

# Current practices and Improvement Potential of Telemedicine Adoption among Physicians in Different Specialties in Egypt

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## Abstract

**Background:** Telemedicine is a newly emerging way in the Egyptian healthcare system, especially after the COVID-19 epidemic; however, understanding its practice and improving its use is critical for sustainability.

**Objectives:** The present study aimed to assess the current situation of telemedicine practice among physicians working in different Egyptian healthcare facilities and its potential for improvement.

**Methods:** A cross-sectional study was conducted among physicians of different specialties working in various Egyptian healthcare facilities using a constructed questionnaire.

**Results:** Sixty-two percent of the physicians were telemedicine users, and 39.71% used telemedicine for the first time after COVID-19. Nearly 44% of the physicians reported that it was easy to learn and use telemedicine, and 32.25% revealed that it was easy to interact with the patient while using telemedicine. 33.66% of the physicians reported being satisfied with the telemedicine experience. Nearly three-quarters of the physicians reported many benefits of telemedicine use. The most perceived barriers to telemedicine use were increased liability for medical errors (62.1%), ethical barriers (58.6%), and cultural barriers (55.9%). Concerning the use of telemedicine among different specialties, 66.1%, 58.7%, and 55.7% of telemedicine users were from the internal medicine specialty, surgical specialty, and other specialties, respectively. Regarding gender, 68.1% of telemedicine users were males ( $p$ -value <0.05). In addition, 72.2% of telemedicine users worked in the private health sector ( $p$ -value <0.05).

**Conclusion:** The current situation of telemedicine adoption among Egyptian physicians indicates a significant adoption after COVID-19. Reported barriers to expanding the adoption of telemedicine services included increased liability for medical errors, ethical barriers, and cultural barriers.

**Keywords:** Telemedicine; Egypt; health care; different specialties

## 1. Introduction

Telemedicine involves providing medical care and health services remotely using technologies, such as text messaging, mobile applications, and video conferencing.<sup>1</sup> It has various applications in healthcare, such as consultation, home care, rehabilitation, and treatment.<sup>2</sup> Advanced technologies with quality network services enhance healthcare delivery and accessibility.<sup>3</sup> This can facilitate access to preventive services and improve lifelong health.<sup>2</sup>

Telehealth enhances the effectiveness, organization, and availability of healthcare services.<sup>4</sup> There are many convincing reasons why people turn to telemedicine to obtain a diagnosis or treatment.<sup>2</sup> Telemedicine is a great option for following up on some health issues, such as following up on psychological diseases, as well as following up on diabetes, high blood pressure, and some heart diseases, and it has a major role in the early detection of many of the complications of these diseases.<sup>5</sup>

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Telemedicine has been in use for 68 years; however, technology has grown significantly in the past two decades. Recently, the volume of patients receiving telemedicine services has increased due to the COVID-19 pandemic. This has sparked discussions about consistent coverage, payment policy, and concerns about licensing, liability, and other issues.<sup>6</sup> Telemedicine was the best way to deal with social isolation and reduce the strain on healthcare systems during the COVID-19 pandemic.<sup>7</sup> While telemedicine offers the benefits of saving time and strengthening the doctor-patient relationship, it comes with significant risks from legal, ethical, and professional perspectives. Therefore, doctors need to be aware of these risks and consider ethical issues in their interactions with patients when utilizing telemedicine.<sup>8,9</sup> Meanwhile, the concept of telemedicine remains relatively new and unclear in the developing world.<sup>10</sup> Healthcare is now routinely delivered by telecommunications-based services in all developed countries and an increasing number of developing countries.<sup>11</sup> In a recent study, researchers studied the growth of telemedicine in some countries and found that China and India are at the forefront of using this type of medicine, while Pakistan, Bangladesh, Iran, and Sri Lanka are still in the infancy of this field.<sup>12</sup> Research on telemedicine in Middle Eastern countries is still in its early stages.<sup>13</sup> As a step toward enhancing telemedicine adoption in Egypt, it was necessary to assess the current situation of telemedicine practice among physicians working in different Egyptian healthcare facilities and their perspectives regarding improvement potentials.

