qualified as well as 62% saw that there is a lack of human resources in hospitals and misusing factor took a percent of 50%, some of participants saw that There is no strong need for this technique and he is think it is not important or it is not differ from face to face visit by percent of 40%. **Conclusion:** There are a high acceptance of new technique in hospitals and regardless of demographic information there is a high interest in technology, we determine most factors that may limit implementation of this technique and these factors may give us a general look about challenges of implementing the other techniques too, if we can determine the problems then we can resolve them to achieve high quality healthcare systems in our hospitals.

Keywords: Telehealth, Telemedicine, Quality of healthcare system, Limitations, New technologies.

INTRODUCTION

When thinking about healthcare, most of us conjure up images of office visits or trips to the ER. Whether it's for a routine check-up, lab tests, an outpatient procedure or major surgery, the norm is for patients and caregivers to leave their homes (often sitting in traffic or rushing from work) to meet their doctor at a healthcare facility of some kind. But things are changing⁽¹⁾. Telemedicine is the use of medical information exchanged from one site to another via electronic communications to improve patients' health status⁽²⁾.

The World Health Organization (WHO) defines telemedicine as “the delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing health of individuals and their communities”⁽³⁾.

The many definitions highlight that telemedicine is an open and constantly evolving science, as it incorporates new advancements in technology and

responds and adapts to the changing health needs and contexts of societies. Some distinguish telemedicine from telehealth with the former restricted to service delivery by physicians only, and the latter signifying services provided by health professionals in general, including nurses, pharmacists, and others. However, telemedicine and telehealth are synonymous and used interchangeably⁽⁴⁾.

Historically, telemedicine can be traced back to the mid to late 19th century⁽⁵⁾. With one of the first published accounts occurring in the early 20th century when electrocardiograph data were transmitted over telephone wires⁽⁶⁾. Telemedicine, in its modern form, started in the 1960s in large part driven by the military and space technology sectors, as well as a few individuals using readily available commercial equipment^(5, 7). Examples of early technological milestones in telemedicine include the use of television to facilitate consultations between specialists at a psychiatric institute and general practitioners at a state mental hospital⁽⁸⁾, and the provision of expert medical advice from a major teaching hospital to an airport medical centre⁽⁹⁾. Recent advancements in, and increasing availability and utilization of,

information and communication technologies (ICTs) by the general population have been the biggest drivers of telemedicine over the past decade, rapidly creating new possibilities for health care service and delivery. This has been true for developing countries and underserved areas of industrialized nations⁽¹⁰⁾. The introduction and popularization of the internet has further accelerated the pace of ICT advancements, thereby expanding the scope of telemedicine to encompass web-based applications (e.g. e-mail, teleconsultations and conferences via the internet) and multimedia approaches (e.g. digital imagery and video). These advancements have led to the creation of a rich tapestry of telemedicine applications that the world is coming to use. Telemedicine applications vary greatly and can be divided into three major categories. The first is patient monitoring or home care that enables medical professionals to monitor patients remotely using various technological devices, such as blood pressure monitors. It is primarily used for managing chronic diseases such as heart disease, diabetes mellitus, and asthma. The second category consists of interactive or real-time applications that use technology for online interaction between participants. These include teleconsultation, videoconferencing, telesurgery, and similar applications. The third category includes store-and-forward applications that use noninteractive technology. This category involves acquiring medical data (such as medical images, biosignals, lab results, etc.) and then transmitting this data to a doctor or medical specialist at a suitable time for assessment, as in teleradiology and telepathology^(11, 12).

The majority of telemedicine services, most of which focus on diagnosis and clinical management, are routinely offered in industrialized regions including, but not limited to the United Kingdom, Northern Ireland, Scandinavia, North America, Australia, Germany⁽¹³⁾, China, and India which are showing high growth rates⁽¹⁴⁾. In low-income countries and in regions with limited infrastructure, telemedicine applications are primarily used to link health-care providers with specialists, referral hospitals, and tertiary care centers⁽¹⁵⁾. Even though low-cost telemedicine applications have proven to be feasible, clinically useful, sustainable, and scalable in such settings and underserved communities, these applications are not being adopted on a significant scale due to a variety of barriers. Despite its promise, telemedicine applications have achieved varying levels of success. In both industrialized and developing countries,

