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ORIGINAL RESEARCH

Telemedicine Policy Availability and Awareness: Directions for Improvement

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Background: There is a shift towards increased use of telemedicine applications for healthcare service provision and delivery. Thus, awareness among healthcare practitioners of telemedicine policies is critical for proper implementation and utilization of telemedicine technology.

Objective: This study assesses the level of computer access and literacy, knowledge of telemedicine policies and technology, perceptions, and willingness to use telemedicine among healthcare practitioners working in ambulatory care clinics.

Methods: An observational cross-sectional study was conducted at King Fahad Armed Forces Hospital in Jeddah. Data were collected between February and March 2021 using a self-completed online survey.

Results: Of 136 healthcare practitioners surveyed, we found that over half had average to high knowledge about telemedicine technology, tools, guidelines, security, and privacy policies within the hospital. 95% were willing to use telemedicine to consult with large centers in their medical or clinical specialty and support further implementation of telemedicine technology in the hospital. 90% expressed a need for continuous training in the use of telemedicine.

Conclusion: The current study shows that there is inadequate computer access and knowledge of telemedicine, but there were very positive perceptions and willingness related to telemedicine among healthcare practitioners working in the ambulatory care clinics. There is an urgent need for orientation and training programs that focus on the technology and applications of telemedicine, as well as current policies.

Keywords: telemedicine, E-health, health policy, health technology, healthcare administration

Introduction

The healthcare industry has witnessed advances in information technology (IT) applications for health, such as telemedicine, telehealth, e-health, and mobile health.[1,2] Information and Communication Technology (ICT) has had a significant impact on the quality and safety of patient-centered healthcare delivery in diagnosis, management, and monitoring of communicable and non-communicable diseases in developing countries.[3] Modern technology has enabled healthcare practitioners (HCPs) to remotely record patient medical information, such as physiological signs, lab results, radiology images, and medication history.[12] ICT plays a key role in reducing healthcare costs, medical errors, and patient complaints.[3]

The World Health Organization (WHO) describes telemedicine as "delivery of healthcare services, where distance is a critical factor, by all the healthcare professionals using ICT for the exchange of valid information for the diagnosis, treatment, and prevention of disease, research and evaluation".[4] During the COVID-19 pandemic, telemedicine became more widely appreciated within the medical community, allowing HCPs to communicate with patients safely and remotely.[5,6] Despite the benefits of telemedicine, significant challenges face its adoption by HCPs.[7,8] The knowledge, skills, and attitudes of HCPs, as well as in the health organization administration, are key in the success of telemedicine.[9,10]

In Saudi Arabia (SA), telemedicine is relatively new.[5] The National Health Information Center (NHIC) has adopted telemedicine as a virtual medical practice, using ICT to provide clinical care remotely.[11] Telemedicine is not limited to transferring information through video consultation; audio, picture, text, and data sharing support health services, surveillance,

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education, and research as well.[12] The NHIC published the Saudi Health Information Exchange (SeHE) policy in 2016 in line with Saudi Vision 2030 to monitor and evaluate privacy and security of telemedicine.[11,31]

The Ministry of Health (MOH) launched an e-health strategy, emphasizing the use of telemedicine in order to improve accessibility and quality of care for patients.[13] At King Fahd Armed Forces Hospital (KFAFH), telemedicine plays a crucial role in the delivery of patient-centered health services in the diagnosis and management of chronic diseases and future treatment plans. The COVID-19 pandemic has positively influenced the uptake of telemedicine services provision within the past year due to lockdowns and social distancing mandates.[5] However, to achieve the MOH's goals for telemedicine, several areas need to be studied such as privacy, security, confidentiality, data portability, and ICT infrastructure challenges.

History of Telemedicine Policy in Saudi Arabia

The earliest telemedicine system in SA was initiated in 1990 in collaboration with the Yale Telemedicine Center as a major source of consultations with physicians and follow-up with patients after face-to-face visits.[3] In 2011, The MOH cooperated with Canada Health Infoway and the Ontario Telemedicine Network to launch the first national project for telemedicine, the Saudi Telemedicine Network (STN).[14] The major purpose of the project was to provide recommendations for developing a national telemedicine system across SA.[14] In 2013, the STN issued a list of standards in collaboration with King Faisal Specialist Hospital (KFSH) to provide unique, high-quality, tertiary telemedicine care services.[14]

