

## **Telemedicine in the Era of the National Health Insurance System: Literature Review**

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**Abstract**— Telemedicine is defined as the utilization of medical information that is transmitted electronically from one location to another to improve patient health. To improve the quality of health services in Indonesia is to reduce the gap in access to health, so that it is available to all people equally. Telemedicine is one of the modalities that can be used to achieve this goal. This study aim is descibe the development of telemedine in Indonesia especially in National Health Insurance System (JKN). From the Literature review, we can find although the telemedicine provided by JKN provides significant convenience to access to health services, there are limitations in the implementation of telemedicine, both as a whole and the obstacles faced by JKN. Doctors and patients who conduct teleconsultation have limitations only on history taking and physical examination, while doctors are taught to do a thorough physical examination before making a diagnosis and providing therapy for patients. This obstacle poses a greater risk of misdiagnosis compared to direct examination. Supportive examinations and therapies other than drugs still need to come to health facilities, so telemedicine cannot completely replace conventional health services. Telemedicine cannot stand alone because it still requires adequate facilities to access adequate health services. Advances in infrastructure and human resources in particular have an important role in the smooth operation of telemedicine. Socialization about the application can be increased through promotion of health services such as Puskesmas and hospitals. The use of public service advertisements in electronic media such as radio and television can also be useful to reach people who do not regularly visit health facilities. Considering that there are still quite a lot of Indonesian people who are not fluent in technology, the operation of telemedicine applications needs to be made as easy and effective as possible. In addition, the telemedicine system that is integrated with the conventional health facility system is an important matter that needs attention, especially regarding pregnant women, emergency cases, and patients with chronic diseases, in order to provide optimal services.

**Keywords:** Telemedicine, National Health Insurance System, Promoting Health in Pandemi Covid-19

### **1. Introduction**

Telemedicine and telehealth are two different concepts that are often used interchangeably<sup>(1, 2)</sup>. Telehealth is defined as a method of remotely accessing or providing technology and services to people and/or their caregivers at home or in the community to facilitate empowerment, assessment, or provision of their care and/or support related to their health (including clinical health) and well-being needs.<sup>(1)</sup> Meanwhile, telemedicine is defined as the utilization of medical information that is transmitted electronically from one location to another to improve patient health<sup>(2)</sup>.

In 1985-1987, Indonesia conducted the first satellite-based telemedicine trial and other academic activities as part of the Intelsat-supported Satellite for Health and Rural Education (SHARE) project

to commemorate its 20<sup>th</sup> anniversary <sup>(3)</sup>. World Health Organization (WHO) and the Faculty of Medicine, Diponegoro University, Semarang, Central Java, held a teleconference on tropical diseases with the medical community from Canada, the United States, and Europe. The data is transferred in text format and the results are assessed in terms of technical performance as well as subjective opinions of users<sup>(3)</sup>.

Indonesia succeeded in producing a low-cost "Still Picture Transmission by Narrowband Technique" for educational and medical services in the early 1990s, followed by a series of laboratory-scale image processing studies, which required more field testing before use<sup>(4)</sup>. Pan Asia-Pacific Region The Telecommunication Network for Tests and Research by Satellite (PARTNERS), a new regional partnership financed by Myanma Posts and Telecommunications and managed by the radio industry and business association, was established to conduct experiments on the Engineering Test Satellite-Five (ETS-V) L-transmission Bands and related applications.<sup>(5)</sup> Slow scan videos are held among MITRA members using 64 Kbps streams (1992-1997).<sup>(5)</sup> Educational and medical information and knowledge can take advantage of this type of application developed by Tokai University School of Medicine, which is one of the technical school partners of the Bandung Institute of Technology (ITB)<sup>(5)</sup>. In 1997, an experimental satellite-based telemedicine was conducted between three institutions: the Faculty of Medicine and Engineering, Achmad Yani University Bandung (UNJANI) as the control center/station, and the Mataram Central Hospital Harapan Kita Hospital Jakarta as the client<sup>(6)</sup>. Demonstrations about maternal care pregnant women use conferences via television through a third-party provider dedicated to developing medical services in hard-to-reach places in the Eastern Region of Indonesia <sup>(6)</sup>. Telemedicine experiment with other partners after the collaboration with MITRA members is a wireless-based telemedicine system that connects two medical faculties in Bandung, namely Hasan Sadikin Hospital (RSHS) and UNJANI via JCSAT 3 satellite-linked between ITB and Tokyo, and then connected by Integrated Services Digital Network to Ohkura National Hospital in Hibiya, Tokyo <sup>(3)</sup>. Other telemedicine activities are carried out at the Laboratory Biomedical ITB. The research team created an internet-based telemedicine system for Puskesmas. Tele-consultation, basic tele-diagnostic, tele-coordination, tele-education, and medical database are some of the services provided<sup>(4, 5)</sup>.

