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Research Article

Future of Telemedicine in Indonesia During Covid-19 Pandemic Era: "Literature Review"

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Abstract

Context: Online health consultation services are developing, both website-based and application-based, better known as telemedicine or telehealth. Over 50% of the population can access health information easily. Telemedicine can expand healthcare services, increase accessibility, provide clinical support, save time and costs, and be efficient because it overcomes geographic barriers, offers a wide variety of communication tools, and improves patient care. Telemedicine is used to bring specialist, anti-discriminatory and effective health services closer to the interests and safety of patients to expand the quality services in healthcare centers, especially in rural areas in Indonesia.

Material and Methods: The study design used in this article is a narrative literature review or formal review by reading the references carefully, then making a summary, drawing conclusions, and finding gaps in the manuscript adapted to the topic to be discussed.

Results: The significant number of problems and challenges in public health services in Indonesia can provide exciting opportunities to develop an e-health system that can help solve problems. To put a stop, the Indonesian government is advising the public and medical professionals to use telemedicine as an online public health service application between hospitals and patients.

Conclusions: Telemedicine significantly correlates with government and start-up calls and can be employed as a health service option during the COVID-19 pandemic. In this pandemic, telemedicine can improve services in terms of monitoring, evaluating, and educating patients and medical staff.

Keywords: Telemedicine; Telehealth; Covid-19, E-health

1. Context

The globalization era of information and technology significantly affected all aspects of human life, especially for people in urban areas. In this era, humans need information and services effectively, efficiently, accurately, and reliably to fulfill their life needs, including in the health sector (1). However, this is not immediately obtained by residents in rural areas with inadequate infrastructures, such as limited access to an unregulated electricity network and an internet network that has not reached the entire region yet (2).

Online health consultation services are developing, both website-based and application-based, better known as telemedicine or telehealth (3). Telemedicine provides health services remotely by using technology to communicate and promote people's and society's health; information is exchanged on diagnosis, treatment, disease and injury prevention, research and assessment, and training for service providers in these areas (4). Telemedicine can also be considered telecommunications and information technology to provide remote care utilizing modern technology (5).

In 2017, 51.06% of the public sought health information online, and 14.05% consulted health experts (6). Over 50% of the population can access health information easily. Telemedicine can expand healthcare services, improve accessibility, provide clinical support, save time and money, be efficient because it overcomes geographic barriers, offers a wide variety of communication tools, and improve patient care (7, 8). Telemedicine supports medical services through telecommunications (9). Telemedicine, known as distance healing, is essential and can be a solution to end the chain of the transmission of COVID-19 during the current pandemic era.

In several studies, various media were used as intermediaries between healthcare providers and patients. One media widely used to deliver telehealth is video conferencing or video calls. Now referred to as VC, a study conducted by Barsom et al. compared the results of health care provider and patient satisfaction between direct consultation and the use of VC in the Netherlands. It

was concluded that VC was a necessary facility for caring for patients during the pandemic and other situations. Guidelines need to be improved for patient and healthcare provider communication (10). The findings of this study are consistent with those of the study that compared legal consultation at an orthopaedic outpatient clinic at the University Hospital of Northern Norway (UNN) with remote consultation through VC at a regional medical center (RMC).

This research's outcomes align with the study that compared remote consultation through VC at RMC and legal consultation at an orthopaedic outpatient clinic at UNN. There were no significant differences between the online and offline consultations in the analysis, which indicates that orthopaedic patients can utilize VC consultations with no risk, as no adverse events attributable to the consultation approach were reported (11).

1.1. Implementation of Telemedicine in the COVID-19 Pandemic Era

Telemedicine is expected to be used by people from various circles, young to old, because internet access is widespread. In 2019, Zhou et al. conducted a study on the acceptance of the telehealth system in the elderly in China with the TAM model; the results showed that the conventional medical services and telehealth system had equal impacts and could be used interchangeably. This study provides valuable information for governments, investors, hospital administrators, and telehealth system designers to promote this technology and better estimate telehealth systems demand (12).

Telemedicine or telehealth has been implemented in several countries and health service facilities during various periods, especially during the current pandemic. Many studies have been conducted to assess the quality of telemedicine-delivered care. A systematic review of five databases found telehealth undoubtedly suitable for reducing the COVID-19 transmission threat. The results indicated that the technology has the potential to prevent physical contact, offer ongoing care to communities, and decrease illness and death during the COVID-19 outbreak (13). The application of telemedicine is reasonable, and after a while, benefits emerge (14).