In 2017, King Fahd Medical City (KFMC) became a key player in launching diverse telemedicine services that met STN standards, which resulted in a high turnout for telemedicine healthcare services for patients in all regions.[3] In 2018, the MOH established the e-health strategic plan to deliver telemedicine healthcare services and utilize mobile applications.[15] The NHIC was established in 2016 and issued updated telemedicine regulations.[11] In 2020, in response to the COVID-19 pandemic, the MOH collaborated with NHIC to activate over 17 mobile applications that deliver high quality accessible healthcare services all over the country.[15]

Impact of Telemedicine Implementation

Several studies have found both positive and negative impacts of the use of telemedicine technology in health organizations. In a review study, Amin et al (2020) reported that a patient-centered telemedicine platform was a potentially cost-effective tool that reduces travel expenses among both healthcare practitioners and patients, improves healthcare access, and reduces disparities, particularly in resource-constrained medical departments in rural and remote areas.[14] Telemedicine technology increases patients and healthcare practitioners' satisfaction by reducing waiting times as well as ensuring that HCPs are consulting with the right patient.[14]

In addition, telemedicine has a remarkable impact on reductions of morbidity and mortality rates related to non-communicable diseases and improving health-related quality of life.[14] Telemedicine technology helps to expand healthcare services in society from just treatment to the inclusion of preventive care.[16] Patients are now more able to manage, monitor, and follow-up from their own homes or wherever they may be located. With the rapid growth of the population, telemedicine services are helping to leverage and support existing healthcare facilities and meet the growing demand.[14]

Barriers to Telemedicine Implementation

Several barriers and challenges related to the implementation of telemedicine have been described.[3,17–21] Al-Samarraie et al (2020) presented major legal, ethical, organizational, and technical barriers that are negatively impacting the adoption of telemedicine technology in SA.[3] Legal, ethical, and regulatory barriers are mainly related to a lack of comprehensive policies and regulatory frameworks to enhance the security, privacy, and confidentiality of the patient data that is transmitted electronically to provide patients and physicians with reassurance of the safety of their data.[3] The organizational and technical barriers are mostly related to the structure of the healthcare facility, the lack of information technology (IT) infrastructure, the quality of the internet, poor connectivity, low speed, or intermittent coverage of wireless local area networks (WLANs) in rural and remote areas. Furthermore, there is a shortage in experienced IT technicians, as well as a lack of training workshops and programs, dedicated conferences, and symposia about updates in telemedicine technology.[3] Also, difficulties in electricity and

computer hardware are considered as reasons for low use of telemedicine technology and negatively influence HCPs' interest and willingness to use telemedicine.[3]

Al-Thbiti et al (2017) found that the primary barriers that affect implementation of telemedicine technology in a Jeddah hospital were individual barriers, such as resistance to change among HCPs due to lack of knowledge, experience, and skills that are satisfactory when offering healthcare services to patients.[20] There was a lack of motivation, awareness, and trust in abilities to use telemedicine technology among both physicians and patients. Nasser et al (2017) reported that cultural barriers are also one of the major challenges faced by HCPs in implementing telemedicine technology.[21] The cultural barriers mainly are social and religious restrictions that prohibit patients from receiving healthcare services that they need. Clinical consultation through telemedicine between two different genders as patients and healthcare practitioners is not generally acceptable practice under specific cultural and traditional beliefs and social norms. Also, diversity in languages makes it difficult to establish a good virtual communication between the physicians and patients. These are delicate cultural challenges that have the potential to affect users' views and attitudes toward telemedicine acceptance and use.[21]

Telemedicine and Privacy

Patients, HCPs, and healthcare organizations have concerns about information privacy and proper measures in place to protect data.[22-24] HCPs are willing to explore options to provide effective healthcare services through telemedicine technology if there is the IT infrastructure to support, and expert technical staff with key knowledge to assist practicing HCPs. Informed consent forms are also necessary to explain patient's rights, and clarify legal accountability penalties for unauthorized collection, use or misuse of personal information or e-health data stored on any hospital repository.[22-24]

Telemedicine and HCPs' Knowledge, Attitudes, and Practices

HCPs telemedicine awareness and beliefs have been examined in several studies in SA.[25–27] Aboalshamat et al (2020) found success of implementing telemedicine technology applications depends upon HCPs' knowledge, skills, and experience.[27] With telemedicine technology's massive advantages, it is rapidly growing and being implemented in several departments of healthcare organizations. Aboalshamat et al (2020) and Albarrak et al (2021) found that as "digital natives," young HCPs were highly willing to implement telemedicine technology via e-mail or social media platforms, while older HCPs with low knowledge and skills of telemedicine technology were reluctant to change.[26,27] This could be due to lack of awareness and continuous training programs to build capacity and skills to support them in this shift towards the technology, or a lack of conferences and meetings to promote the advantages of telemedicine and its applications in healthcare. A lack of clear internal hospital policies that provide privacy, security, and confidentiality guidelines based on the NHIC telemedicine regulations is also an issue.

