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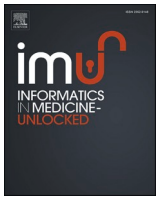

Acceptance of telemedicine technology among physicians: A systematic review

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ABSTRACTS

Background: Telemedicine is vital technology to deliver health services at a distance by health professionals, especially physicians, who are key players in Community health. Given the important role of telemedicine in improving health care, especially in the COVID-19 epidemic, an examination of behavioral barriers and not using this technology among physicians can be important.

Objectives: The aim of our systematic review is to identify the behavioral factors influencing the acceptance of telemedicine technology among physicians in different contexts.

Methods: A literature search was conducted according to the PRISMA guidelines. The search was conducted without any time limitations up to the Dec of 2020 in Web of Science, PubMed, Scopus, and Embase scientific databases; by applying keywords. The article selection was made based on inclusion (telemedicine among physicians, using the acceptance behavioral theories), and exclusion (physicians not the end-users of technology, it is not about acceptance of technology) criteria by two authors independently. Data was gathered using a data extraction form, and the results were reported in tables and figures based on the study objectives.

Results: From all the retrieved studies, 37 articles were included based on the inclusion and exclusion criteria. The United States and Spain have the most conducted studies about the acceptance of telemedicine from the physicians' point of view. The study results showed that the Technology Acceptance Model (TAM) and extended TAM model have the highest frequency. The main factors affecting the acceptance and use of telemedicine were perceived usefulness, attitude to use, compatibility, perceived ease of use, self-efficacy, subjective norms, perceived behavioral control, and facilitating condition.

Conclusions: Identifying the most important factors that affect the acceptance of telemedicine from physicians' perspectives, as a key player in telemedicine projects, can help managers and policymakers make the right decisions about implementation of telemedicine successfully, especially in the initial phases. Future studies can also evaluate the aggregation of factors identified in this paper.

1. Introduction

Telemedicine technology provides healthcare services in situations where distance is a determinant factor. Specialized staff use telecommunications technologies to exchange valid information for the diagnosis, treatment, and prevention of disease and injury, as well as for continuing education concerning health of the needy [1–3]. This technology includes a complete set of proceedings taken to increase the health and well-being of the individual in society, and has a variety of applications and a wide range of technologies [2]. Broadly, there are three main types of telemedicine: store-and-forward, remote monitoring, and real-time interactive services [4].

Some distinguish telemedicine from telehealth, which was previously restricted to service delivery by physicians only and the telehealth representing services provided by health professionals in general, including nurses, pharmacists, and others. However, both of them are synonymous and used interchangeably in this manuscript. Telemedicine combines the convenience, low cost, and ready accessibility of health-related information and communication using the Internet and associated technologies. The use of telemedicine can help patients to become

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more involved in their healthcare plan and increase their autonomy. Telemedicine can significantly contribute to healthcare in underserved areas through telestroke, telecardiology, teledermatology, telepediatrics, telepsychiatry, and teleneonatology. This tool aims to improve access to care for anyone regardless of location and it reduce the number of face-to-face visits [5,6].

With of the COVID-19 and quarantine days' pandemic, this issue has become very important. The distance and social distance that are important aspects of telemedicine can be an important reason to offer a unique opportunity to accelerate acceptance and the many advantages of this technology, which is anyway unavoidable. So, telemedicine can be utilized in three the health care aspect, including prevention, education, and treatment.

Studies have shown that effective communication between patient and physician is associated with positive health outcomes [7–9]. A growing body of research shows that physicians' communication behaviors does indeed have a positive impact on patients' health outcomes. Accordingly, physicians are providing medical-care remotely using telemedicine and virtual services. These virtual care services provide various non-dispensing functions, enabling physicians for delivering quality medical care during the COVID-19 pandemic. Such services may include review of patient medication histories, health education, health therapy management, and drug use review remotely [10].