## 2. Patients and methods

**Design and Setting:** Between December 2022 and June 2023, a descriptive cross-sectional study was conducted in Egypt to survey the current situation of telemedicine practice among physicians of various specialties working in different Egyptian healthcare facilities.

**Population, Sample Size, and Sampling Technique**

The study participants were selected using non-probability convenience sampling from Egyptian physicians working in different Egyptian healthcare facilities in fourteen governorates representing urban governorates (Cairo, Alexandria, and Suez), lower Egypt (Menoufia, Sharqia, Gharbia, and Daqahlia), Upper Egypt (Giza, Helwan, Sohag, and Assiut), and frontiers (North and South Sinai and Red Sea). Practicing any of the major medical and surgical subspecialties via various online platforms (WhatsApp, email, Facebook). The sample size was calculated using Epi-Info software to be 708 subjects

with a 95% confidence level, 80% power, an expected frequency of 36%, a Design effect (DEFF) of 2, and a margin of error of 5%. Finally, a total of 710 participants were included in the study.

**Inclusion and Exclusion Criteria:** Egyptian physicians working in different Egyptian healthcare facilities in various geographical areas of Egypt were eligible for the study; those who refused to participate were excluded.

**Data Collection Questionnaire:** A constructed questionnaire was developed based on a literature review. The questionnaire consists of four parts. It included three main domains in addition to the first section that addresses the study participants' general characteristics, such as age, gender, specialty, workplace, years of experience, and governorates. The first domain consists of nine questions about the use, preference, and experience of physicians who practiced telemedicine in providing healthcare services. It included questions about previous use of telemedicine, first-time use, being paid for the service, and whether the workplace provides telemedicine services to its patients. Additionally, it provides ease of use and learnability, interaction quality, and satisfaction while providing telemedicine services. The second domain included twelve questions about perceived benefits and uses of telemedicine as telemedicine saves time and cost, decreases waiting list, provides the patient with suitable information on an emergency, and improves compliance with treatment in addition to questions about services that could be provided adequately in different specialties as health education, reviewing laboratory and radiology results, postoperative follow up, nutritional and psychological counseling and follow up of chronic diseases. The third domain included nine questions addressing perceived barriers and improvement methods of telemedicine practice in Egypt. Questions about perceived barriers included ethical issues, cultural barriers, and increased liability for medical errors. Perceived improvement methods questions included training of healthcare providers and technical support, incorporation into medical education, researching its impact on quality of healthcare services, increasing awareness about it among the general population, adoption of telemedicine in big hospitals, and putting laws regulating its use.

The questionnaire accuracy and content validity were assessed by four professors of public health, gastroenterology, general surgery, and clinical pathology. A pilot study was done on 80 participants to ensure the clarity, completion time, and applicability of the constructed questionnaire. Those participants were not included in the full-scale study. Based on the pilot study results, the questionnaire was revised and prepared for use in the main research.

The tool Cronbach's alpha was (0.75, 0.84, 0.85) for the three main domains, respectively, which are considered satisfactory levels of internal reliability. Online self-administered Google Forms were distributed via various online methods (WhatsApp,

mail, Facebook, and other platforms) in the English language. Potential participants were contacted and informed about research objectives and invited to participate; furthermore, they were encouraged to invite their colleagues as well. To ensure the validity of the study results, the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) was followed.<sup>14</sup>

**Ethical Considerations:** The study procedure received approval from the ethical committee of the National Liver Institute (NLI IRB00003413FWA0000227). The questionnaire used in the study was anonymous, and the confidentiality of the data was assured. All participants signed a consent form before enrolment and were informed of the study's aims and objectives, emphasizing that their participation was voluntary.

**Statistical Data Analysis:** Data were collected and entered into the computer using the SPSS (Statistical Package for Social Science) program for statistical analysis (BM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.).

The questionnaires gathered both numerical and categorical data, which were analyzed appropriately. Quantitative data were presented as mean, standard deviation, and range, while qualitative data were expressed as frequency and percentage. The Chi-square test was utilized to measure the relationship between qualitative variables. A P-value of less than 0.05 was considered statistically significant.