During the early twenty-first century, rapid advances in information technology have extended to other industries, including healthcare through telemedicine. Despite the government's decision to start practicing telemedicine (tele-EKG) in 2011 <sup>(7)</sup> there have been several telemedicine medical studies in Indonesia in 2004. This research was developed with an emphasis on Community Health Centers (Puskesmas). The research focuses on creating a telemedicine system that works over the internet. This telemedicine service supports teleconsultation, tediagnosis, simple telecoordination, tele-education, and drug database. In the same year, telebiomicroscopy was developed by the research group of the Faculty of Health, University of Padjadjaran. Microscopic images of eye diseases are conveyed through the wireless communication channel in this system. As a result of the findings, it was determined that the diagnosis of eye disease could be carried out remotely using a telemedicine system <sup>(8)</sup>. Another experiment was carried out in a hemodynamically compromised patient state, with vital patient data provided via a communication link. The results of this study also produce something positive <sup>(9)</sup>.

The Indonesian National Telecommunications Company (PT Telkom) has developed a web-based medical information system for the general public <sup>(10)</sup>. Teleconsultation and tele-education were carried out as part of a trial called MediFa which uses videophones to connect primary care clinics and referral hospitals <sup>(11)</sup>. This technology was expanded over the next few years to include video

streaming, Short Message Service (SMS), and WAP for use by family physicians <sup>(11)</sup>. Telemedicine continued to grow until 2005, and since then, Indonesia has established an e-system health services designed for epidemic management <sup>(12)</sup>. Several e-health prototypes have been made for web-based epidemic management systems and mobile-based systems with multiple communication links. Base units (in hospitals or health care units) and mobile units make up a mobile telecommunications system (installed in ambulances or mobile vehicles), and these systems are created to select the communication links available in a given place for mobile (or mobile equipment)<sup>(13)</sup>. In 2007, mobile telemedicine was developed as part of a tele-emergency project to provide medical health care in rural areas<sup>(14)</sup>. This systematic design combines mobile internet protocol (MIPv6) with a fast network based on Mobile Ad-hoc Network (MANET) and IEEE 802.11 Wireless LAN (WLAN). Mobile telemedicine system prototypes, which include both hardware and software, can be rapidly deployed in remote areas or in disaster sites where telecommunications infrastructure is difficult to reach <sup>(14)</sup>.

The telemedicine application was first launched in 2010 as part of biomedical engineering which includes simple block diagrams and covers a wide range of disciplines <sup>(15)</sup>. The e-health application is evolving so that medical stations can connect to terminals in real-time for remote consultations between general practitioners and specialist. The technology that utilizes store-and-forward can be used to distribute short reports on recapitalization of patients at the primary health care <sup>(16)</sup>. In 2011, an e-health application was developed for disease diagnosis using SMS technology to stream audio and video data on mobile phones<sup>(17)</sup>. In the same year, an e-prescription system with a mobile e-health system for child and maternal therapy was established to assist patient and pharmacy data.<sup>(18)</sup> The SMS module in this system can send short messages in various modes of operation. Basically, e-prescribing for mobile e-health is a PC-based e-health system with an SMS software module and a modem connected to it<sup>(18)</sup>. Telemedicine develops a focus on mobile-based health systems. In 2018, the government managed seven network-based health service applications and 18 private online health service applications <sup>(19)</sup>. Although various platforms provide online health information and services, many Indonesians have not used these applications. According to a poll conducted between May and July 2018, 67.6% of 102 respondents had never used an online healthcare app. Trust in face-to-face consultations (47%) and ignorance about online healthcare applications (18%) are the top two reasons why the public still does not use network-based healthcare applications or eHealth applications<sup>(19)</sup>.

**2. Type of Telemedicine in Indonesia**

There are 7 network-based health service applications managed by the government and 18 private online health service applications which can be seen from table 1<sup>(19)</sup>:

Table 1 Online healthcare application that is managed by the government and privately in Indonesia.