Prior to COVID-19, several studies discussed implementation of telemedicine and others post-pandemic.[5,12,15,20,28–30] Kaliyadan et al (2020) showed mixed views of HCPs towards the use of telemedicine technology during the COVID-19 pandemic for diagnostic concordance and reliability.[5] HCPs across specialties debate the diagnostic concordance and suitability of telemedicine. Specialties with apparent visual patient data, such as dermatology and radiology, may be best suited to the practice of telemedicine, as opposed to dental and surgical specialties.

Telemedicine and the Saudi Vision 2030

Saudi Vision 2030 and the National Transformation Program (NTP) aim to achieve healthcare transformation through the MOH e-health strategy.[31] The strategic objectives are increasing accessibility to healthcare services, improving quality of healthcare services, and promoting preventive care of health risks via e-health technology and Accountable Care Organizations (ACOs).[31] The ACOs serve as leaders and drivers to enhance quality, efficiency, and productivity of healthcare services and improve patient satisfaction.[31] These initiatives have led to the establishment of the NHIC, which is a national center for the assessment of healthcare technologies, such as telemedicine technology, which can provide healthcare services such as preventive, diagnostic, therapeutic, rehabilitative, and palliative care.[31] In addition, the telemedicine regulations of the NHIC must adhere to the SeHE policy, which covers all specific data security and privacy policies, as well as interoperability frameworks or HIPAA regulations.[11]

Another significant initiative was the launch of the Saudi Patient Safety Center (SPSC) to bring together healthcare regulators, payers, providers, patients, and communities to focus on patient safety with the goal of providing healthcare services that are free from harm, promoting a national culture of patient safety reporting, and awareness of safety issues.[32] The Saudi Communications and Information Technology Commission (CITC) established a Cybersecurity Regulatory Framework (CRF) in 2019 to provide comprehensive cybersecurity regulations and privacy laws to safeguard patient data using ICT.[33] CRF also maintains communications, information security, and confidentiality in compliance with the highest quality and security requirements, increasing the level of cybersecurity awareness in Saudi society.[34] The Saudi Commission for Health Specialties (SCFHS) issued a code of ethics for HCPs that addresses professional ethics and regulations in medical practice and specifies the importance of maintaining privacy and confidentiality of patient data.[35]

Objectives

The objectives of this study were:

1. To identify the availability of a clear policy for telemedicine services among HCPs
2. To explore the applicability of existing telemedicine policies and evaluate knowledge, perceptions, and willingness among HCPs
3. To detect associations between HCPs demographic and professional characteristics and computer access, literacy, knowledge, perceptions, and willingness for telemedicine.

Materials and Methods

Study Design

An observational cross-sectional survey of HCPs using an online questionnaire, conducted between February and March 2021.

Study Setting

The study was conducted at the ambulatory care clinic in KFAFH in Jeddah. The clinic includes a primary healthcare center, home healthcare center, and specialty clinics, staffed by 325 HCPs of multiple medical specialties. KFAFH is a 420-bed governmental tertiary care facility that provides members of the Saudi Arabia Armed Forces and their relatives with a wide variety of primary, secondary, and tertiary medical services. It is currently accredited locally by the Saudi Central Board for Accreditation of Healthcare Institutions (CBAHI) and internationally by the Joint Commission International (JCI) since 2017.

Sample Size Estimation

325 HCPs were working at the ambulatory care clinic at the time of the study. According to Albarrak et al (2021), the average level of knowledge among HCPs about telemedicine technology is 46.1%.[26] Assuming a knowledge level of 46% with 6% two-sided confidence limits, 147 HCPs would be required to respond to our survey using an 80% power level and 95% two-sided significance level.

Sampling Technique

A list of all HCPs working at the ambulatory care clinic in KFAFH was obtained, including official emails and contact numbers. The data collection tool was distributed to HCPs via official emails and contact numbers via text or WhatsApp. Two reminders were sent.