The technology acceptance process is critical to the effective implementation of the process, and one of the key measures to the successful implementation of IT and continued use is technology acceptance by users. The high cost of implementation and poor reimbursements policies for care delivered through telemedicine can result in resistance to change for adoption of digital innovations among physicians. A major barrier is the lack of acceptance by the key players (physicians) in healthcare [11,12]. This barrier is related to both technical and behavioral aspects [13]. In the technical (contextual) aspect of this non-acceptance, are factors such as buying a suitable technology, training staffs and even the patients, workflow after telemedicine (such as referral to the laboratory after a visit), uncertainty of financial stability after quarantine, confusion in coverage insurance and inadequate technology infrastructure [14,15]. Non-acceptance behavioral aspects of physicians are the subject of our study. Implementing digital health technologies is complex but can be facilitated by considering the features of the tool that is being implemented, and the team that will use it, also and the routines that will be affected [16]. Licensing issue is a significant barrier because countries and states within countries need to licensing requirements [17]. Non-technical factors (human characteristics, computer skills, and organizational characteristics) are the most influential factors in adopting care technologies [13]. Many models are provided and used to determine the influential factors in accepting and using technologies, especially health. Some of these models include the Technology Acceptance Model (TAM), Extended technology acceptance model (TAM2), Unified Theory of Acceptance and Use of Technology (UTAUT), Theory of Planned Behavior (TPB), and Diffusion of Innovations Theory (DIT) [13,18–21]. Due to the importance of studying the factors affecting the acceptance of telemedicine as one of the most widely used information technologies in health, many studies have determined the factors affecting its acceptance using the mentioned models. Due to the variety of models and behavioral (individual) factors, in each country, technology and context, many studies have been conducted with different models of acceptance of telemedicine among physicians, which each one of them introduces specific factors and models. The results of these studies are scattered and often duplicate across different literatures, in other words, in duplicate environments, various acceptance models and factors have been confirmed without knowledge of the studies performed, or even sometimes in similar types of telemedicine, the same factors and models are repeated exactly. Therefore, this study can show a coherent whole of the models and factors studied in different types of telemedicine among physicians and gain an overview of the studies and factors.

Considering that so far no study has comprehensively assessed the models and factors affecting the acceptance of telemedicine from the perspective of physicians as key users of the system. The purpose of our study is to provide a total overview and theory of behavioral models and factors performed in different types of telemedicine technology, and general acceptance model based on the frequency of approved factors in different types of telemedicine is to examine the admission factors among physicians in different environments.

2. Methods

2.1. Study design

This study is a systematic review conducted ending until 2020 based on Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [22].

2.2. Study selection process

We used systematic search processes to identify all original published articles related to physicians' acceptance and perception of telemedicine in health services from the beginning to the end of 2020. The authors, title, journal, year of publication, and abstract for each article were collected in an Excel (Microsoft Office 2019) spreadsheet. The PubMed, Scopus, Web of Science, ScienceDirect, and Embase databases were searched, and English-only publications were selected. The broad keywords used for the initial search are displayed in Table 1.

2.3. Inclusion and exclusion criteria

Original research articles related to the acceptance and use of telemedicine from the perspective of physicians were included in the study without time limit. Articles that used technology acceptance theories were given priority.

The exclusion criteria had physicians not the end-users of technology; it is not about acceptance of technology; in general, the only evaluation is the use of telemedicine. Review articles, letters to the editor, short communications and other irrelevant articles were excluded from the study.

The full texts of the remaining articles were read for eligibility, and the qualified publications were retained in a list. A search of the recent reviews and hand-searching references from articles were made to get related articles.

The quality assessment of the selected articles was done based on Newcastle-Ottawa Scale (NOS) tool [23]. This assessment tool is used to assess the quality of observational studies in systematic reviews [24]. However, evaluations revealed that all selected articles were of the quality required for inclusion in the study.

2.4. Data gathering

After selecting related studies, data gathering was conducted by two authors independently. We used a data extraction table in Excel software. The main items of the table include general data of the studies,

Table 1
Search strategy.

limitations	English full text studies, up to Dec 2020
#1	"telemedicine" OR "telehealth" OR "telemonitoring" OR "telecare"
#2	"acceptance" OR "behavioral intention" OR "intention to use" OR "adoption" OR "technology acceptance models" OR "effective factors"
#3	"Physicians" OR "doctor" OR "healthcare providers" OR "HCP"
Search strategy	#1 AND #2 AND #3

model name, type of applied telemedicine, and most influential factors in acceptance of telemedicine.

2.5. Data analyses

Data analyses were done through content analyses, and the results were summarized and reported in tables and figures based on the study objectives.