telemedicine has yet to be consistently employed in the health care system to deliver routine services, and few pilot projects have been able to sustain themselves once initial seed funding has ended⁽¹⁶⁾. Several routinely cited challenges account for the lack of longevity in many telemedicine endeavours. One such challenge is a complex of human and cultural factors. Some patients and healthcare workers resist adopting service models that differ from traditional approaches or indigenous practices, while others lack ICT literacy to use telemedicine approaches effectively. Most challenging of all are linguistic and cultural differences between patients (particularly those underserved) and service providers^(5, 7, 15).

In order to overcome these challenges telemedicine must be regulated by definitive and comprehensive guidelines, which are applied widely, ideally worldwide⁽¹⁷⁾. Concurrently, legislation governing confidentiality, privacy, access, and liability needs to be instituted. As public and private sectors engaged in closer collaboration and become increasingly interdependent in health applications, care must be taken to ensure that telemedicine will be deployed intelligently to maximize health services and optimal quality and guarantee that for-profit endeavours do not deprive citizens access to fundamental public health services. In all countries, issues pertaining to confidentiality, dignity, and privacy are of ethical concern with respect to the use of ICTs in telemedicine. It is imperative that telemedicine be implemented equitably and to the highest ethical standards, to maintain the dignity of all individuals and ensure that differences in education, language, geographic location, physical and mental ability, age, and sex will not lead to marginalization of care⁽¹⁸⁾.

On the other hand, proper understanding of telemedicine technology, especially by physicians, is an important requirement for successful implementation and deployment of the technology. The more knowledge of the benefits and capabilities of telemedicine the users have, the more positive their attitudes toward this technology are expected to be. As a result, their confidence in using this technology will increase. Consequently, if the use of a new technology is supported by the people working in the field, others will have more confidence in the use of the technology, and a higher degree of positive attitude will be realized⁽¹⁹⁾.

Telemedicine in Saudi Arabia was first launched by King Faisal Specialist Hospital and Research Center. The hospital is one of the largest specialist

hospitals in the Middle East. It provides free medical care and accommodation for patients' need of treatment inside and outside Saudi Arabia. Telemedicine services in Saudi Arabia allowed healthcare providers to connect directly with leading specialists around the world. The hospital is connected with George Washington University Hospital for continuing medical education purposes and with Massachusetts General Hospital in Boston for consultation purposes. The consultation telemedicine connect with Massachusetts General hospital included confirming the accuracy of radiology, histopathology reports and also patient management protocols. Nowadays telemedicine consultation between both hospitals is to a large extent limited to patient management protocols. Some public and private sector hospitals in Riyadh, the capital of Saudi Arabia, and Jeddah, the second largest city, have contracted later with private healthcare services and plans providers to purchase patient management consultations. In 1993, Saudi government established an e-Health Center according to a royal decree. Since that time, the center has been delivering telemedicine services such as medical consultations and continuing medical education through international videoconferencing and fiber optic networks. At the beginning, the signed agreements for the telemedicine services have included only a few hospitals in Saudi Arabia and years later the number of connected sites for the national telemedicine network increased to twenty sites around the Kingdom of Saudi Arabia ⁽²⁰⁾.

Telemedicine applications have successfully improved the quality and accessibility of medical care by allowing distant providers to evaluate, diagnose, treat, and provide follow-up care to patients in less economically developed countries. They can provide efficient means for accessing tertiary care advice in underserved areas ⁽²¹⁾. By increasing the accessibility of medical care telemedicine can enable patients to seek treatment earlier and adhere better to their prescribed treatments ⁽²²⁾, and improve the quality of life for patients with chronic conditions ⁽²³⁾. Telemedicine has been advocated in situations where the health professional on duty has little or no access to expert help ⁽²⁴⁾; it is able to offer remote physician access to otherwise unavailable specialist opinions ⁽²⁵⁾, providing reassurance to both doctors and patients. Telemedicine programs have been shown to directly and indirectly decrease the number of referrals to off-site facilities and reduce the need for patient transfers ⁽²⁶⁾. Remote care and diagnosis via telemedicine in less-economically