Data Collection and Survey Instrument

We used a self-completed online structured questionnaire adapted from Albarrak et al (2021), which contained 5 sections.[26] Section 1 was on demographic and professional characteristics details (5 questions), section 2 was on

computer access and literacy (8 questions), section 3 was on knowledge of telemedicine (8 questions), section 4 was on perceptions towards telemedicine (5 questions), and section 5 was on willingness to use telemedicine (5 questions).

Reliability of the Study Instrument

A pilot study was conducted with 10 HCPs to test reliability of the study instrument, as well as the logistics and duration of data collection. We used Cronbach's alpha, and the overall reliability was very good (Cronbach's alpha 0.781). The reliability of different survey sections ranged between 0.609 and 0.859, indicating good to excellent reliability.

Data Analysis

Frequencies and percentages were calculated for categorical data while continuous data are presented using mean and standard deviation (SD). Responses to questions about computer access, literacy, knowledge, perceptions, and willingness towards telemedicine were scored using points, and summed up for each domain. Higher scores indicate higher computer access, knowledge, positive perceptions, and willingness. Scores were then transformed to a scale of 100 for interpretation.

Scores for each domain were compared according to HCPs demographic and professional characteristics. The Mann–Whitney test was used to examine differences in two-level characteristics (gender). The Kruskal–Wallis test was used to examine differences in multi-level characteristics (such as age groups). All P-values were two-tailed. A P-value <0.05 was considered as significant. SPSS (Version 25.0, Armonk, NY: IBM Corp) was used for all statistical analyses.

Ethical Considerations

The research project was approved by the research ethics committee at KFAFH (REC 415, 18/Feb/2021). The study survey included information about the objectives and the researchers' contact information. Agreement to participate in the study was clearly voluntary, and the HCPs had the ability to contact the researcher with queries. Personal identifying information of HCPs such as names and contacts were not collected. No incentives or rewards were given. Data was collected using an online survey tool (Survey Monkey), confidentially kept safe in the cloud, and only used for the purposes of the study.

Results

From 325 HCPs surveyed, we received 136 responses (50%). The demographic and professional characteristics are shown in Table S1 (Supplementary Material). The majority were 25–35 years old (44.9%), followed by 36–45 years (36.0%), 46–55 years (12.5%), and lastly, over 55 (6.6%). Genders were equally represented (49.3% male, 50.7% female). Majority respondents were physicians (51.5%), followed by pharmacists (28.7%), other HCPs (16.2%), nurses (3.7%). As for professional rank, 36.8% were specialists, followed by consultants (22.1%), registrars (17.6%), residents (7.4%), and several other professional levels (16.2%). As for specialties', 37.5% were from pharmacy (37.5%), followed by medicine (8.8%), family medicine (8.1%), ophthalmology (6.6%), pediatrics (6.6%), and surgery (5.1%).

Table S2 (Supplementary Material) shows computer access and literacy among participating HCPs. More than half of HCPs often or always use computers in the hospital (55.1%), use online medical information resources in the hospital (55.9%), search for online medical information (58.8%), and communicate with medical staff outside the hospital (52.9%). However, only 29.4% of HCPs often or always interact with patients via e-mail, phone, or social media, and 41.2% of HCPs had been asked by their patients about online means of contacting them. The majority of HCPs were using the internet to maintain their knowledge and skills (80.9%), to perform literature searches (69.1%), and to obtain information for their patients (67.6%). The majority (70.6%) of HCPs were concerned about possible ethical, legal and regulatory issues around interacting with patients online.

Table S3 (Supplementary Material) shows the knowledge of telemedicine among participating HCPs. Approximately 55 to 72% of HCPs had average to high knowledge about telemedicine in their hospital, including telemedicine technology (72.4%), medical applications of telemedicine technology (69.9%), telemedicine tools (65.9%), telemedicine guidelines (60.2%), and telemedicine security and privacy policy (55.3%). Additionally, 59.3% of HCPs had average to high knowledge about telemedicine in other countries. Approximately 64.2% of HCPs had average to high awareness of