Throughout the COVID-19 pandemic, Australia has been attentive to delivering health services through universal health insurance schemes, and it also supported national policies that promote the future of telehealth. However, there are still shortcomings in the Australian system. They need to learn about the efficiency, value, well-being, unexpected aids, deployment risks, and optimal configurations of the services for sustainable healthcare in a pandemic setting. Delivering telehealth services for patients, practitioners, and taxpayers is crucial to guarantee its value (15).

Amid the pandemic, all medical specialties need to familiarize themselves with alternative means of healthcare delivery without requiring physical contact with patients. Several specialist doctors in healthcare facilities have implemented telemedicine to care for their patients. Efficient patient care could reduce the need for hospital admissions, prevent emergency management, and prevent disease progress (16). Telemedicine may be used for diagnosis, monitoring, treatment, consultation, and education during an epidemic. The following are research results of the application of telemedicine in specializations: (1) a study evaluating surgical complications after appendectomy via smartphones showed that the sensitivity and specificity for identifying surgical wound complications were 100% and 91.67% (17); (2) studies of follow-up text messages after colorectal surgery discovered no unrecognized postoperative complications in online consultations and suggested that text message follow-up questionnaires could substitute in-person postoperative follow-ups (18); (3) telemedicine provides safe management for stroke patients in the emergency departments during a pandemic and is currently used worldwide in: (a) United States: Telemedicine applications, for example, the tele-stroke services to provide hospital expertise, have been successful and are growing; (b) Taiwan, China: In patients with acute ischemic stroke, consultation through a tele stroke program offers a quality equivalent to the original personal consultation models. In addition, it helps spare the workforce. It is a great way to fill the gaps as the program makes a comprehensive stroke center neurology care available to all patients anytime and anywhere (19); (4) telemedicine is a viable and economical solution for managing heart failure by offering interaction between healthcare providers and patients, increasing patient knowledge, and enhancing self-care management (20).

1.2. Advantages, Disadvantages, and Barriers to Implementing Telemedicine

A study by Kichloo in 2020 evaluated the advantages, disadvantages, and barriers to implementing telemedicine in the United States. The benefits of telemedicine include (21) assisting doctors in visiting more patients directly during their spare time through virtual visits. We provide healthcare services in rural areas through access to specialist medical care using international telemedicine, helping avoid expensive patient hospitalizations. In 2011, according to the Bureau of Justice Statistics, $7.7 billion was spent on prisoner health care. The Texas Department of Criminal demonstrated telemedicine decreased the costs of prisoners leaving jail for health care by 85%, ultimately saving US$780 million over 14 years (22) and reducing carbon emissions through reduced trips to health services (22).

The main disadvantage of telemedicine is the consumers' unawareness of their access to the services and their costs. Additionally, 0% of consumers who claimed "bad" health said they had used telemedicine the previous year.

Consumers do not have access to either direct health care services or telemedicine. Fewer people have an internet connection when they age, reside in rural regions, have less education, and suffer from more severe illnesses. Therefore, patients who acquire the most significant benefit from their treatments have the least access to them (21).

Barriers to implementing telemedicine include (21):

Patients' perspective involves age, education level, computer literacy, bandwidth, and service ignorance, while providers struggle with price, compensation, legality, privacy and secrecy, data security, efficiency, and equipment. Insurance coverage is limited to telehealth services under Medicare/Medicaid in the United States. Problems with licensure include limited expertise and the ability of healthcare professionals to provide care across states.

In a post-pandemic era, the desire to develop solutions to these problems can considerably raise the standard of care services, particularly in rural areas. Regarding primary care, a study that interviewed patients after telemedicine visits found that all interviewees reported telemedicine visits as more satisfactory. Furthermore, the majority stated that they preferred telemedicine to holidays in the future (23). As a result, more people are looking to telemedicine as a turning point for high-quality services in the future. In the United States, organizations such as the American Medical Association and the American Telemedicine Association continue to encourage the use of telemedicine during the current pandemic. Therefore, telemedicine may eventually become the forefront of healthcare services. This consultation could decrease face-to-face visits to receive healthcare services during pandemics (24).