3. Results

A total of 4789 documents were retrieved from the database searches. After the removal of 1023 duplicates, 3766 publications were entered into the selection process. Results of the screening process in the analysis are noted in the flow diagram in Fig. 1. First, 3766 publications' titles and abstracts were assessed together by three authors. At this stage, 3523 articles, that means most of them unrelated to the topic, were excluded from the review. The full texts of the relevant articles were then reviewed by three authors together. Three authors then reviewed the titles and abstracts of the relevant articles. When the title or abstract was deemed significant for inclusion in the review, the full text was scanned to ensure relevant content. At this stage, 206 articles unrelated to acceptance of telemedicine technology in physicians, related to the effectiveness of technology, satisfaction with telemedicine technology, or evaluating telemedicine use were excluded in general. When there was disagreement, the authors evaluated their assessment until consensus was reached. The systematic search of the literature identified 37 articles that reported original empirical research on the use of telemedicine among physicians, details of these articles are shown in Table 2.

According to our findings, the first study on the adoption of telemedicine technology among physicians using the Theory of Planned Behavior (TPB) model was in 1999 in Hong Kong. As shown in Table 3, approximately half of the studies on telemedicine acceptance used the original TAM model, and several other papers combined the TAM and extended TAM or TAM2 models. Other important models used after the TAM model are the TPB and DIT models and combinations of these models. Other surviving common models performed among physicians include UTAUT, TIB, NPT, and so on.

The distribution of countries in relation to the acceptance of telemedicine technology among physicians is shown in Table 4. The United States has the highest number of telemedicine studies. Spain is next with five studies, followed by Hong Kong with four studies. China, Germany, South Korea, Canada, and India are next with 3,3, 2, 2, and 2 studies, respectively.

As shown in Table 5, the results showed that 22 of the studies were generally conducted on the acceptance of telemedicine services without mentioning the context of telemedicine (platform), and perceived usefulness (10), attitude (6), compatibility (5), perceived ease of use (4), self-efficacy (4), subjective norm (4), and perceived behavioral control (3) factors had the most important and highest frequency of use among the studies, respectively. The next telemedicine platform is teleconsulting, with four studies that accepted factors shown in the table. Mobile health and telerehabilitation are other types of telemedicine that have been ranked with three studies, and the perceived usefulness factor is the most important accepted factor in this type of telemedicine. Other telemedicine substrates include telehomecare, telemedicine in diabetes, telemonitoring, teleneonatology, telestroke and tele palliative each with one study. The most important factor of these platforms is the perceived usefulness that has been accepted in all these studies.

The frequency of models and factors obtained in telemedicine acceptance among physicians shows that telemedicine services, in