developed countries thus benefits both patients and the health care system by reducing the distance travelled for specialist care and the related expenses, time, and stress ⁽²⁷⁾. Furthermore, telemedicine programs have the potential to motivate rural practitioners to remain in rural practice through augmentation of professional support and opportunities for continuing professional development ⁽²⁸⁾. Telemedicine networks in developing countries could also offer secondary benefits. Telecommunication technologies, such as those used in telemedicine initiatives, have shown to be effective tools for connecting remote sites ⁽²⁹⁾. By opening up new channels for communication telemedicine connects rural and remote sites with health-care professionals around the world, overcoming geographical barriers and attempting to reverse 'brain drain' or flight of human capital. This can lead to increased communication between health service facilities, and facilitate cross-site and inter-country collaboration and networking. Such collaborations can support health-care providers in remote locations through distance learning and training ⁽²⁷⁾. Telemedicine also provides opportunities for learning and professional development by enabling the provision and dissemination of general information and the remote training of health-care professionals ⁽³⁰⁾.

Methods

This study was based on a paper and electronic – based questionnaire survey about the extent of medical care provider's acceptance to implementation of new techniques such as Telemedicine and their points of view about challenge of implementation. A total of five hospitals were chosen randomly such as **King Abdul-Aziz University Hospital, Ibn Sina National Collage Hospital, King Abdul-Aziz Hospital and Oncology Center, St. Bugshan St. king Abdul-Aziz Medical City** participated in paper-based questionnaire. This study was approved by **Ibn Sina** National Collage Research Center. We distributed our questionnaire from 25-2-2017 to 9-4-2017. All the participants were given informed consent and were asked to complete the questionnaire; questionnaires that weren't completed were to be excluded. A total of 114 medical care providers were participated. All medical care providers have completed the questionnaire with complete privacy.

The questionnaire consisted of 22 questions distributed on three parts. The first part was about "Personal information", the second part was about "The extent of satisfaction of medical care providers on their hospitals' healthcare systems

and their acceptability of new technique such as Telehealth System”, and the last part was about “The extent of agreement on factors and challenges” ,from medical provider's point of view, that may limit implantation of Telehealth System in KSA hospitals appropriately. In part one, all the participants were required to write down their "personal information": age, profession, education level, nationality, the hospital which they work at and the department at the beginning of the questionnaire. Part two which is about "The extent of satisfaction of medical providers in their hospitals' healthcare systems and their acceptability of a new technique such as telemedicine System", we asked about the extent of their interest with technology and if they heard about Telehealth System technique before, if it was implemented at their hospitals and in which department, and if they used it before or not, we also asked a private question about their extent of acceptance about the quality of healthcare system

in their hospitals, and if they actually are interested in implementing this technique in hospitals after knowing about it or not. Part three which is about "The extent of agreement on factors and challenges", from medical providers' point of view, that may limit implantation of Telehealth System in KSA hospitals appropriately. It includes challenges such as: Lack of awareness, it is hard to get someone qualified, there is no strong need for this technique, there will be misusing, there is lack of human resources, the new healthcare system requires training which may consume time and money, the resistance to change in both social and medical members and their reasons from their experience (Table 4). Ethical Approval number H-01-10082017 from Ibsina national collage in jeddah.

For data collection, statistical analysis was computed by Statistical Package for the Social Sciences (SPSS).

INDEX: questionnaire

Part I: Personal information:

1. Age: 25-45 <input type="checkbox"/> 46-60 <input type="checkbox"/>	2. Gender: Male <input type="checkbox"/> Female <input type="checkbox"/>
3. You are <input type="checkbox"/> Pharmacist <input type="checkbox"/> Physician <input type="checkbox"/> Nurse <input type="checkbox"/> Other	
4. Education level <input type="checkbox"/> Bachelor's degree <input type="checkbox"/> Master's degree <input type="checkbox"/> Pharm. D <input type="checkbox"/> Specialist <input type="checkbox"/> MD	
5. Work Experience: <input type="checkbox"/> 1-5 years <input type="checkbox"/> 6-10 years <input type="checkbox"/> More than 10 years	
6. Nationality: Saudi, Non-Saudi	
7. *Workplace:	
8. Department in which you work:	