1.3. Telemedicine in Indonesia

In Indonesia, telemedicine brings anti-discriminatory and effective health services of specialists closer to the interests and safety of patients. It enhances the standard of care in medical facilities, particularly in remote places. Despite the pandemic, several specialist doctors in healthcare facilities have implemented telemedicine to offer treatment to their patients. All medical specialties adjust and adapt to continuously provide patient care while preserving social distance for quality services in question characterized (25).

(1) Safe (safe services): Avoid accidents for patients from the various services provided for them; (2) effective (services that fit the purpose): Provide services based on appropriate science and technology and avoid services that do not benefit patients; (3) patient-centred (patient-focused care): Providing services that respect and are according to the patient's values, needs, and tastes, including ensuring that the patient understands all decisions regarding the clinical service they will receive; (4) timely (on time): Reduce waiting time and sometimes avoid dangerous incidents for both parties, namely the recipient and the service provider; (5) efficient (cost-effective services): Eliminating useless things and garbage from medical devices, medicines, consumables, thoughts, and energy; (6) equitable (fair and equal services): Providing services of the same quality (for the same disease and needs) and not discriminating based on differences in personal characteristics such as socioeconomic status, gender, creed, ethnicity, and regional origins.

Currently, in Indonesia, 42 telemedicine-supporting hospitals have developed from 2015 to 2019, with 63 hospitals and 35 health centers being managed, and the total health care facilities that carry out telemedicine are 140 (26).

Based on Ministry of Health regulation (No. 20/2019), telemedicine services are carried out by licensed health workers to practice in health care facilities (fasyankes) that include providing and requesting consultations. It provides telemedicine consultations to all regions, namely central, regional and private government hospitals. Hospitals, first-level healthcare facilities, and other healthcare institutions that request telemedicine consultations are referred to as health facilities requesting a consultation. The health facilities mentioned in Government Regulation 47 of 2016 regarding Health Service Facilities include public health centres, clinics, hospitals, pharmacies, blood transfusion units, health laboratories, optical facilities, medical service facilities for legal purposes, and traditional healthcare facilities.

Then, with the advancement of science and technology, the telemedicine services offered include clinical teleconsultation, teleradiology, tele ultrasonography, tele electrocardiography, and other telemedicine consulting services. Online health consultations fall within the category of clinical teleconsultation, which refers to remote clinical consultation services to assist in making a diagnosis and offer treatment recommendations (4).

The Ministry of Health provides telemedicine applications; However, if telemedicine services use independently-created applications, those applications need to be registered with the Ministry of Health; for example, the service developed by the Ministry of Health is "Temenin (telemedicine Indonesia)." The official Temenin website states that four telemedical services are provided, namely radiology, ultrasonography, EKG, and consultation. On the same page, it is explained that teleconsultation is intended to bring patients closer to expert doctors through online consultations, diagnosing the condition, and making treatment recommendations. The latest service developed by the Ministry of Health is "SehatPedia," which is a mobile application-based platform (from now on referred to as an application) operated by the Ministry of Health which is used by "users," namely individuals or people who download, access or use the application for their interests or other parties related to health to 13 services, one of them being teleconsultation. On the same page, it is explained that teleconsultation is an online consultation carried out remotely via video calls with

patients to help establish diagnoses and connect them to hospitals.

A study investigating the benefits of using various media to provide health care for patients distantly showed no differences between online or offline interventions. Based on this outcome, the authors decided to conduct a literature review on telemedicine by reading and summarizing them. This research aimed to achieve a literature review on telemedicine in health centers during the COVID-19 pandemic and determine its possible pitfalls.

2. Material and Methods

The study is a narrative literature review or formal review by reading the references carefully, then making a summary, drawing conclusions, and finding gaps in the manuscript adapted to the topic to be discussed. The search strategy and data sources were obtained from Google Scholar, Science Direct, Web of Sciences, Scopus, and PubMed websites to identify relevant published studies. Article searches were carried out on titles and abstracts with a minimum publication year of 2016. The researcher read independently, summarized, and drew conclusions from emerging articles. The steps taken are collecting related articles, reviewing articles, and discussing them. The policies made by the Indonesian government are also a reference in this article (Table 1).