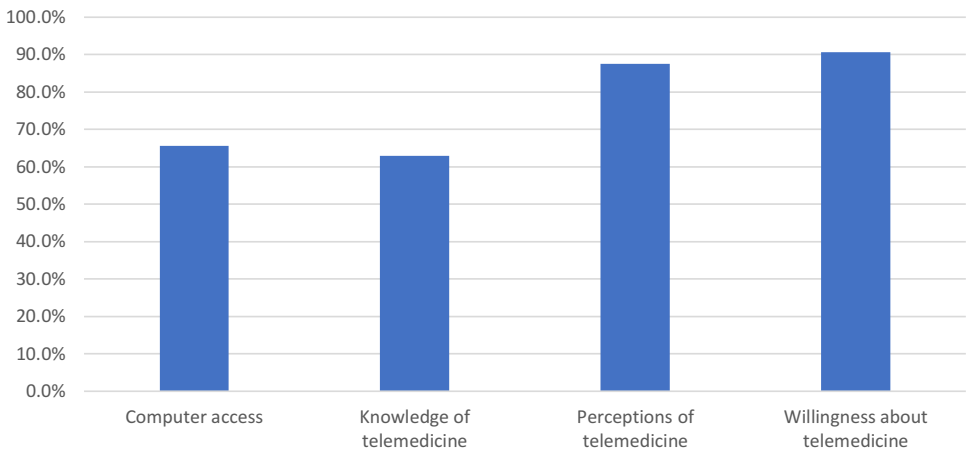

Figure 1 Percentage scores of computer access and knowledge, perceptions, and willingness about telemedicine among participating healthcare practitioners. (**A**) Computer access, (**B**) Knowledge of telemedicine, (**C**) Perceptions of telemedicine, (**D**) Willingness about telemedicine.

conferences, continuous education, or meetings held in their hospital regarding telemedicine technology. Approximately 90.2% of HCPs had average to high need for continuous training in the use of telemedicine for healthcare practices in their hospital.

Table S4 (Supplementary Material) shows the perceptions and willingness regarding telemedicine among participating HCPs. At least 85% of the HCPs had positive perceptions about the use of telemedicine systems in the hospital, indicating that it can save time and money for the hospital and patients (94.2%), has a potential role for information and communications technology (90.1%), improves quality and safety of care (90.1%), and is a reliable approach to provide patients with medical care services (86.0%). Approximately 95% of the HCPs had positive willingness related to telemedicine, indicating that they preferred to consult with the large centers in their specialty (95.0%), would like to be able to watch a procedure virtually as it is taking place (94.2%), and supported the implementation of telemedicine technology in hospitals (94.2%).

As shown in Figure 1, the average percentage scores were 65.6% for computer access, 62.9% for knowledge of telemedicine, 87.6% for positive perceptions of telemedicine, and 90.7% for positive willingness about telemedicine. Table S5 (Supplementary Material) shows the scores of computer access, knowledge, perceptions, and willingness about telemedicine according to the demographic and professional characteristics of participating HCPs. Computer access was significantly associated with gender, professional category, and professional level. For example, computer access was significantly higher among females than males (69.5%±19.2% versus 61.6%±15.7%, p=0.003), highest among pharmacists, lowest among nurses (73.2%±16.3% versus 38.2%±13.5%, p=0.001), and higher among specialists than other professional levels (70.3%±18.5% versus 55.8%±18.9%, p=0.031).

Knowledge and perceptions of telemedicine were associated with some demographics, but not the professional characteristics of participating HCPs. For example, knowledge of telemedicine tended to be higher among physicians with older age compared to those with younger age (64.8%±18.4% for age >55 years versus 57.8%±16.5% for age 25–35 years, p=0.005). Additionally, positive perceptions of telemedicine were significantly higher among males than females (90.5%±19.3% versus 84.5%±21.2%, p=0.048). There were no significant associations between willingness to use telemedicine and either demographic or professional characteristics of participating HCPs.

Discussion

This study examined knowledge, perceptions, and willingness towards telemedicine, as well as computer access and literacy among HCPs working at the ambulatory care clinics in a tertiary care facility in Jeddah. The findings showed that computer access and literacy were considerably low, with an average percentage score of 65%. Although more than 80% of HCPs were using the internet to maintain their knowledge and skills, only 55% HCPs often or always use their

computers in the hospital. Similarly, Albarrak et al (2021) found that only 50% of physicians in four large hospitals in Riyadh were using their computers or laptops.[26]

The limited use of computers or laptops can be partly explained by the increasing presence of smart phones or tablets, which have largely replaced the use of the larger computer devices in many activities related to social and professional life. However, the findings also underscore the need to improve the IT infrastructure and training in the use of electronic resources in the primary care setting to expand telemedicine services. The lack of infrastructure is the most frequently reported challenge to telemedicine services in the Middle East and other developing countries.[3,7] The Gulf Cooperation Council (GCC) states, including Saudi Arabia, are in the process of digitalizing their healthcare infrastructure.[12,29]