Part II: The extent of satisfaction of medical providers in their hospitals healthcare systems and their acceptability of a new technique such as Telehealth System

No.	Question	
9	The extent of your interest in technology.	<input type="radio"/> Low <input type="radio"/> High
10	Did you hear about Telehealth System technique before?	<input type="radio"/> Yes <input type="radio"/> No
11	Do you actually implement advanced telemedicine technologies at your hospital ?	<input type="radio"/> Yes, in which department <input type="radio"/> No
12	Did you use it before? ^{*(If Q10 was YES)}	<input type="radio"/> Yes, How long?..... <input type="radio"/> No
13	The extent of your acceptance about the quality of hospital /clinic healthcare system.	<input type="radio"/> Low <input type="radio"/> High
14	After you know about it from our quick definition , are you actually interested to implement advanced Telehealth Technologies, e.g., Telepharmacy, Teleradiology, Telemedical education, Teleconsultation, Videoconferencing, etc... ? ^{*If Q9 was low}	<input type="radio"/> Yes <input type="radio"/> No

Part III: The extent of agreement on factors and challenges "From medical provider's point of view" that may limit implantation of Telehealth System in KSA hospitals appropriately.

15. Lack of awareness (knowledge about meaning, benefits, applications and types of telemedicine...etc.)
16. It is hard to get someone qualified to transmit the needed information thoroughly.
17. There is no strong need for this technique, I think it is not important or I think it is not different from face to face visit.
18. There will be misuse in hospital that applies Telehealth System
19. Lack of human resources.
20. It requires a new healthcare system, and that may consume time, money and training.
21. Resistance of change in both social and medical members.
- 22.*Other reasons

RESULTS

Part I

A total of 114 medical care providers from Jeddah hospitals participated in the survey, whose age ranged between 25 to 60 years. 45 of them (40%) were Saudi nationals and the rest of them (60%) were holding other nationalities.

As for their professions: 24 participants (21%) were pharmacists, 58 (51%) were physicians from different specialties, 22 (19%), were nurses and other professions such as dentists, clinicians were 18 (9%).

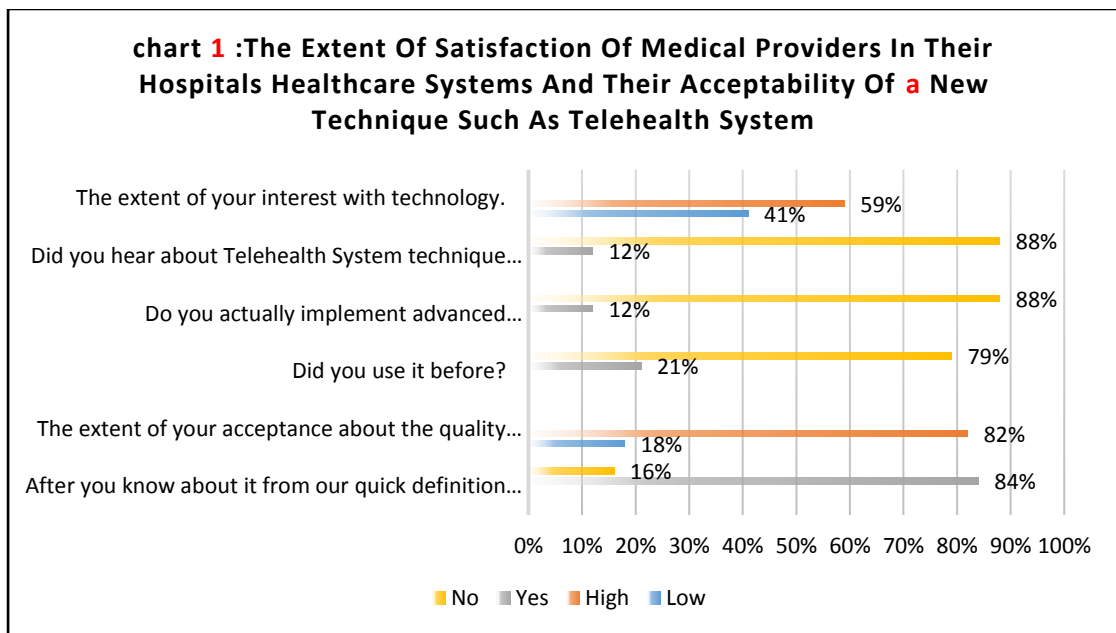
Their education levels varied, 39 of them (34%) were Bachelor's degree, 28 Master's degree (25%), 17 were Pharm.D. (15%), 17 were specialist (15%), and 13 were MD (11%) as shown in (Table 1).