Table 1. Search Strategy

Object and Researcher	Research Focus
Telemedicine	
Geng-Ramos et al. (27)	The research is about the application of telemedicine to determine patients' risk before surgery in America. Through a patient and provider satisfaction survey, in light of the COVID-19 epidemic, this research investigates how satisfied patients and healthcare professionals were with video-based telemedicine preoperative clinic sessions. More than 93 percent of the patients said they were happy with their telemedicine consultations. Similar to the patients, > 85% of healthcare professionals said they were satisfied with the preoperative telemedicine visits overall and acknowledged its benefits (27).
Al Meslamani et al. (28)	They investigated consumer patterns, traits, and predictors of telemedicine utilization and consumer attitudes toward telemedicine in the United Arab Emirates. In the final dataset, there were 1,584 participants, and during the coronavirus disease 2019 (COVID-19) pandemic, 496 (31.3%) of them used telemedicine. During COVID-19, the two most frequent excuses for not using telemedicine were either not realizing its existence (38.3%, 417 of 1088) or not understanding how to use it (33.5%, 365 of 1088). Telemedicine users reported that the most popular telemedicine services used during the COVID-19 crisis were tele-pharmacy (89.7%), teleconsultation (78.2%), and telediagnosis (23.0%). In the United Arab Emirates, they looked into consumer trends, characteristics, predictors of telemedicine use, and consumer attitudes toward telemedicine. In the final dataset, there were 1,584 participants, and during the coronavirus disease 2019 (COVID-19) pandemic, 496 (31.3%) of them used telemedicine. During COVID-19, the two most frequent excuses for not utilizing telemedicine were either not knowing its existence (38.3%, 417 of 1088) or not understanding how to use it (33.5%, 365 of 1088). Telemedicine users indicated that the most popular telemedicine services used during the COVID-19 crisis were tele-pharmacy (89.7%), teleconsultation (78.2%), and telediagnosis (23.0%) (28).
Umeh et al. (29)	They were examined to see if satisfaction was different between individuals who began using telemedicine during the pandemic and those who started using it before COVID-19. The findings demonstrated that providers who had utilized telemedicine before the pandemic consistently reported greater satisfaction levels across all sub-categories. This result may have been influenced by the user's familiarity with the software. User satisfaction was high overall, and 86.3% of doctors said they would keep utilizing telemedicine in their practice (29).
E-health	
Thomason (30)	Discussed the growth of digital health in Asia and three significant changes in the global health landscape. The first was the business' substantial foray into healthcare technologies. The second involves commercializing consumer data and producing market health data. The third is Asia's rise to the top of the digital health world (30).
Chakraborty et al. (31)	Discussed the impact of health technology startups on healthcare. The review shows that research on startups is inadequate, especially concerning entrepreneurship, business frameworks, and rules in health technology (31).
Maciel et al. (32)	Research in Brazil discussed the proposed steps in developing a successful e-health education program (32).

McIntosh et al. (33)	Examine the most recent research to see how well e-health interventions are working to increase physical activity (PA) in teenagers. Therefore, e-health interventions are a very effective strategy to boost PA. Further studies are needed to determine the theoretical foundations that best support interventions and the length of interventions needed to achieve the most significant benefits following the intervention (33).
Anya and Tawfik (34)	described application scenarios and prototypes a system for assessing suggested methods using e-health. It also discussed the idea of model design and proposed a formal way to describe the practice as a context in an online health sector (34).
Telehealth	
Grewal et al. (35)	Discussed telemedicine and Telehealth-based therapies have arisen as tenable, workable answers to these difficulties in providing cancer care. Even in distant communities, technological improvements have addressed the connectivity issue for telemedicine. In the age of information technology, teleconsultation is a viable choice for patients and healthcare professionals (35).
Delioglu et al. (36)	Investigated family concerns and terms of service during covid19. In teleconsultation, this study also aimed to assess the effect of telehealth services on family concerns (36).
Raad et al. (37)	Explained the creation of a Telehealth system for monitoring older people with Alzheimer's based on IoT technology. This paper discusses a functioning prototype that uses a wearable wireless ECG sensor to monitor vital signs and provides required care data for elderly patients who stay at home. In Saudi Arabia, at the King Fahd University of Petroleum and Minerals (KFUPM) Medical Center, the prototype was successfully demonstrated on several patients (37).
This research	The future in indonesia telemedicine during Covid-19 pandemic era: "A literature review"

2.1. Inclusion Criteria

In the original articles, Covid-19 was directly controlled via telemedicine and telehealth.

2.2. Exclusion Criteria

Letters, editorials, review articles without a complete text, studies with small sample sizes, and papers that did not focus on telemedicine or telehealth services were submitted during Covid-19.

2.3. Paper Selection

Two databases' search results were put into the Mendeley software. The manuscript was reviewed by a researcher who removed duplicate publications. There was a final list of the papers that were included.