### 3. Results

Table 1 shows that about seven hundred and ten physicians with a mean age of 39.942 ± 8.8629 participated in this study. Of them, 55% were males. Nearly one-third of the participating physicians had an MD and Ph.D. (26.8%+10.7%), one-third had a master's degree (34.2%), and another third had a fellowship or bachelor's. About 37.5% worked in Ministry of Health and Population (MOHP) hospitals and 35.6% in University Hospital. Internal medicine and its subspecialties had the highest participation in the study at about 57.32%. [Table 1](#)

*Table 1. General characteristics of the study participants and Usage start, preference, and experience while using telemedicine tools by physicians in Different specialties in Egypt (N=710).*

VARIABLES	N	%
AGE: MEAN ±SD RANGE(MIN-MAX)	39.942 ±8.8629 54 (23 -77)	
YEARS OF EXPERIENCE: MEAN ±SD RANGE(MIN-MAX)	14.31±8.490 49(1-50)	
GENDER:		
MALE	392	55.2
FEMALE	318	44.8
HIGHEST EDUCATIONAL QUALIFICATIONS:		
BACHELOR OF MEDICINE (GP)	126	17.7
FELLOWSHIP	71	10.0
MASTER (SPECIALIST)	243	34.2
MD	190	26.8
PHD	76	10.7
OTHERS	4	0.6
PLACE OF WORK:		
HEALTH INSURANCE SECTOR	91	12.8
MINISTRY OF HEALTH AND	266	37.5

POPULATION (MOHP) HOSPITAL		
PRIVATE SECTOR (CLINICS, HOSPITALS, AND MEDICAL CENTERS)	72	10.1
UNIVERSITY HOSPITAL	253	35.6
OTHERS	28	3.9
GOVERNORATES:		
URBAN(CAIRO, ALEX, SUEZ)	243	34.2
LOWER EGYPT (MENOUIA, SHARQIA, GHARBIA, DAQAHLIA)	300	42.25
UPPER EGYPT(GIZA, HELWAN, SOHAG, ASSIUT )	128	18.02
FRONTIERS(NORTH AND SOUTH SINAI AND RED SEA)	39	5.49
SPECIALTIES:		
MEDICINAL SUBSPECIALTIES	407	57.32
SURGICAL SUBSPECIALTIES	109	15.35
LABORATORY, RADIOLOGY, AND OTHERS	194	27.32
SPECIALTIES:		
INTERNAL MEDICINE	92	13.0
GASTROENTEROLOGY	49	6.9
PEDIATRICS	44	6.2
CHEST	46	6.5
CARDIOLOGY	39	5.5
ENDOCRINOLOGY	34	4.8
CLINICAL PATHOLOGY	40	5.6
RADIOLOGY	17	2.4
DERMATOLOGY	25	3.5
EMERGENCY	10	1.4
INTENSIVE CARE	16	2.3
GENERAL SURGERY	19	2.7
GYNECOLOGY AND OBSTETRICS	26	3.7
ENT	13	1.8
OPHTHALMOLOGY	19	2.7
ORTHOPAEDICS	20	2.8
UROLOGY	12	1.7
NUTRITION	18	2.5
PSYCHIATRY	25	3.5
RHEUMATOLOGY AND PHYSICAL MEDICINE	9	1.3
OTHERS (SUCH AS OCCUPATIONAL MEDICINE, ANESTHESIOLOGY, FORENSIC MEDICINE, AND TROPICAL MEDICINE)	137	19.3
USAGE OF TELEMEDICINE IN PROVIDING HEALTHCARE SERVICES AMONG EGYPTIAN PHYSICIANS (YES)	441	62.1
DOES YOUR WORKPLACE PROVIDE TELEMEDICINE SERVICES?		
I DON'T KNOW OR AM NOT SURE.	63	8.9
NO	342	48.2
YES	305	43.0
DID YOU PREVIOUSLY USE TELEMEDICINE IN PROVIDING HEALTHCARE SERVICES?		
NO	269	37.9
YES	441	62.1
IF YES, WHEN WAS THE FIRST TIME YOU USED TELEMEDICINE IN PROVIDING HEALTHCARE SERVICES?		
AFTER COVID	282	39.71
BEFORE COVID	181	25.5
NOT APPLICABLE	269	37.88
DO YOU PROVIDE A PAID SERVICE OF TELEMEDICINE?		
NO	488	68.7
SOMETIMES	50	7.0
YES	169	23.8
IT WAS EASY TO LEARN TO USE TELEMEDICINE TOOLS:		
I DO NOT KNOW OR AM NOT SURE.	19	2.7
I HAVE NOT USED ANY TELEMEDICINE TOOLS.	269	37.88
NO	105	14.8
YES	317	44.65
IT WAS SIMPLE TO USE TELEMEDICINE TOOLS:		
I DO NOT KNOW OR AM NOT SURE.	24	3.4
I HAVE NOT USED ANY TELEMEDICINE TOOLS.	269	37.88
NO	106	14.9
YES	311	43.80
IT WAS EASY TO INTERACT WITH THE PATIENT WHILE USING TELEMEDICINE:		
I DO NOT KNOW OR AM NOT SURE.	37	5.2
I HAVE NOT USED ANY TELEMEDICINE TOOLS.	269	37.88
NO	175	24.6
YES	229	32.25