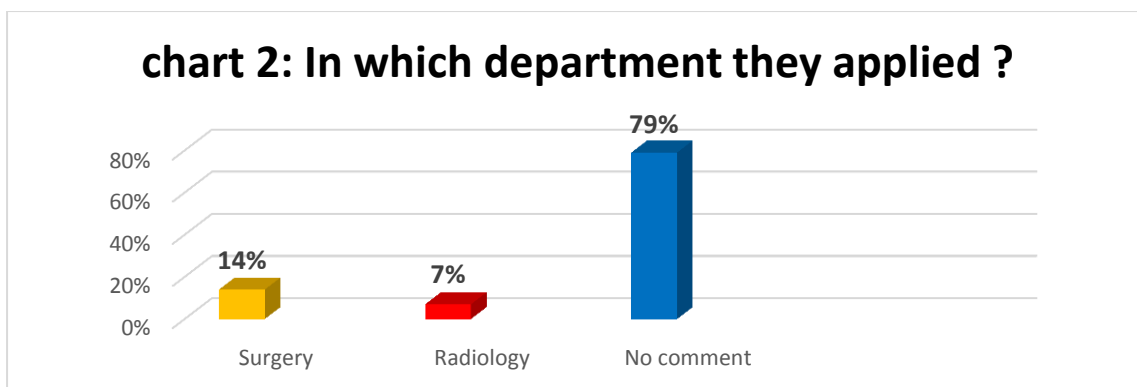
Table (1): differences in age, profession, education level and nationality

	Rate	Quantity
Age		
25-45 years old	60%	69
45-60 years old	40%	45
Profession		
Pharmacist	21%	24
Physician	51%	58
Nurse	19%	22
Other	9%	10
Education level		
Bachelor's	34%	39
Masters	25%	28
Pharm.D.	15%	17
Specialist	15%	17
MD	11%	13
Nationality		
Saudi	40%	45
Non-Saudi	60%	69

In part 2 which is known as "The extent of satisfaction of medical providers in their hospitals healthcare systems and their acceptability of a new technique such as telemedicine System", we noticed that 67 (59%) Of participants were interested in technology, 14 (12%) only heard about telemedicine , 14 (12%) from participants indicated that they actually implement this technique in their hospitals, out of these 14 participants who certified that they implement this technique in departments only 2 said they implement this technique in surgery department and 1 said that they applied it in the radiology department , and the rest 11 participants left us without any comment . We also asked participants that heard about this technique if they had used it before or not, 21% emphasized that they had used it and feel satisfied with it. We also asked a private question about their extent of satisfaction about their healthcare system in their hospitals and found that 18% were feeling unsatisfied on their healthcare system. After we explained to the participants about this technique, we asked them if they would like to implement it or not; 96(84%) said that they hope to apply high quality techniques such as telemedicine in many departments.

Table 2 : The extent of satisfaction of medical providers in their hospitals healthcare systems and their acceptability of new technique such as Telehealth System		
Total : 114	Rate	Quantity
The extent of your interest with technology.		
Low	41%	47
High	59%	67
Did you hear about Telehealth System technique before?		
Yes	12%	14
No	88%	100
Do you actually implement advanced telemedicine technologies at your hospital ?		
Yes	12%	14
No	88%	100
In Which department telemedicine is applied?		
Surgery	14%	2
Radiology	7%	1
No comment	79%	11
Did you use it before?		
Yes	21%	24
No	79%	90
The extent of your acceptance about the quality of hospital /clinic healthcare system.		
Low	18%	21
High	82%	93
After you know about it from our quick definition , are you actually interested in implementing advanced Telehealth Technologies, e.g., Telepharmacy, Teleradiology, Telemedical education, Teleconsultation, Videoconferencing, etc... ?		
Yes	84%	96
No	16%	18