2.4. Data Extraction

Three independent assessors independently retrieved data from the included publications based on the author, country, telemedicine, participants, and impact.

2.5. Data Analysis

Data were analysed using descriptive analysis.

3. Results

It referred to the National E-health Strategy Attachment to the Minister of Health Regulation Number 46 of 2017. The many problems and challenges in public health services in Indonesia can provide exciting opportunities to develop an e-health system that can help solve problems. Some issues, for example, are the varying quantity and quality of health services, relatively high maternal and infant mortality rates, and various matters in handling tuberculosis patients and other diseases. The researcher conducted nine literature reviews from several countries, such as America, China, Taiwan, and Indonesia, about Telemedicine for health services. This study compared the literature between other countries and Indonesia.

Suppose it is associated with the definition of effectiveness as a characteristic of quality health services. Telemedicine services in Indonesia have many shortcomings. They have not been able to provide services based on the appropriate technology. They have not provided benefits for patients regarding teleconsultation in the classification of patient-doctor relationships-patients with nurses (tele homecare) and patients with pharmacists (tele pharmacy).

Telemedicine is information technology that transfers medical, diagnostic, therapeutic, and educational information (38). Interactive pictures, videos, and audio communicate information between patients and medical professionals (39). In addition, several features in telemedicine applications that can be utilized are online consultations, screening, and chat boxes (40).

During this pandemic, services may be monitored, evaluated, and educated more effectively and efficiently through telemedicine by medical staff and patients. Patients can describe their symptoms and receive guidance and information about their ailments using several telemedicine techniques. Telemedicine providers must be licensed to practice medicine, have the necessary credentials, and be under the supervision of the responsible authorities (41).

To combat the spread of Covid-19, the Indonesian government pushed for telemedicine to be used as a remote or online public health service application between hospitals and patients (42). However, there were several obstacles, such as technological capabilities, data security, patient

privacy, laws and regulations, usage guidelines, and individual patient problems (43). Therefore, the government must continue to be involved in formulating rules and developing long-term partnerships with hospitals and medical professionals regarding telemedicine usage (39-41).

4. Discussion

The implementation of e-health has strengths, especially in infrastructure. Communication network for health infrastructure has spread to rural areas through hospitals, health centers, and medical personnel. Behind the strengths and advantages that Indonesia has, there are still disadvantages in the implementation of e-health.

The ITE Law has not been synchronized, and no organization has full authority on this issue. The main challenge is humans as the executor of this application. HR work culture is not easy to change, especially for those who refuse the use of ICT and still adhere to the conventional system. The process of changing this mindset involved will be long and will cause resistance.

There are several recommendations so that the implementation of telemedicine can be further improved, especially in Indonesia:

Every health facility should have guidelines for conducting telemedicine/ teleconsultation that can be given to every health worker and informed to patients. The guidelines, of course, should be based on the rules and policies of the government.

Training on implementing telemedicine for both health and non-health workers should be involved. The training provided relates to the socialization of policies that the government and ethics have made, the social and laws of telemedicine itself, and how to dig up information and conduct examinations on patients through telemedicine. Examples include a video recording of the patient's physical appearance, observation of the patient's breathing (including involvement of accessory respiratory muscles, respiratory effort, and speech), video observation of the oropharynx, and directed lymph nodes to the patient to assess for prominent lymphadenopathy.

The consultation duration with health workers can be notified to the patient at the beginning when the patient registers so that the patient and staff can adjust.

They are educating the public about the procedures for conducting a simple physical examination. For example, checking vital signs such as calculation and heart rate by feeling the wrist, palpating the radial pulse, counting for one minute, and measuring blood pressure and temperature with a thermometer is essential. This education can be provided through leaflets at each health facility, social media, or also informed in the teleconsultation process before consulting a doctor to shorten the time.

Every officer at healthcare facilities can provide information about the JKN mobile application managed by the Health Social Security Administration (BPJS) to the public to use the health screening feature so that the community can evaluate their condition and then consult a doctor.

4.1. Conclusions

Telemedicine significantly correlates with government and start-up calls and can be employed as a health service option during the COVID-19 pandemic. Medical professionals and people can use telemedicine to improve patients' monitoring, assessment, and education during this pandemic. Patients can report their symptoms and receive guidance and information about their ailment utilizing several telemedicine techniques. Moreover, a focus on medical personnel and patients during the COVID-19 pandemic should be involved. Based on the results obtained, it can be concluded that telemedicine in Indonesia has not been able to provide an appropriate service for patients in terms of online consultation.