NO		
YES		
I WAS ABLE TO PERFORM A SATISFYING REMOTE EXAMINATION WHILE USING TELEMEDICINE TOOLS:		
I DO NOT KNOW OR AM NOT SURE.	38	5.4
I HAVE NOT USED ANY TELEMEDICINE TOOLS.	269	37.88
NO	298	42.0
YES	105	14.79
OVERALL, YOU ARE SATISFIED WITH THE TELEMEDICINE EXPERIENCE:		
I DO NOT KNOW OR AM NOT SURE.	31	4.4
I HAVE NOT USED ANY TELEMEDICINE TOOLS.	269	37.88
NO	171	24.1
YES	239	33.66

About 48.2% of the participating physicians' workplaces did not provide telemedicine services, while telemedicine was used in providing healthcare services among 62.1% of participating Egyptian physicians. In addition, 39.71% of them started using telemedicine for the first time after COVID-19. Unfortunately, 68.7% of the services they provided were mainly unpaid. Learning and using telemedicine was easy for nearly 44% of our study participants and 32.25% reported that it was easy to interact with the patient while using telemedicine. Only 14.79% were able to perform a satisfying remote examination using telemedicine tools; the majority were not (42%). Finally, 33.66% of the participating physicians reported being satisfied with the telemedicine experience in general (Table 1).

Table 2. Perceived benefits, uses, barriers, and telemedicine practice improvement methods by physicians in different specialties in Egypt (N=710).

VARIABLES	I DON'T KNOW OR AM NOT SURE N(%)	NO N(%)	YES N(%)
PERCEIVED BENEFITS AND USES OF TELEMEDICINE BY PHYSICIANS IN DIFFERENT SPECIALTIES IN EGYPT			
TELEMEDICINE SAVES TIME IN PROVIDING HEALTHCARE.	40(5.6)	137(19.3)	533(75.1)
TELEMEDICINE SAVES COSTS IN PROVIDING HEALTHCARE.	63(8.9)	135(19.0)	512(72.1)
TELEMEDICINE CAN DECREASE THE WAITING LIST	52(7.3)	127(17.9)	531(74.8)
TELEMEDICINE CAN PROVIDE PATIENTS WITH SUITABLE INFORMATION IN EMERGENCIES.	67(9.4)	227(32)	416(58.6)
CAN IMPROVE PATIENTS' COMPLIANCE WITH TREATMENT IN YOUR SPECIALTY, HEALTH EDUCATION COULD BE PROVIDED ADEQUATELY USING TELEMEDICINE	94(13.2)	159(22.4)	457(64.4)
IN YOUR SPECIALTY, REVIEWING LABORATORY AND RADIOLOGY REPORTS COULD BE PROVIDED ADEQUATELY USING TELEMEDICINE	62 (8.73)	168 (23.7)	480 (67.6)
IN YOUR SPECIALTY, POST-OPERATIVE FOLLOW-UP COULD BE PROVIDED ADEQUATELY USING TELEMEDICINE	51(7.2)	132(18.6)	527(74.2)
IN YOUR SPECIALTY, CONSULTATION IN EMERGENCIES COULD BE PROVIDED ADEQUATELY USING TELEMEDICINE:	154(21.7)	244 (34.4)	312 (43.9)
IN YOUR SPECIALTY, FOLLOW-UP OF CHRONIC DISEASES COULD BE PROVIDED ADEQUATELY USING TELEMEDICINE	75 (10.6)	301(42.4)	334 (47.0)
IN YOUR SPECIALTY, NUTRITIONAL COUNSELLING COULD BE PROVIDED ADEQUATELY USING TELEMEDICINE	68 (9.58)	182 (25.6)	460 (64.8)
IN YOUR SPECIALTY, PUTTING LAWS REGULATING ITS USE.	96 (13.52)	147 (20.7)	467 (65.8)
IN YOUR SPECIALTY,	124	205	381(53.7)