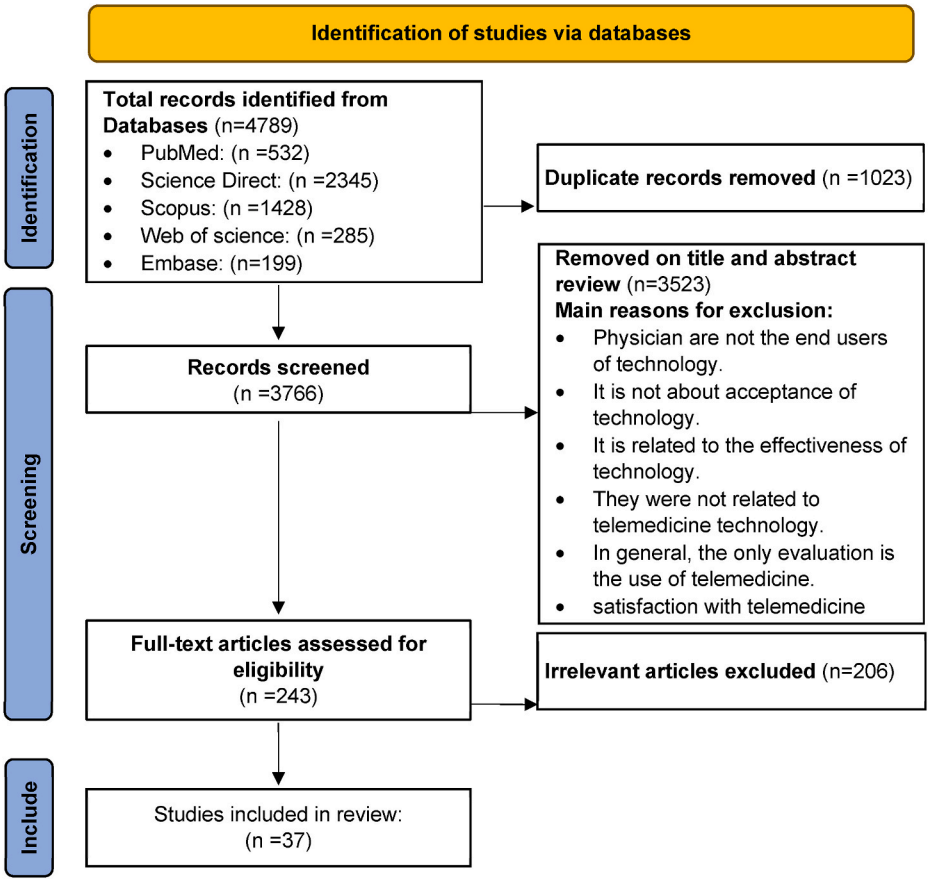

Fig. 1. Preferred reporting items for systematic reviews (PRISMA) flow diagram.

Table 2
Publications related to the acceptance of telemedicine among physicians.

Item	Author	Year	Country	Basic model	Technology studied/ Platform	The factor affecting the acceptance	Other
1	Hu PJ & Chau PY [29]	1999	Hong Kong	Theory of Planned Behavior (TPB)	Telemedicine	Attitude, perceived behavioral control	The subjective norm factor was ineffective.
2	HU et al. [30]	1999	Hong Kong	TAM (Technology acceptance model)	Telemedicine	Perceived usefulness	-
3	Chau, P. Y. K & Hu, P. J. H [31]	2001	Hong Kong	TAM, TPB	Telemedicine	Attitude, perceived usefulness, compatibility	Subjective norm and perceived behavioral control factors were ineffective
4	C P·Y.K. Chau, P. J.-H. Hu HAU AND HU [32]	2002	Hong Kong	TAM, TPB	Telemedicine	Perceived usefulness, perceived behavioral control	Subjective norm, perceived ease of use, and attitude were ineffective.
5	Gagnon et al. [33]	2003	Canada	Theory of interpersonal behavior (TIB)	Telemedicine	Normative factor, comprising personal, social norms, self-identity	
6	Helitzer et al. [34]	2003	USA	Diffusion of Innovations Theory (DIT)	Telemedicine	Relative advantage, compatibility, complexity, observability, trialability	-
7	Spaulding et al. [35]	2005	USA	Diffusion of Innovations Theory (DIT)	Health-care consultation	Adopters' perceptions of the patient advantages, provider advantages, observability, trialability	-
8	J. Kim et al. [36]	2010	USA	TAM and TPB	Telehomecare	Attitude, subjective norms, perceived ease of use, Perceived usefulness.	Theory of planned behaviour better explains physicians' actual use of telemedicine.
9	Bennani Az et al. [37]	2010	Morocco	TAM	Telemedicine	Attitude, Perceived usefulness.	-
10	Kifle et al. [38]	2010	Ethiopia	TAM, TPB, UTAUT	Telemedicine	Self-efficacy, compatibility, perceived ease of use, perceived usefulness, social influence, anxiety	The Perceived voluntariness has a negative impact
11	Gagnon, M. P et al. [39]	2011	Spain	TAM	Telemonitoring	Perceived usefulness, facilitators	-
12	Parra et al. [40]	2012	Spain	TAM	TeleStroke	Perceived usefulness and perceived ease, Subjective norm, facilitating conditions, intention to use	-
13	Rho MJ, Choi IY, Lee J [41]	2014	South Korea	TAM	Telemedicine	Perceived usefulness, perceived ease of use, the accessibility of medical records and of patients, self-efficacy, perceived incentives	-
14	Saigí-Rubió et al. [42]	2014	Spain, Colombia, Bolivia	Extended TAM	Telemedicine	Level of ICT use in personal life, perceived Ease-of-use, Propensity to innovate	-
15	Zailani.S et al. [43]	2014	Malaysia	Extended TAM	Telemedicine	Government policies, top management support, perceived usefulness, computer self-efficiency, health culture	Moderating role of health culture on the relationship between government policies as well as perceived usefulness on telemedicine acceptance by Malaysian hospitals
16	Dany, F & Römer, B [11]	2014	Germany	TAM	Telemedicine	Physicians' technological contexts (data security and data reliability), financial contexts (billability and costs), individual contexts (technology affinity, subjective norms and motivations), and organizational contexts (compatibility of telemedicine systems with existing processes)	-
17	Kuang-Ming Kuo et al. [44]	2015	Taiwan	Theory of Planned Behavior(TPB)	Telemedicine	Attitude (AT), subjective norm (SN), perceived behavioral control (PBC)	According to the results, our study suggests that differing strategies for experienced and inexperienced physicians must be formulated to substantially boost the adoption of telemedicine technology.
18	Saigi-Rubió F et al. [45]	2016	Spain	Extended TAM	Telemedicine	Security, confidentiality, reduced cost, the patients' predisposition	Patients and medical staffs can influence acceptance through the factor of subjective norm.
19	Adenuga K I et al. [46]	2017	Nigeria	UTAUT	Telemedicine	Performance expectancy, effort expectancy, facilitating condition, reinforcement factor	-
20		2018	India	TAM	Telemedicine		-