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References

1. World Health Organization, Organisation for Economic Co-operation and Development & International Bank for Reconstruction and Development. *Delivering quality health services: a global imperative for universal health coverage*. Geneva: World Health Organization; 2018.
2. Asian Development Bank. *Achieving Universal Electricity Access in Indonesia*. Mandaluyong City, Philippines: Asian Development Bank; 2016.
3. Shen YT, Chen L, Yue WW, Xu HX. Digital Technology-Based Telemedicine for the COVID-19 Pandemic. *Front Med (Lausanne)*. 2021;**8**:646506. doi:10.3389/fmed.2021.646506. [PubMed:34295908]. [PubMed Central:PMCPMC8289897].
4. Moeloek NF. [Regulation of the Minister of Health of the Republic of Indonesia number 20 of 2019 concerning the implementation of services]. Jakarta: State Gazette of the Republic of Indonesia; 2019; Available from: https://persi.or.id/wp-content/uploads/2020/11/pmk202019.pdf.
5. Soltanzadeh L, Babazadeh Sangar A, Majidzadeh K. The Review of Usability Evaluation Methods on Tele health or Telemedicine Systems. *Front Health Inform*. 2022;**11**(1):112. doi:10.30699/fhi.v11i1.357.
6. Indonesia Internet Service Provider Association. [Penetration & behavior internet user Indonesia]. Jakarta: Indonesia Internet Service Provider Association; 2017; Available from: https://web.kominfo.go.id/sites/default/files/Laporan%20Survei%20APJII_2017_v1.3.pdf.
7. Scott Kruse C, Karem P, Shifflett K, Vegi L, Ravi K, Brooks M. Evaluating barriers to adopting telemedicine worldwide: A systematic review. *J Telemed Telecare*. 2018;**24**(1):4-12. doi:10.1177/1357633X16674087. [PubMed:29320966]. [PubMed Central:PMCPMC5768250].
8. Alvandi M. Telemedicine and its Role in Revolutionizing Healthcare Delivery. *Am J Accountable Care*. 2017;**5**(1):e1-5.
9. Soltanzadeh S, Soltanzadeh L. Is that Possible Technology Transfer in the Field of Telemedicine? *Iran J Med Inform*. 2016;**5**(1):1-5. doi:10.24200/ijmi.v5i0.104.