PSYCHOLOGICAL COUNSELLING COULD BE PROVIDED ADEQUATELY USING TELEMEDICINE	(17.5)	(28.9)	
PERCEIVED BARRIERS AND TELEMEDICINE PRACTICE IMPROVEMENT METHODS BY PHYSICIANS IN DIFFERENT SPECIALTIES IN EGYPT			
BARRIERS INCLUDE:	110	184	416
ETHICAL ISSUES.	(15.5)	(25.9)	(58.6)
CULTURAL BARRIERS.	97 (13.7)	216	397
		(30.4)	(55.9)
IT CAN INCREASE MEDICAL ERRORS.	102	167	441(62.1)
	(14.4)	(23.5)	
IMPROVEMENT METHODS INCLUDE:			
TRAINING OF HEALTH CARE PROVIDERS AND TECHNICAL SUPPORT.	39 (5.5)	104	567
		(14.6)	(79.9)
INCORPORATION INTO MEDICAL EDUCATION.	54 (7.6)	118	538
		(16.6)	(75.8)
RESEARCH ON THE IMPACT OF TELEMEDICINE ON THE QUALITY OF HEALTHCARE SERVICES.	59 (8.3)	106	545
		(14.9)	(76.8)
INCREASING AWARENESS ABOUT TELEMEDICINE AMONG THE GENERAL POPULATION	40 (5.6)	110	560
		(15.5)	(78.9)
ADOPTION OF TELEMEDICINE SERVICES IN BIG HOSPITALS.	75 (10.6)	100	535
		(14.1)	(75.4)
PUTTING LAWS REGULATING ITS USE.	59 (8.3)	89 (12.5)	562
			(79.2)

Table 2 shows details of the perceived benefits, uses, barriers, and telemedicine practice improvement methods section. Nearly three-quarters of the physicians believed that telemedicine saves time and cost in providing healthcare, decreases the waiting list, and helps review laboratory and radiology reports adequately. Nearly 50% or more reported that telemedicine provides patients with suitable information in emergencies and improves patients' compliance with treatment and follow-up. The most reported barriers were increased liability for medical errors (62.1%), ethical barriers (58.6%), and cultural barriers (55.9%). The most telemedicine improvement methods reported by the participating Egyptian physicians were training of health care providers and technical support (79.9%) followed by putting laws regulating its use (79.2%) and increasing awareness about telemedicine among the general population (78.9%). Nearly three-quarters of study participants suggested incorporating telemedicine into medical education, researching the impact of telemedicine on the quality of healthcare services, and adopting telemedicine in big hospitals as a method for improving telemedicine.

Table 3 shows the comparison of perceived barriers and improvement methods of telemedicine practice among physicians' specialties subgroups in Egypt. About 80% or slightly more of the laboratory, radiology, and other subspecialty groups reported that incorporating telemedicine into medical education, researching the impact of telemedicine on the quality of healthcare services, and adopting telemedicine services in big hospitals as their preferred perceived telemedicine practice improvement methods, which was significantly higher than among surgical and medicinal subspecialty groups. (p-value < 0.05).