(*continued on next page*)

Table 2 (*continued*)

Item	Author	Year	Country	Basic model	Technology studied/ Platform	The factor affecting the acceptance	Other
	Shadangi et al. [47]					Perceived usefulness, perceived ease of use, attitude	
21	Pereyra-Rodriguez et al. [48]	2018	Spain	Extended TAM	Telemedicine	Institution's support, perceived usefulness	Introduction of article is in English
22	Ayatollahi et al. [49]	2018	Iran	TAM	Telemedicine in diabetes	Perceived usefulness, perceived ease of use, personal abilities, availability of resources, subjective norms	-
23	G. H. Mengesha and M. J. Garfield [50]	2019	Ethiopia	UTAUT	Telemedicine	Facilitating conditions, compatibility with medical practice, compatibility with physicians preferred work style	-
24	Shadangi et al. [51]	2019	India	Theory of Planned Behavioral (TPB)	Telemedicine	Attitude, social norms, perceived behavioural control and perceived value	-
25	Almojaibel et al. [52]	2019	Saudi Arabia, USA	TAM	Tele-Pulmonary	Perceived usefulness, perceived ease of use, behavioral intention	-
26	Asiedu et al. [53]	2019	USA	Normalization process theory (NPT)	Teleneonatology	perceived benefit, mutual understanding of the guidelines, and expectations of use.	-
27	Jacob et al. [54]	2020	Switzerland and Germany	Researcher made	Clinical photo documentation mHealth app	Awareness, attitude, culture, experience and habit, usefulness, easy to use	No acceptance model
28	Almojaibelet al [55]	2020	USA	TAM	Telerehabilitation for pulmonary rehabilitation.	Perceived usefulness	Sample studies are from several countries
29	Klingb et al. [56]	2020	Dar Es Salaam, Tanzania	TAM	M-health technology for emergency care of burn patients	Compatibility, Perceived usefulness	Most of the factors used in the study, such as image, sound, perceived ease of use, Self-efficacy, Voluntariness, Anxiety, Social influences, Facilitating conditions were not effective.
30	Lucia et al. [57]	2020	USA, Brazil	Researcher made	Telemedicine	Policy, culture, privacy	Security was not effective.
31	Nguy et al. [58]	2020	Canada	TAM	Telehealth applications in palliative care	perceived usefulness(enabling remote connection and information-sharing platform) and ease of use (integration with existing IT systems and user-friendly with ready access to technical support)	User-friendliness has been the most important acceptance factor
32	Haun eta l [59]	2020	Germany	Diffusion of Innovations Theory (DIT)	Video-based integrated care models featuring mental health specialist video consultations (MHSVC)	the availability of a designated room	-
33	Kissi et al. [60]	2020	China	TAM	Telemedicine	Perceived ease of use, perceived usefulness	These factors led to increased efficiency, quality of services, quality patient care delivery, and satisfaction among physicians
34	Cao et al. [61]	2020	China	Elaboration likelihood model and Trust transfer theory	The promotion of mobile online health community (MOHC)	Doctor's initial trust, doctor's information quality, trust in offline doctors' health service, service quality, MOHC platform's initial trust.	-
35	Lee et al. [62]	2020	South Korea	TAM	Teleconsultation Robots	Perceived usefulness, perceived ease of use, satisfaction	-
36	Almojaibel et al. [63]	2020	USA	TAM	Telerehabilitation	Perceived usefulness	Other factors were not influential
37	Chen et al. [64]	2020	china	Expectancy theory and the Bagozzi, Dholakia, and Basuroy (BDB)	Online Counseling Services	Extrinsic rewards, expected relationships, image, sense of self-worth	-