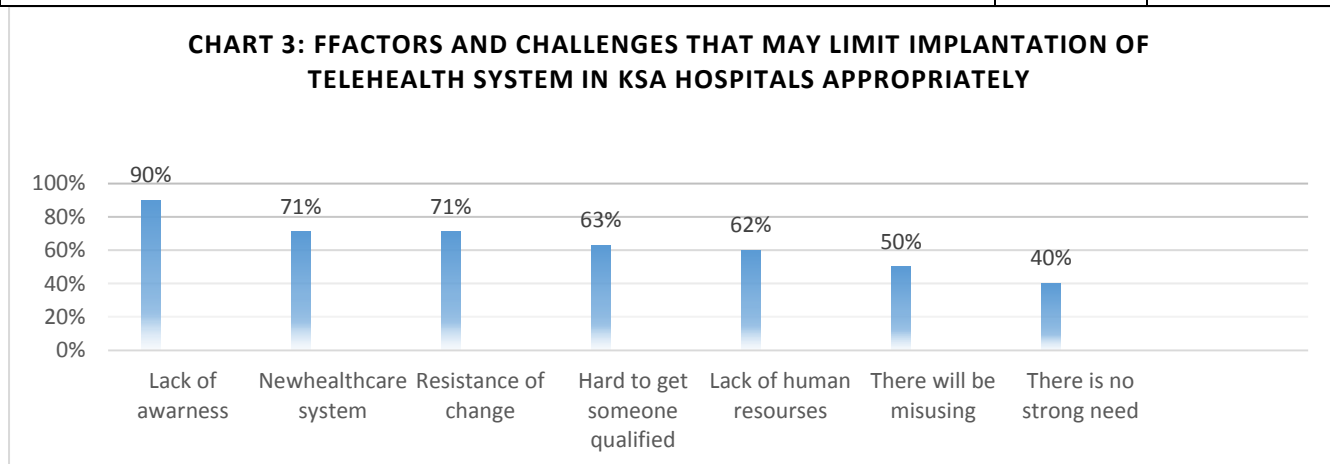
Part III :

In part 3 we measured the "factors that limit telemedicine from implementation in Jeddah hospitals" from medical providers' point of view. We found that lack of awareness was a major factor by 103 (90%) and 81 doctors (71%) said that this technique may require a new health care system and it may be time consuming and cost a lot of money and training by. The previous percentage

and frequency also presented a factor of resistance in both medical and social community. 72 of the participants (63%) saw that it is hard to get someone qualified and 71 (62%) saw that there is a lack of human resources in hospitals while the misuse factor was 50%. Some of the participants 46 (40%) saw that there is no strong need for this technique and they thought it is not important or it is not different from face to face visit.

Table 3 : The extent of agreement on factors and challenges From medical provider's point of view" that may limit implantation of Telehealth System in KSA hospitals appropriately.

Total : 114	Percent	Frequency
Lack of awareness (knowledge about meaning, benefits, applications and types of telemedicine...etc.)	90%	103
It is hard to get someone qualified to transmit the needed information thoroughly.	63%	72
There is no strong need for this technique, I think it is not important or I think it is not different from face to face visit.	40%	46
There will be misuse	52%	59
Lack of human resources.	61%	69
It requires a new healthcare system, and that may consume time, money and training.	71%	81
Resistance of change in both social and medical members.	71%	81



DISCUSSION

Another limitation was that the samples were selected from specific hospitals; therefore, the results cannot be generalized. In addition, Limited time, Hospitals were not cooperating with us and Transportation was difficult.

The adoption of telemedicine systems in Jeddah, Saudi Arabia requires acceptance by both the patient and the health professional involved; both parties may be more familiar with face-to-face encounters and resistant to utilize telemedicine services, or unaware of their potential benefits. In particular, health-care professionals have reported a “fear of the unknown” with regards to handling computers, an anxiety that telemedicine will lead to job loss, an apprehension that the initially high investment required is not viable, or a concern that the bedside presence of consulting physicians in local hospitals will decline. Fear that the integration of new communication technologies into telemedicine systems may alter existing work practices, challenge physician referral methods, or interrupt workflow may also affect physician acceptance of telemedicine. Designing systems that enhance rather than dislodge current work practices and effectively communicating them to practitioners’ presents a challenge and an opportunity to ensure appropriate and meaningful uptake of telemedicine systems within low-income settings.