Table 3. Comparison of perceived barriers and improvement methods of telemedicine practice in Egypt among physicians' specialties subgroups. (N=



710).

VARIABLES	PHYSICIANS' SPECIALTIES						CHI-SQUARE TEST	P-VALUE
	Medicinal (N=407)		Surgical (N=109)		Laboratory, radiology, and others (N=194)			
	N	%	N	%	N	%		
PERCEIVED TELEMEDICINE PRACTICE BARRIERS AMONG EGYPTIAN PHYSICIANS OF DIFFERENT SPECIALTY SUBGROUPS.								
ETHICAL ISSUES.								
I DON'T KNOW.	58	(14.3)	14	(12.8)	38	19.6	7.07	0.13
NO	98	(24.1)	29	(26.6)	57	29.4		
YES	251	(61.7)	66	(60.6)	99	51.0		
CULTURAL BARRIERS.								
I DO NOT KNOW.	43	10.6	20	18.3	34	17.5	8.2	0.08
NO	128	31.4	34	31.2	54	27.8		
YES	236	58.0	55	50.5	106	54.6		
IT CAN INCREASE MEDICAL ERRORS.								
I DO NOT KNOW.	59	14.5	11	10.1	32	16.5	2.8	0.55
NO	97	23.8	24	22.0	46	23.7		
YES	251	61.7	74	67.9	116	59.8		
PERCEIVED TELEMEDICINE PRACTICE IMPROVEMENT METHODS AMONG EGYPTIAN PHYSICIANS OF DIFFERENT SPECIALTY SUBGROUPS.								
TRAINING OF HEALTH CARE PROVIDERS AND TECHNICAL SUPPORT.								
I DON'T KNOW.	20	4.9	9	8.3	10	5.2	7.12	0.13
NO	67	16.5	18	16.5	19	9.8		
YES	320	78.6	82	75.2	165	85.1		
INCORPORATION INTO MEDICAL EDUCATION.								
I DO NOT KNOW.	28	6.9	11	10.1	15	7.7	11.429	0.022*
NO	75	18.4	24	22.0	19	9.8		
YES	304	74.7	74	67.9	160	82.5		
RESEARCHING THE IMPACT OF TELEMEDICINE ON THE QUALITY OF HEALTHCARE SERVICES.								
I DO NOT KNOW.	26	6.4	16	14.7	17	8.8	15.795	0.003*
NO	72	17.7	17	15.6	17	8.8		
YES	309	75.9	76	69.7	160	82.5		
INCREASING AWARENESS ABOUT TELEMEDICINE AMONG THE GENERAL POPULATION								
I DO NOT KNOW.	22	5.4	7	6.4	11	5.7	5.696	0.06
NO	71	17.4	19	17.4	20	10.3		
YES	314	77.1	83	76.1	163	84.0		
ADOPTION OF TELEMEDICINE SERVICES IN BIG HOSPITALS.								
I DO NOT KNOW.	38	9.3	17	15.6	20	10.3	13.2	0.003*
NO	70	17.2	15	13.8	15	7.7		
YES	299	73.5	77	70.6	159	82.0		
PUTTING LAWS REGULATING ITS USE:								
I DO NOT KNOW.	32	7.9%	10	9.2%	17	8.8%	3.653	0.16
NO	59	14.5%	12	11.0%	18	9.3%		
YES	316	77.6%	87	79.8%	159	82.0%		

\* Statistically significant p-value &lt;0.05.