general, have a proven model based on the TAM model including perceived usefulness, attitude, compatibility, perceived ease of use, self-efficacy, subjective norm, perceived behavioral control, facilitating condition, health culture, reduced cost, security, and government policies factors. The relationships of this model can be implicitly created in the form of Fig. 2 by basing the TAM model implicitly.

4. Discussions

Most organizational and technical (contextual) factors (such as connection speed, equipment, substrates, etc.) affect the intention of physicians to use telemedicine technology and is predictable. Nevertheless, most behavioral factors are unpredictable and vary in different end-users such as physicians, patients, and professionals. Behavioral beliefs play a central role in health research [25]. So behavioral (individual) factors are critical in the acceptance of telemedicine by

Table 3
Frequency of acceptance models as a basis for telemedicine acceptance among physicians.

Model used	Frequency
Technology acceptance model (TAM)	15
Extended technology acceptance model (TAM2)	4
Theory of Planned Behavior (TPB)	3
Diffusion of Innovations Theory (DIT)	3
Combination of TAM and TPB	3
Unified theory of acceptance and use of technology (UTAUT)	2
Theory of interpersonal behavior (TIB)	1
Normalization process theory (NPT)	1
Expectancy theory and the Bagozzi, Dholakia, and Basuroy (BDB)	1
Elaboration likelihood model and Trust transfer theory	1
Combination of TAM, TPB and UTAUT	1

Table 4
The distribution of countries in relation to the acceptance of telemedicine.

Country	Number of studies
United states (USA)	8
Spain	5
Hong Kong	4
China	3
Germany	3
South Korea	2
India	2
Canada	2
The remaining of the countries have a study each	

physicians. This study aims to review the studies conducted in related to the adoption of this technology in terms of behavioral factors.

Most studies have used the term telemedicine and services without mentioning their type and context. Given that there are different types of telemedicine, they seem to be general and ambiguous studies. Each specific type of telemedicine has its own patients, and certain factors that may influence its use. For example, telecounseling is very different from telesurgery, it requires different tools and even certain health professionals, and these differences can change the influencing factors.

Considering that in these studies, most of the same factors and acceptance models have been used, but the influencing factors have significant contradictions, such as subjective norm and perceived easy-to-use factors. Their base model has been TAM and extended TAM models. This may lead to lack of physician understanding of telemedicine, So, according to the different types of telemedicine, a specific type of telemedicine should be considered, and the general services of telemedicine, which is ambiguous, should not be considered. According to the results, what is obvious and accepted in most studies is the TAM model, which has been accepted in most cases, so the TAM model is the most important basic model in accepting telemedicine among physicians.

AlQudah et al. [20] Conducted a review study to examine the acceptance of technology, models, and factors common in the health care environment. The key findings confirmed that the TAM, UTAUT, and their constructs (anxiety, computer self-efficacy, innovativeness, and trust) are robust theories to understand the acceptance of various technologies through different users. The results of this study are consistent with our study of the acceptance of telemedicine among physicians.

The model presented in the results section is in fact a proposal model that is based on the frequency of confirmed factors. There may be important and new factors in studies that are not very common but are very important. Each type of telemedicine can have specific factors that can be combined with the proposed model.

One of the factors that has been used in most studies and has not been accepted is the subjective norm. Garavnd et al. [21] showed that in technologies that have a private aspect, the subjective norm is ineffective. Therefore, the use and strengthening of this factor among physicians should be done with caution.

In a comprehensive systematic review study on the use of the

Table 5
Types of telemedicine and frequency of factors accepted in them.