Government	Privat
Layanan kesehatan ke rumah 24 jam berbasis telemedicine dan teleradiologi di Makassar (Dottoro'ta)	Alodokter
JKN Mobile	GO-MED
Verifikasi Digital Klaim/Vedika BPJS	Gue Sehat
Aplikasi <i>Acquired Immune Deficiency Syndrome</i> (AIDS) Digital	HaloDoc dan GoAptik
TeleEKG dan TeleRadiologi	Homedika
P-Care BPJS	Homecare24

Aplikasi untuk registrasi online pasien rawat jalan	Indonesian Kalkulator of Oocyte (IKO)
	K24 Klik
	Klik Dokter
	Medika App
	Medico
	MIMS Indonesia
	PesanLab
	Periksa.id
	Pro Sehat
	RSPI Mobile
	TeleCTG
	Sehati

The rapid growth of constantly changing technology, especially in the digital innovation sector, has brought about major changes in terms of medical practice. Information and communication technology (ICT) has been implemented to assist, provide healthcare services, or serve as a temporary alternative to consultation during the COVID-19 pandemic<sup>(20)</sup>. Rapid technological developments have allowed medical practitioners and patients to benefit from a variety of novelties. health-related features of telemedicine. In Indonesia, the important benefits of medicine are: in terms of emergency response and disaster management, disease surveillance, support for physician decisions at the place of care, and remote monitoring and patient care <sup>(21, 22)</sup>. In Indonesia, telemedicine-based mobile applications can promote health literacy, encourage a more balanced lifestyle, prevention, control, and management of chronic diseases. In addition to increasing the prevalence of non-communicable diseases such as diabetes mellitus and hypertension, promoting health literacy is very much needed in Indonesia. Compared to other countries, Indonesia still has low health literacy even though technological progress has been very rapid <sup>(23)</sup>.

Indonesia is the 4th most populous country in the world with 250 million people spread over 17,508 islands<sup>(24)</sup>. Despite strong growth in gross domestic product (GDP) per capita annually from \$823 in 2000 to \$3,932 as of 2018<sup>(25)</sup>, there is an increasing inequality in wealth inequality with more and more people falling into poverty every year<sup>(26)</sup>. This indicates that not everyone can access health services equally while medical costs in Indonesia are getting more expensive every year. In 2005, outpatient costs were \$9.25 for primary hospice care, \$13.12 for secondary hospice care, and \$19.41 for tertiary hospice care. This fee does not include diagnostic tests and necessary medications or treatments <sup>(27)</sup>. The scarcity of medical professionals makes healthcare inaccessible to everyone. According to 2018 data, Indonesia only has 4,269 doctors (per 10,000 population), 24,149 nurses and midwives, 0.548 dentists (in 2017), and 0.852 pharmacists. Ideally the ratio of doctors to patients is 1:600 according to WHO, and according to this ratio, the medical health system in Indonesia is one of the worst in Southeast Asia <sup>(28)</sup>.

The problems that mentioned above can be helped by telemedicine. Telemedicine has several benefits for patients that can solve Indonesia's health problems in terms of costs and inequality of health access such as reduction of travel distance which leads to reduction of travel costs and hence increase additional travel savings, cost effectiveness for home care and access to on-call hospital specialists, and rural service delivery, increased satisfaction among patients and providers, improved medication adherence, saved time from waiting for appointments, decreased lost pay due to job loss, increased

appointment rates, and improved chronic disease control outcomes (such as glycemic control and reduce asthma attacks)<sup>(23)</sup>.

### **3. The Development of Telemedicine in the Era of the National Health Insurance System**

Telemedicine in Indonesia is not new, but its progress has been rapid in recent times along with the increasing use of electronic media which is closely related to daily life. To date, the number of people registered with the National Health Insurance (JKN) is 225,964,199 people, and there are 26,923 health facilities that cooperate with BPJS<sup>(29)</sup>. Many people who are members of JKN place the responsibility on the government as the organizer to improve their quality. One way to improve the quality of health services in Indonesia is to reduce the gap in access to health, so that it is available to all people equally. Telemedicine is one of the modalities that can be used to achieve this goal.