10. Barsom EZ, Meijer HAW, Blom J, Schuuring MJ, Bemelman WA, Schijven MP. Emergency upscaling of video consultation during the COVID-19 pandemic: Contrasting user experience with data insights from the electronic health record in a large academic hospital. *Int J Med Inform.* 2021;**150**:104463. doi:10.1016/j.ijmedinf.2021.104463. [PubMed:33872824]. [PubMed Central:PMCPMC8040322].
11. Buvik A, Bugge E, Knutsen G, Smabrekke A, Wilsgaard T. Quality of care for remote orthopaedic consultations using telemedicine: a randomised controlled trial. *BMC Health Serv Res.* 2016;**16**:483. doi:10.1186/s12913-016-1717-7. [PubMed:27608768]. [PubMed Central:PMCPMC5017045].
12. Zhou M, Zhao L, Kong N, Campy KS, Qu S, Wang S. Factors influencing behavior intentions to telehealth by Chinese elderly: An extended TAM model. *Int J Med Inform.* 2019;**126**:118-27. doi:10.1016/j.ijmedinf.2019.04.001. [PubMed:31029253].
13. Monaghesh E, Hajizadeh A. The role of telehealth during COVID-19 outbreak: a systematic review based on current evidence. *BMC Public Health.* 2020;**20**(1):1193. doi:10.1186/s12889-020-09301-4. [PubMed:32738884]. [PubMed Central:PMCPMC7395209].
14. LeRouge C, Garfield MJ. Crossing the telemedicine chasm: have the U.S. barriers to widespread adoption of telemedicine been significantly reduced? *Int J Environ Res Public Health.* 2013;**10**(12):6472-84. doi:10.3390/ijerph10126472. [PubMed:24287864]. [PubMed Central:PMCPMC3881125].
15. Hall Dykgraaf S, Desborough J, de Toca L, Davis S, Roberts L, Munindradasa A, et al. "A decade's worth of work in a matter of days": The journey to telehealth for the whole population in Australia. *Int J Med Inform.* 2021;**151**:104483. doi:10.1016/j.ijmedinf.2021.104483. [PubMed:33984625]. [PubMed Central:PMCPMC8103781].
16. Davis RB. Information technologies in healthcare. *Kansas Med J Kansas Med Soc.* 1995;**96**(Index):167-8
17. Segura-Sampedro JJ, Rivero-Belenchon I, Pino-Diaz V, Rodriguez Sanchez MC, Pareja-Ciuro F, Padillo-Ruiz J, et al. Feasibility and safety of surgical wound remote follow-up by smart phone in appendectomy: A pilot study. *Ann Med Surg (Lond).* 2017;**21**:58-62. doi:10.1016/j.amsu.2017.07.040. [PubMed:28794868]. [PubMed Central:PMCPMC5537421].
18. Carrier G, Cotte E, Beyer-Berjot L, Faucheron JL, Joris J, Slim K, et al. Post-discharge follow-up using text messaging within an enhanced recovery program after colorectal surgery. *J Visc Surg.* 2016;**153**(4):249-52. doi:10.1016/j.jviscsurg.2016.05.016. [PubMed:27423211].
19. Lin CH, Lee KW, Chen TC, Lin JH, Liaw KR, Hsiao PJ, et al. Quality and safety of Telemedicine in acute ischemic stroke: Early experience in Taiwan. *J Formos Med Assoc.* 2022;**121**(1 Pt 2):314-8. doi:10.1016/j.jfma.2021.04.024. [PubMed:33994236].
20. Azam S, Skov J. Systematic literature review on telemedicine solutions implemented for management of patients with heart failure. Berlin: ResearchGate; 2016; Available from: https://www.researchgate.net/publication/299897754.
21. Kichloo A, Albosta M, Dettloff K, Wani F, El-Amir Z, Singh J, et al. Telemedicine, the current COVID-19 pandemic and the future: a narrative review and perspectives moving forward in the USA. *Fam Med Community Health.* 2020;**8**(3):e000530. doi:10.1136/fmch-2020-000530. [PubMed:32816942]. [PubMed Central:PMCPMC7437610].
22. Smith D, Sorenson G, Lewis B. Why Telemedicine, Why Now? : GlobalMed; 2019; Available from: https://www.americantelemed.org/wp-content/themes/ata-custom/download.php?id=3717.
23. Powell RE, Henstenburg JM, Cooper G, Hollander JE, Rising KL. Patient Perceptions of Telehealth Primary Care Video Visits. *Ann Fam Med.* 2017;**15**(3):225-9. doi:10.1370/afm.2095. [PubMed:28483887]. [PubMed Central:PMCPMC5422083].
24. Hamlin M, Steingrimsson S, Cohen I, Bero V, Bar-Tl A, Adini B. Attitudes of the Public to Receiving Medical Care during Emergencies through Remote Physician-Patient Communications. *Int J Environ Res Public Health.* 2020;**17**(14):5236. doi:10.3390/ijerph17145236. [PubMed:32698481]. [PubMed Central:PMCPMC7400122].
25. Darmawan ES. [Health Services: Quality and or Abandoned?]. *Jurnal Kesehatan Masyarakat Aceh.* 2018;**4**(2):302-4.
26. Rahim AH. [Implementation of Telemedicine in Indonesia]. Jakarta: Ministry of Health of the Republic of Indonesia; 2019; Available from: https://persi.or.id/wp-content/uploads/2019/09/implementasi-telemedicine.pdf.