Context of Telemedicine	Frequency of telemedicine type	Factors and frequency
Telemedicine services	21	Perceived usefulness (10), attitude (6), compatibility (5), perceived ease of use (4), self-efficacy (4), subjective norm(4), perceived behavioral control (3), facilitating condition (2), health culture (2), reduced cost (2), security (2), government policies (2), comprising personal (1), relative advantage (1), anxiety (1), level of ICT use in personal life (1), propensity to innovate (1), top management support (1), reliability (1), technology affinity (1), motivations (1), the patients' predisposition (1), performance expectancy (1), effort expectancy (1), reinforcement factor (1), institution's support (1), privacy (1), confidentiality (1), billability (1), the accessibility of medical records and of patients (1), perceived incentives (1), complexity (1), observability (1), trialability (1).
Tele-consultation	4	Perceived usefulness (1), perceived ease of use (1), satisfaction (1), trialability (1), image (1), observability (1), adopters' perceptions of the patient advantages (1), provider advantages (1), the availability of a designated room (1), extrinsic rewards (1), expected relationships(1), sense of self-worth (1).
Mobile health	3	Perceived usefulness (2), awareness (1), attitude (1), culture (1), experience (1), habit (1), perceived easy to use (1), doctor's initial trust (1), doctor's information quality (1), trust in offline doctors' health service (1), service quality (1), application platform's initial trust (1), compatibility (1).
Telerehabilitation (Telepulmonary)	3	Perceived usefulness (3), perceived ease of use (1), behavioral intention (1).
Telehomecare	1	Perceived usefulness (2), perceived ease of use (2), attitude (1), subjective norms (1).
Telemedicine in diabetes	1	Perceived usefulness (1), perceived ease of use (1), personal abilities (1), availability of resources (1), subjective norms (1).
Telemonitoring	1	Perceived usefulness (1), facilitators (1).
Teleneonatology	1	Perceived benefit (1), mutual understanding of the guidelines (1), expectations of use (1).
TeleStroke	1	Perceived usefulness (1), perceived ease of use (1), Subjective norm (1), facilitating conditions (1), intention to use (1).
Telehealth applications in palliative care	1	perceived usefulness (1), perceived ease of use (1).

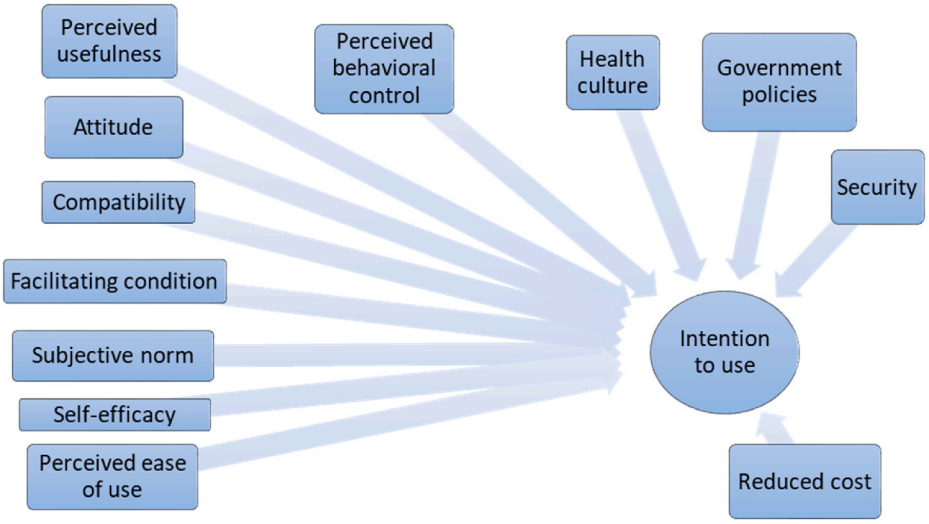

Fig. 2. The most important factors affecting the acceptance of telemedicine from the perspective of physicians.

technology acceptance model (TAM) conducted by Rahimi et al., in 2018 [19], the results showed that most of the factors that affect the acceptance of telemedicine by physicians are almost consistent with our study. In our study, new factors are observed that, despite their low frequency in the study, seem to be very important and should be given much attention in telemedicine acceptance studies with the COVID-19 pandemic: such as government policies, relative advantage, top management support, patient's and doctor's initial trust the patients' predisposition, and trialability.

The results of our study are consistent with those of Bradford et al. [26]. This review study aims to collate, review and synthesize the available literature regarding telehealth services in rural and remote locations of Australia, and to identify the factors associated with their sustained success. Six key factors related to service success and sustainability included vision, ownership, compatibility, economy, efficiency, and equipment.