The flexibility of time and place between medical personnel and patients in providing health services is an advantage of telemedicine. For example, patients do not need to travel long distances and take leave from work to go for treatment, so that health services are easier to reach as long as the facilities are adequate (signal, availability of mobile phones, or internet access). This convenience as a result can improve medication adherence, especially in patients with the need for repeated consultations<sup>(30)</sup>.

The fairly good technological progress in Indonesia can be observed through data in 2020, where there are more than 190 million smartphone users in Indonesia<sup>(31)</sup> which allows telemedicine to reach the wider community, as well as reducing the gap in health facilities in Indonesia and reaching faraway places. from health facilities<sup>(30)</sup>. Another advantage of telemedicine relates to the merging of one health facility with another, without being limited by distance, so that the information contained in medical records in one place can be accessed in another. Referrals between doctors can also be easier to do<sup>(30)</sup>.

Mobile-JKN developed by BPJS Kesehatan can be used as a forum for teleconsultation between doctors and patients. Various other application platforms also provide the same service, but BPJS Kesehatan has the advantage that almost all Indonesians use national health insurance. The increasing role of telemedicine needs to be followed by digitizing medical records to complete part of the online consultation<sup>(32)</sup>.

In some cases, patients require periodic control, for example during pregnancy and chronic disease. One study found that barriers to access and financing were associated with maternal health utilization<sup>(33)</sup>. Telemedicine services in maternal health services can be optimized for populations living in remote areas far from health facilities, thereby reducing complications during pregnancy and reducing maternal mortality. Other studies have shown that telemedicine can be used for monitoring patients with type 2 diabetes mellitus, but during the COVID-19 pandemic, its use was still underutilized by patients, so that control of blood sugar levels and complications from type 2 diabetes were not resolved<sup>(34)</sup>. In cancer patients, telemedicine systems provide significant benefits because patients can consult an oncologist even early in the course of the disease. After the consultation, patients who are deemed necessary to undergo further examination are then advised to come to the clinic or hospital. Some cases that are considered benign may be advised to postpone the visit to the hospital, other cases that show signs of malignancy with more severe conditions can be further examined at a health facility for further management<sup>(35)</sup>.

Natural disasters, which are often emergency cases, can also benefit from telemedicine. Medical personnel with certain specializations are not always available in disaster-affected areas. The required

expertise can be consulted online through medical personnel in the field to more skilled personnel through telemedicine<sup>(36)</sup>

Although the telemedicine provided by JKN provides significant convenience to access to health services, there are limitations in the implementation of telemedicine, both as a whole and the obstacles faced by JKN. Doctors and patients who conduct teleconsultation have limitations only on history taking and physical examination, while doctors are taught to do a thorough physical examination before making a diagnosis and providing therapy for patients. This obstacle poses a greater risk of misdiagnosis compared to direct examination<sup>(30)</sup>. Supportive examinations and therapies other than drugs still need to come to health facilities, so telemedicine cannot completely replace conventional health services.

If the consultation is carried out entirely through telemedicine, the provision of therapy that is limited to prescription drugs can even pose a risk of side effects for the patient, such as allergic reactions. With that informed consent needs to be given in advance to prevent the lack of information received by the patient. Moreover, telemedicine which does not require face-to-face contact can make it difficult for doctors to assess the patient's honesty regarding the history of their illness, both current and past<sup>(37)</sup>. The transfer of medical records to digital requires a process that is not short, especially considering that medical records are often still incomplete. paper-based which is prone to damage, loss, and incomplete data collection<sup>(32)</sup>.

Indonesia is one of the countries with a low Network Readiness Index (NRI)<sup>(38)</sup>. The geographical structure of Indonesia which consists of 13,466 islands makes it difficult for Indonesia to provide good access to remote areas<sup>(39)</sup>. Facilities such as electricity sources, mobile phones, and internet access are not available. in some remote areas, especially eastern Indonesia. This gap is also the root of various problems that need to be faced in implementing telemedicine, which is especially needed for areas that are far from adequate facilities<sup>(39)</sup>. Technology in developing countries such as Indonesia is still a problem. For example, elderly patients still find it difficult to adapt to operating a mobile phone, and some among the community are still illiterate. In addition, there are also doubts on the part of health workers and patients to conduct consultations and prescribe drugs virtually due to a lack of trust in telemedicine<sup>(30)</sup>.