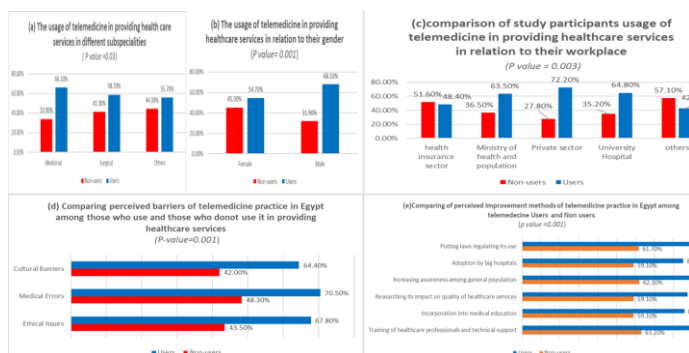


Figure 1: (a): Usage of telemedicine in providing healthcare services among different Egyptian physicians' subspecialty groups (N=710), (b): Comparison of Egyptian physicians' usage of telemedicine with their gender (N=710). (c) Comparison of Egyptian physicians' usage of telemedicine in providing healthcare services in their workplace. (d): Comparison of perceived

barriers to telemedicine among Egyptian physicians who use and those who do not use it in providing healthcare. and (e) Comparison of perceived telemedicine improvement methods among Egyptian physicians who use and those who do not use it in providing healthcare.

Figure 1(a) shows a significant difference between Egyptian physicians' subspecialty groups regarding the usage of telemedicine in providing healthcare services ( $p$  value < 0.05), where 66.1% of the internal medicine subspecialty group and 58.7% of the surgical specialty group used telemedicine in providing healthcare services. Other specialty groups were the least in using telemedicine (55.7%). Figure 1(b) shows a significant difference between males and females in the usage of telemedicine for providing healthcare services, where 68.1% of males were users of telemedicine compared to 54.7% of females ( $p$ -value < 0.05). Figure 1(c) The private health sector shows a high prevalence of use of telemedicine in providing healthcare services (72.2%) in comparison to other workplaces with statistically significant difference. ( $p$  value < 0.05).

Figure 1 (d) shows a significant difference between Egyptian physician telemedicine users and non-users regarding perceived barriers to telemedicine practice in Egypt, where increased medical error liability was reported among 70.5% of users, followed by ethical issues in 67.8% of them ( $p$ -value < 0.05). Figure 1(e) shows a significant difference between Egyptian physicians who use telemedicine and those who don't in terms of their perceived methods for improving telemedicine practice ( $p$ -value < 0.05) where (90%) of users and (63.2%) of non-users indicated that training healthcare professionals and technical support were their preferred methods for improving telemedicine practice.

#### 4. Discussion

The 21st century has seen an unprecedented increase in technology utilization and adoption across various sectors, particularly healthcare. The usage of information and communication technologies in healthcare can result in better access, increased efficiency, and enhanced quality of provided services. Low- and middle-income countries have significant inequities in access to healthcare. 15 Because of limited human resources, inconvenient budgetary support, and deficient management of healthcare, these countries will require modern and innovative approaches to make access to healthcare services efficient.<sup>15</sup> Telemedicine, through the use of different digital technologies, will overcome the obstacles that hinder access to health services to reach the needy and remote communities. The present study aimed to evaluate the current situation of telemedicine practice in different specialties in Egypt.

In the present study, nearly two-thirds of the physicians (62%) were using telemedicine to provide healthcare services. This finding agreed with a study conducted by Kasim et al, which showed that 62.1 % of their physicians were users of telehealth services.<sup>16</sup> A National Survey on healthcare providers' perspectives on the use of telemedicine in Egypt showed that 36% of the participants used telemedicine.<sup>17</sup> In Brazil, nearly three-quarters of physicians in large hospitals reported using telemedicine services (78.3%), followed by physicians working in small private clinics (66.4%) and primary health care centers (58.4%).<sup>18</sup> The variability of telemedicine use among countries is due to differences in physicians' and healthcare workers' knowledge about telemedicine, skills, and previous training, which consequently influence their attitude towards the use of telemedicine, along with other factors such as technical expertise, health organization infrastructure, and technological accessibility of the patients.

The present study showed an increase in telemedicine use after the COVID-19 pandemic. Nearly 40% of physicians used telemedicine for the first time in providing healthcare services after the COVID-19 pandemic, and 25.5% of physicians before the pandemic. Furthermore, this study revealed that males (68.1%) were the most common users of telemedicine, similar to other studies.<sup>19,20</sup> This may be because women faced more stress and cognitive responsibilities, and were more exposed to stress and cognitive responsibilities during the COVID-19 pandemic due to lifestyle changes and increased household demands.