27. Geng-Ramos G, Taneja R, Challa C, Vazquez-Colon C, Cronin J, Campos A, et al. Telemedicine for the pediatric preoperative assessment during the COVID-19 pandemic: Evaluating patient and provider satisfaction. *Perioper Care Oper Room Manag.* 2022;**27**:100252. doi:10.1016/j.pcorm.2022.100252. [PubMed:35382029]. [PubMed Central:PMCPMC8972972].
28. Al Meslamani AZ, Aldulaymi R, El Sharu H, Alwarawrah Z, Ibrahim OM, Al Mazrouei N. The patterns and determinants of telemedicine use during the COVID-19 crisis: A nationwide study. *J Am Pharm Assoc (2003).* 2022;**62**(6):1778-85. doi:10.1016/j.japh.2022.05.020. [PubMed:35710898]. [PubMed Central:PMCPMC9142173].
29. Umeh UO, Roediger F, Cuff G, Romanenko Y, Vaz A, Hertling A. Satisfaction with telemedicine among anesthesiologists during the COVID-19 pandemic. *Trends Anaesth Crit Care.* 2022;**45**:32-6. doi:10.1016/j.tacc.2022.06.001.
30. Thomason J. Big tech, big data and the new world of digital health. *Glob Health J.* 2021;**5**(4):165-8. doi:10.1016/j.glohj.2021.11.003.
31. Chakraborty I, Ilavarasan PV, Edirippulige S. Health-tech start-ups in healthcare service delivery: A scoping review. *Soc Sci Med.* 2021;**278**:113949. doi:10.1016/j.socscimed.2021.113949. [PubMed:33901972].
32. Maciel R, Chiavegato LD, Marin LS, Portella DDA, de Souza MC, Camelier FWR, et al. Development of an e-health education program at the workplace using formative research - Technologies for improving quality of life. *Eval Program Plann.* 2019;**73**:129-37. doi:10.1016/j.evalprogplan.2018.12.009. [PubMed:30622061].
33. McIntosh JRD, Jay S, Hadden N, Whittaker PJ. Do E-health interventions improve physical activity in young people: a systematic review. *Public Health.* 2017;**148**:140-8. doi:10.1016/j.puhe.2017.04.001. [PubMed:28482322].
34. Anya O, Tawfik H. Designing for practice-based context-awareness in ubiquitous e-health environments. *Comput Electr Eng.* 2017;**61**:312-26. doi:10.1016/j.compeleceng.2016.08.012.
35. Grewal US, Shankar A, Saini D, Seth T, Roy S, Aden D, et al. Telehealth and cancer care in the era of COVID-19: New opportunities in low and middle income countries (LMICs). *Cancer Treat Res Commun.* 2021;**27**:100313. doi:10.1016/j.ctarc.2021.100313. [PubMed:33465561]. [PubMed Central:PMCPMC7833952].
36. Delioglu K, Ozal C, Seyhan Biyik K, Unes S, Tuncdemir M, Uzumcugil A, et al. Requirements for tele-health in children with obstetric brachial plexus palsy during Covid-19-like situations. *Hand Surg Rehabil.* 2022;**41**(1):78-84. doi:10.1016/j.hansur.2021.09.009. [PubMed:34655823]. [PubMed Central:PMCPMC8531202].
37. Raad MW, Sheltami T, Shakshuki E. Ubiquitous Tele-health System for Elderly Patients with Alzheimer's. *Procedia Comput Sci.* 2015;**52**:685-9. doi:10.1016/j.procs.2015.05.075.
38. Perednia DA, Allen A. Telemedicine Technology and Clinical Applications. *JAMA J Am Med Assoc.* 1995;**273**(6):483. doi:10.1001/jama.1995.03520300057037.
39. Board of Governors in Supersession of the Medical Council of India. Telemedicine Practice Guidelines. New Delhi: Board of Governors in Supersession of the Medical Council of India; 2020; Available from: https://www.mohfw.gov.in/pdf/Telemedicine.pdf.
40. Vidal-Alaball J, Acosta-Roja R, Pastor Hernandez N, Sanchez Luque U, Morrison D, Narejos Perez S, et al. Telemedicine in the face of the COVID-19 pandemic. *Aten Primaria.* 2020;**52**(6):418-22. doi:10.1016/j.aprim.2020.04.003. [PubMed:32402477]. [PubMed Central:PMCPMC7164871].
41. Wang Y, Li B, Liu L. Telemedicine Experience in China: Our Response to the Pandemic and Current Challenges. *Front Public Health.* 2020;**8**:549669. doi:10.3389/fpubh.2020.549669. [PubMed:33425827]. [PubMed Central:PMCPMC7793949].
42. Mahmud MS, Talukder MU, Rahman SM. Does 'Fear of COVID-19' trigger future career anxiety? An empirical investigation considering depression from COVID-19 as a mediator. *Int J Soc Psychiatry.* 2021;**67**(1):35-45. doi:10.1177/0020764020935488. [PubMed:32615833]. [PubMed Central:PMCPMC7335942].
43. Sulistiadi W, Slamet SR, Harmani N. Management of COVID-19 Public Stigma in Indonesian Society. Kesmas: *National Public Health Journal.* 2020;**1**(Special Issue):70-6. doi:10.21109/kesmas.v15i2.3909.