Legal regulations regarding telemedicine have not been carefully drafted, this is evidenced by the absence of special funds from BPJS which are allocated for telemedicine and its facilities<sup>(30)</sup>. Moreover, there is a lack of public knowledge that there is already a telemedicine service from the Ministry of Health in the form of the "Temenin (Telemedicine Indonesia) application. )" which provides tele-radiology, tele-EKG, tele-USG, and tele-consultation services that have connected 39 teaching hospitals and 115 supported hospitals and health centers. But unfortunately the socialization that is still not optimal causes this application and telemedicine service cannot be fully utilized to develop telemedicine between health facilities<sup>(40)</sup>.

Regulation of the Minister of Health (PERMENKES) number 1438 of 2010 article 11 that telemedicine services must have a separate room. So it is clear that it is not possible to provide telemedicine services through each doctor's electronic device, for example via a mobile phone or an unregistered personal computer. Unfortunately there is no explanation about the registration of the application used by the hospital. Likewise, there is still not enough socialization regarding the registration of the supporting hospitals and health facilities provided<sup>(37)</sup>. In order to avoid violating the medical ethics principle of privacy, teleconsultation permitted by the government is limited to the

internet system of registered health facilities <sup>(7)</sup>. In addition, the regulation data storage is also regulated by laws that only allow its storage through government information networks <sup>(40)</sup>.

Another problem with telemedicine provided by JKN is that there are no regulations governing telemedicine special funding. For health care facilities that already use services and supporting infrastructure for telemedicine, the cost can be transferred to accumulated payments from BPJS. However, the cost of building telemedicine in facilities that previously did not have the facilities or human resources to carry out telemedicine requires funds, including establishing infrastructure, training human resources, operating and maintaining costs that are not cheap <sup>(41)</sup>.

#### **4. Discussion**

The COVID-19 pandemic has accelerated changes in activity in the shopping, office, and even restaurant sectors. The health care sector has not been spared the effects of the pandemic. This rapid digitization has led to a shift in healthcare services towards telemedicine. What's more, patients' concerns about dealing with health workers who have a high risk of being exposed to COVID-19 can be reduced, and at the same time reduce the transmission of COVID-19 because there is no need to meet face to face <sup>(30)</sup>.

At the beginning of the emergence of COVID-19 in Indonesia, health workers were mobilized to respond to the pandemic situation, so that health facilities were shifted as COVID-19 centers and resulted in the provision of routine health services being disrupted. Patients with previous medical history who are at high risk for contracting COVID-19 are advised not to visit health facilities, and as a result, care for non-COVID patients is disrupted <sup>(42)</sup>. Indonesia, which is a developing country, previously considered telemedicine to be an additional option to obtain health services. However, during the COVID-19 pandemic, the government and the public began to realize the benefits of telemedicine, so the development of telemedicine during the pandemic experienced a rapid acceleration of development. Policy support and the presence of telemedicine are increasingly felt by the teleconsultation provided by BPJS <sup>(43)</sup>.

Due to Indonesia's vast diversity, both in terms of culture and the natural environment, a good implementation of telemedicine for ease of access needs to be adapted to each region. For example, Makassar has a telemedicine program that is regulated by its local government in terms of design, regulation, and funding, so that the success of telemedicine is more developed compared to programs that are run nationally <sup>(41)</sup>. With regard to medical ethics, the principles of privacy and confidentiality need strict attention in the legislation because they are vulnerable to harming patients with data leakage through cyber crime. <sup>(44)</sup> At the same time, strong cyber security is needed to support the security of medical records.

#### **5. Conclusion**

Telemedicine cannot stand alone because it still requires adequate facilities to access adequate health services. Advances in infrastructure and human resources in particular have an important role in the smooth operation of telemedicine. Socialization about the application can be increased through promotion of health services such as Puskesmas and hospitals. The use of public service advertisements in electronic media such as radio and television can also be useful to reach people who do not regularly visit health facilities. Considering that there are still quite a lot of Indonesian people who are not fluent in technology, the operation of telemedicine applications needs to be made as easy and effective as possible. In addition, the telemedicine system that is integrated with the conventional health facility system is an important matter that needs attention, especially regarding pregnant

women, emergency cases, and patients with chronic diseases, in order to provide optimal services.

## 6. Conflict of Interest

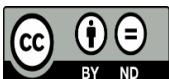
The author states that there is no conflict of interest in this study

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