Although telemedicine is a promising technology, telemedicine modalities used in Jeddah, Saudi Arabia were very limited. The percentage of adoption of already existing telemedicine technologies by health professionals was low. However, the majority of respondents at Jeddah hospitals in the study that had not adopted telemedicine, were interested in learning about and implementing telemedicine regardless of their demographic parameters. The perception of participants adopting telemedicine on its benefits was higher than that of those who had not adopted telemedicine. The most frequently cited benefits among adopters were improving quality of care, enhancing access to healthcare, and providing patient care and management. However, the lowest-ranked benefits as mentioned by adopters were easy use of the network. The greatest barrier as perceived by healthcare providers not adopting telemedicine was a lack of knowledge about the meaning of telemedicine and its applications, types, and benefits. For participants adopting telemedicine, the most frequently cited barriers

were lack of sufficient knowledge about other services and benefits of telemedicine, followed by difficulty in the application of telemedicine and then lack of time to adopt telemedicine. Accordingly, the following are recommended:

1. Better distribution of information about the development in telemedicine via national programs to educate and train healthcare professionals. Increasing awareness could be achieved through seminars, workshops, symposia, conferences, and so forth.
2. Proper training of healthcare providers on telemedicine to improve their skills.
3. Increase the human resources using the telemedicine systems in telemedicine centers in order to support and train the other healthcare professionals
4. Design the telemedicine system in an easy to use interface that minimizes the misuse of the system and increases the awareness of the telemedicine benefits versus the face to face visits.
5. A decrease in other nonclinical activities required by health professionals adopting telemedicine to allow them to devote more of their time to adopting the various modalities of telemedicine.
6. Better utilization of the already existing telemedicine network and an increase in the number of telemedicine centers. These recommendations will help to ensure that the benefits of existing and future investments in telemedicine technologies are fully realized.

LIMITATION

One of the main limitations of our study was the small sample size, which limited the generalizability of our conclusions and the power to detect differences in important subgroups. Ethical Approval number H-01-10082017 from Ibsina national collage in jeddah.

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REFERENCES

1. **Federal Communications Commission (2016):** Telehealth, Telemedicine and Telecare: What's What? <https://www.fcc.gov/general/telehealth-telemedicine-and-telecare-whats-what>
2. **American Telemedicine Association (2016):** Telehealth and Telemedicine. <https://thesource.americantelemed.org/resources/telemedicine-glossary>
3. **World Health Organization (2010):** Telemedicine: Opportunities and