The current study showed that there is considerably low knowledge about telemedicine, with an average percentage of 63%. The knowledge of HCPs about telemedicine in their hospital, including telemedicine technology, medical applications, telemedicine tools, guidelines, and security and privacy policy, ranged between 55% and 72%. Similarly, Alnobani et al (2021) found the knowledge of physicians and nurses about telemedicine technology in the intensive care units in Makkah ranged between 50% and 70%.[25] The knowledge of physicians working in Riyadh on telemedicine technology, applications, tools, and guidelines was low, ranging between 30% and 55%.[26] Additionally, only 25 to 62% of dental students were aware of the uses and benefits of telemedicine in delivering dental care services.[27] The inadequate knowledge of telemedicine among HCPs observed in the current and previous studies underscores the importance of education and training. Training of HCPs using a multimodal approach could improve their comfort, knowledge, and skills needed to embrace the utilization of telehealth in health care.[36,37]

HCPs in the current study had very positive perceptions and willingness towards the use and benefits of telemedicine. The score for positive perceptions was 88%, and the score for positive willingness was 91%. More than 90% of the HCPs recognized the benefits of telemedicine, including saving time and money and improved quality and safety of care. Over 90% supported the implementation of telemedicine technology in hospitals. More than 60% of older HCPs were willing to integrate telemedicine technology in the hospital. This is in contrast to a previous finding that older HCPs lacked telemedicine expertise and skills and were hesitant to adapt.[26]

The current findings point to the potential benefits of orientation and training of HCPs about telemedicine.[36] This is especially important, as 90% of HCPs in the current study expressed a need for continuous training in the use of telemedicine. Very similar findings have been reported previously.[25–27] For example, among physicians working in Riyadh, very positive attitude and willingness to use telemedicine were reported, despite the limited use of computers and knowledge about telemedicine technology and applications among them.[26] Similarly, the relatively limited knowledge of sophisticated telemedicine technology used in intensive care patients did not prevent physicians and nurses from expressing a strong willingness to use this new technology.[25] They believed that telemedicine helps them to improving their skills by increasing communication with colleagues, facilitating access to expert opinions, and improving clinical decisions.[25] Likewise, dental students who had very limited knowledge about telemedicine were very open to learning and using the technology.[27]

Approximately 40% of the HCPs were not familiar with telemedicine guidelines in the hospital, and 45% were not aware of the policy governing telemedicine security and privacy. This is despite the fact that the Family Medicine Department of KFAFH has issued a detailed policy for the use of telemedicine at primary care setting. The finding may indicate inadequate distribution and limited orientation of the HCPs with the policy. Additionally, the policy must be available on the hospital intranet, updated regularly, and address HCPs' concerns about telemedicine, such as security, privacy, legal and ethical issues.

Knowledge, perceptions, and willingness regarding telemedicine in the current study were not associated with professional characteristics of HCPs. This indicates that the limited knowledge and positive perceptions/willingness were universal across all professional categories, levels, and specialties. This may be explained by a lack of training for all and a perceived positive impact of telemedicine on different services. On the other hand, computer access and literacy were associated with professional characteristics. This may indicate that some professional groups are disadvantaged in regards to the infrastructure necessary for implementing telemedicine. The higher access among pharmacists and less access among nurses may also point to the nature of work in both groups. For example, all prescriptions should be registered on electronic patient records and may be communicated with the treating physician.

The current study adds to the awareness and practices towards telemedicine among HCPs. It used a detailed questionnaire and included multiple specialties and grades of HCPs. Nevertheless, as single-center study using a convenience sample, the

findings should be generalized with caution. The cross-sectional design may be open to recall bias and does not prove causation. However, these limitations are very common in similar studies and unlikely to affect the findings.

Conclusion

We examined HCPs telemedicine knowledge, perceptions, willingness, computer access and literacy. Over half of HCPs had average to high knowledge about telemedicine technology, medical applications, tools, guidelines, security, and privacy policies. There is a willingness to use telemedicine and perception of its benefits, with an expressed need for continuous training in the use of telemedicine.

Recommendations

Based on findings, we recommend the following:

- Orientation and training programs focusing on telemedicine technology and applications.
- Continuous training in telemedicine use and evaluation of program outcomes is key to sustain progress and development.
- Telemedicine policy must be regularly updated and readily available on hospital intranet and address HCP concerns on security, privacy, and other legal and ethical aspects.
- Inequalities in literacy and access must be considered when designing and implementing telemedicine programs.
- We encourage further research on telemedicine in across care settings to detect wider issues for telemedicine implementation and impact.

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