The present study revealed that the most frequent specialty using telemedicine was internal medicine (66.1%), followed by surgery (58.7 %). It was shown that practicing medical care through telemedicine significantly increased during the COVID-19 pandemic and provided a new experience to many physicians.<sup>11</sup> Another study revealed that the top three specialties providing telemedicine services are surgeons (13.2%), general practitioners (10%), and neurologists (9.6%).<sup>4</sup> However, other studies revealed that radiologists, psychiatrists, and cardiologists were the most common providers of telemedicine services among different specialties.<sup>21,22</sup>

The present study of healthcare providers agreed about the usability of telemedicine services. They agreed on the ease of use, learnability, usefulness, and quality of services provided through telemedicine. Similar studies in Saudi Arabia<sup>23</sup> and the southern part of Iraq reported the agreement of their physicians about the usefulness of telemedicine services and the desire to implement this service in clinical practice.<sup>24</sup>

This study depicted that telemedicine is an effective way of providing convenience, cost-effectiveness, and time-saving service, as reported by physicians, in agreement with other studies.<sup>21,25</sup> However, concerns remain, particularly regarding

the barriers to the use of telemedicine services.<sup>21,26</sup> Telemedicine implementation might reduce the quality of medical services provided to patients by increasing the probability of medical errors.<sup>18</sup> The present study showed that the perceived barriers towards telemedicine practice among physicians who are telemedicine users were medical error liability, followed by ethical issues. The Delphi survey conducted by Austrian health experts showed that data confidentiality was the most critical issue confronted in telemedicine applications.<sup>27</sup> In this study, technical support is one of the improvement methods reported by physicians who are users and non-users of telemedicine services. A study conducted in Iraq showed that the lack of awareness and unfamiliarity with telemedicine among physicians was the main cause of the prevention of telemedicine adoption.<sup>28</sup> Other studies revealed that poor internet services were the main reason for the decline in the use of telemedicine.<sup>29,30</sup> Kasim et al reported that chronic diseases cannot be managed remotely through telemedicine services, and this was a barrier to their study.<sup>16</sup> The present study showed that 42% of the participants were unable to perform a satisfying remote examination while using telemedicine tools.

The present study revealed that training healthcare professionals is the most effective method that should be adopted to increase telemedicine utilization. This finding aligns with another study that showed the need for enhanced educational practices for both patients and healthcare providers to achieve successful telehealth services.<sup>29</sup>

Despite telemedicine being accepted by healthcare professionals in the present study, its utilization still faces many barriers, including cultural barriers, ethical issues, and the occurrence of medical errors. Training of healthcare professionals and technical support should be implemented to achieve more successful adoption of telemedicine services in Egypt.

The main limitation of this study is that it employed the convenience sampling method for recruiting study participants which resulted in unavoidable Sampling biases and all participants were recruited by the online methods however, efforts were made to increase the accuracy of results as The Checklist for Reporting Results of Internet E-Surveys (CHERRIES) (Eysenbach, 2004) which was followed to ensure the validity of the study results. Additionally, participants were encouraged to invite their colleagues to join the study to increase the representation of physicians of various medical subspecialties working in different healthcare facilities in various geographic regions of Egypt. This approach was used to improve the generalizability of our results.

#### 4. Conclusion and Recommendations

The present study revealed that 62% of the physicians were telemedicine users, 39.71% used telemedicine for the first time after COVID-19, and one-third of users were satisfied with the

telemedicine experience. Most telemedicine users' physicians were males who worked in the private sector and were from a medical subspecialty. Reported barriers to the adoption of telemedicine services included increased liability for medical errors, ethical barriers, and cultural barriers. Significant improvements are needed in various sectors, including regulatory, infrastructural, legal, and financial, to enhance telemedicine adoption among Egyptian physicians.

## Disclosure

The authors have no financial interest to declare in relation to the content of this article.

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All authors have a substantial contribution to the article

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