- Developments in Member States: Report on the Second Global Survey on eHealth. World Health Organization.
http://www.who.int/goe/publications/goe_telemedicine_2010.pdf
4. **Telemedicine opportunities and developments in Member States (2012):** report on the second global survey on eHealth. (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3402558/>)
 5. **Craig J, Patterson V (2005):** Introduction to the practice of telemedicine. *Journal of Telemedicine and Telecare*, 11(1):3–9.
 6. **Einthoven W. Le télécardiogramme “The telecardiogram” (1906):** *Archives Internationales de Physiologie*, 35:132–164.
 7. **Currell R, Urquhart C, Wainwright P, Lewis R (2002):** Telemedicine versus face to face patient care: effects on professional practice and health care outcomes (Cochrane Review). In: *The Cochrane Library*, 1. <https://www.ncbi.nlm.nih.gov/pubmed/10796678>
 8. **Benschoter RA, Eaton MT, Smith P (1965):** Use of videotape to provide individual instruction in techniques of psychotherapy. *Academic Medicine*, 40(12):1159–1161.
 9. **Dwyer TF. Telepsychiatry (1973):** psychiatric consultation by interactive television. *American Journal of Psychiatry*, 130:865–869.
 10. **Wootton R, Jebamani LS, Dow SA. E-health and the Universitas 21 organization (2005):** Telemedicine and underserved populations. *Journal of Telemedicine and Telecare*, 11(5):221–224.
 11. **Sachpazidis, Ilias (2008):** “Image and Medical Data Communication Protocols for Telemedicine and Teleradiology.” Dissertation, Department of Computer Science, Technical University of Darmstadt, Germany.
 12. **American Telemedicine Association (2016):** Telemedicine/Telehealth Terminology, <http://www.americantelemed.org/main/about/about-telemedicine/telemedicine-faqs>.
 13. **Wootton R(2000):** The development of telemedicine. In: Rigby, Roberts, Thick, eds. *Taking Health Telematics into the 21st Century*. Oxon, Radcliffe Medical Press, Pp:17–26.
 14. **Market Entry - Telemedicine Industry in Saudi Arabia - Analysis of Growth, Trends and Forecast (2016 - 2021) (2016).** Retrieved from: <https://www.mordorintelligence.com/industry-reports/market-entry-telemedicine-industry-in-saudi-arabia>.
 15. **Heinzelmann PJ, Lugn NE, Kvedar JC (2005):** Telemedicine in the future. *Journal of Telemedicine and Telecare*, 11(8):384–390.
 16. **Wootton R (2008):** Telemedicine support for the developing world. *Journal of Telemedicine and Telecare*, 14(3):109–114.
 17. **Stanberry B (2006):** Legal and ethical aspects of telemedicine. *Journal of Telemedicine and Telecare*, 12(4):166–175 .
 18. **Resolution WHA58.28 (2010):.** eHealth. In: *Fifty-eighth World Health Assembly*, (http://apps.who.int/gb/ebwha/pdf_files/WHA58/WHA58_28-en.pdf).
 19. **Hu P J , Chau PY and Sheng OR(2002):** “Adoption of Telemedicine Technology by Health Care Organizations: An Exploratory Study.” *Journal of Organizational Computing and Electronic Commerce*, 12(3) : 179–221.
 20. **Alyememi M. Five Year Program to Transform Healthcare Delivery in Saudi Arabia. Saudi Arabia Ministry of Health. Available from: http://www.himss.org/content/files/MiddleEast10_presentations/CS1_MohammedAIYemeni.pdf [Last accessed on 2016].**
 21. **Vinals F, Mandujano L, Vargas G, Giuliano A (2005):** Prenatal diagnosis of congenital heart disease using four-dimensional spatio-temporal image correlation (STIC) telemedicine via an internet link: a pilot study. *Ultrasound in Obstetrics & Gynecology*, 25(1):25–31 .
 22. **Kvedar J, Heinzelmann PJ, Jacques G(2006):** Cancer diagnosis and telemedicine: a case study from Cambodia. *Annals of Oncology*, 17(8):S37–S42.
 23. **Chanussot-Deprez C, Contreras-Ruiz J(2008):** Telemedicine in wound care. *International Wound Journal*, 5(5):651–654.
 24. **Ben Zion I, Helveston EM(2007):** Use of telemedicine to assist ophthalmologists in developing countries for the diagnosis and management of four categories of ophthalmic pathology. *Clinical Ophthalmology*, 1(4):489–495.
 25. **Mukundan S (2003):** Trial telemedicine system for supporting medical students on elective in the developing world. *Academic Radiology*, 10(7):794–797.
 26. **Heinzelmann PJ, Jacques G, Kvedar JC (2005):** Telemedicine by email in remote Cambodia. *Journal of Telemedicine and Telecare*, 11(2):S44–S47.
 27. **Kifle M, Mbarika V, Datta P(2006):** Telemedicine in sub-Saharan Africa: The case of teleophthalmology and eye care in Ethiopia. *Journal of the American Society for Information Science & Technology*, 57(10):1383–1393.
 28. **Gagnon MP, Julie Duplantie, Jean-Paul Fortin and Réjean Landry (2006):** Implementing telehealth to support medical practice in rural/remote regions: What are the conditions for success? *Implementation Science*, 1:18.
 29. **Nakajima I, Chida S(2000):** Telehealth in the Pacific: current status and analysis report (1999-2000). *Journal of Medical Systems*, 24(6):321–331.
 30. **Wootton R(2001):** Telemedicine and developing countries – successful implementation will require a shared approach. *Journal of Telemedicine and Telecare*, 7(1):S1–S6.