In reviewing the articles, the role of physicians in the use of telemedicine has been emphasized more, and fewer models and factors have emphasized the importance of educating patients as one of the communication aspects of telemedicine. However, according to Mehrotra et al. [14] one of the serious barriers to the use of telemedicine among doctors is the time-consuming training of patients to use this technology. Also, the results of the study of Ashfaq et al. [27] showed that poverty and lack of education was thought to be the biggest barrier to the practice of telemedicine in the developing world.

Another major barriers to using telemedicine are socioeconomic and cultural factors [28]. Additionally, telemedicine is mostly implemented in rural and under-populated areas, and cultural and religious beliefs are important in these areas, therefore they generally prefer practitioners who are familiar with their culture [15]. In studies, especially telecounseling, few studies have paid attention to the category of culture and religious beliefs. Therefore, cultural factors in the acceptance of telemedicine can be helpful.

The availability of a designated room factor, while simple, is an important factor in telecounseling that can play a significant role in the organization and acceptance of this type of telemedicine among the medical profession.

With the spread of the COVID-19 due to the rapid spread of the disease and its unknowingness, in remote areas where the information infrastructure is not appropriate, and the nature of the distance in telemedicine, factor access to update scientific information, and teleconsulting is even more important.

The number of studies in countries has shown that most of these studies have taken place in high-income countries, and only a few numbers of these factors are tested in the low-income countries. So, according to the authors, along with financial issues, defined standards at the national level can affect greatly on the use of telemedicine [15]. The use of telemedicine in low-income countries can reduce many medical costs, thus, the results of this study for developing countries can be very helpful for accepting telemedicine among physicians.

A limitation in the choice of telemedicine studies is that mobile software may be considered as a telemedicine technology, but due to the widespread use of mobile and the variety of applications, it is a separate technology, so studies were selected from the articles that used the keyword telemedicine. One of the limitations of some of the studies was that the review factors were performed on all health professionals. To overcome this limitation, factors that only affecting physicians were reported.

5. Conclusion

Telemedicine is still a rich field for more innovation and investment, and it will bring more opportunities as a new technology that improves the quality of telemedicine services in the coming years. Telemedicine technology and its different types are important and necessary technologies in facilitating prevention and treatment, especially during the pandemic of COVID-19 for medical staff and patients, and we are realizing its importance day by day. Physicians are playing the crucial role in public health, so their use of telemedicine can help in reducing cost, accelerating actions, preventing the spread of COVID-19 to the society, and consequently, in the world. The use of this technology among physicians is considered as a key function; however, if it is not identified and enhanced, that can lead to fail of the technology. The use of Telemedicine is not exclusive to the COVID-19 pandemic period, and this technology can be used at any time. There is a concern that the use of this technology will be deminished after the COVID-19 pandemic due to the lack of government support, insurance coverage, financial resources and voluntary use.

When reviewing studies in the use of telemedicine among physicians, and the type of technology used, validated models and factors in each context have been extracted. TAM and TAM2 models offer a number of obtained factors such as perceived usefulness, attitude, compatibility, perceived ease of use, self-efficacy, subjective norm, perceived behavioral control, facilitating condition, health culture, reduced cost, security, and government policies which can be utilized as a behavioral and individual model, in addition to contextual factors, to examine the acceptance of telemedicine among doctors.

Many studies have been conducted to examine the acceptance of this

technology and its types among physicians. According to the authors, a comprehensive investigation was needed to implement these studies, and review the factors. Despite some of the factors that are generally accepted in all types of telemedicine technologies, some of them are specific. In this systematic review, we have tried to identify the most important factors which are affect the acceptance of telemedicine from the physician perspective as a key player in telemedicine projects. These results can assist managers and policymakers in making acceptable decisions to implement telemedicine successfully, in particular, in the initial phases. However, in order to achieve more accurate results, it is suggested that the model presented in our study, which is as the result of combining the most important factors that can affect acceptance of telemedicine from physicians' perspective, be further examined and evaluated.

Protection of human and animal subjects

Not applicable.

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Contributions

A.G and N.A Searched for articles on the databases and retrieved many articles. H.N and A.G decided on the inclusion criteria and reviewed the retrieved articles based on the target checklists. H.N wrote the manuscript and draw the figures and construct the tables. S.A and S. D reassessed the selected articles, reviewed the manuscript, and edited the figures and tables. All authors read and approved the final manuscript.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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