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## Adoption of Telemedicine during COVID-19 Pandemic Crisis: A Review of the Literature

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### Abstract:

Digital health literature has provided significant insights into how telemedicine contributes to improving the quality of healthcare and reducing the cost of healthcare. This research focuses on factors influencing adoption of telemedicine. Moreover, the author identifies the challenges of adopting telemedicine. A total of 20 papers were systematically studied and classified. The results show that telemedicine adoption may be influenced by several factors; the results also revealed that major barriers to telemedicine include poor infrastructure of digitalization, resistance to digital transformation, lack of digital knowledge among doctors and patients.

**Key words:** Barriers, COVID-19, Digital health, eHealth, Public Health, Telehealth.

**JEL Classification Codes:** I100, I150.

### Introduction:

Technology is advancing in a rapid pace, and it is changing our life and work. Emerging technologies, such as cyber security, industrial robots, Internet of Things (IoT), artificial intelligence, serverless, cloud computing, augmented reality, and blockchain, is advancing at a rapid pace. The current technological advances helps us to have more information more easily and rapidly, computing capacity, communication, and connectivity, in addition to providing new modes of collaboration between different networks and actors (Pereira et al., 2020). Digital technologies have played an important role in supporting the COVID-19 response and recovery efforts. In this way, COVID-19 accelerated technology utilization for both organizations and consumers. For example, the increased fear of COVID-19 virus contamination created major changes in food service delivery and shoppers' behaviors (Bouarar, Mouloudj, & Mouloudj, 2021), and COVID-19 obliged universities to stop all their activities forced the switch toward online education system (Mouloudj, Bouarar, & Stojczew, 2021).

In addition, due to the COVID-19 pandemic, several countries have adopted digital technologies for planning, monitoring, surveillance, evaluation, testing, health care, and other functions. In other word, the public health emergency that resulted from COVID-19 increased demand for telemedicine worldwide; and many hospitals have adapted to virtual healthcare and telemedicine (Ali et al., 2020; Alghamdi, Alqahtani, & Aldhahir, 2020). Therefore, digitization of the healthcare system can help in the management of the pandemic, alleviating the disruption of societal systems (Whitelaw et al., 2020). Rahi, Khan, & Alghizzawi (2021) argue that “the adoption of telemedicine health services are cost-effective, efficient, time-saving and free from errors”.

According to the world health organization (WHO) telemedicine is “the delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the

interests of advancing health of individuals and their communities” (WHO, 2010). In other word, telemedicine is “the practice of healthcare using audio, video, and data communications” (El-Mahalli, El-Khafif, & Al-Qahtani, 2012). According to Omboni et al. (2022, p.9), major issues to be tackled to permit large scale implementation of telemedicine include: (1) formulating adequate policies to legislate telemedicine, license healthcare operators, protect patients’ privacy, and implement reimbursement plans; (2) providing and disseminating practical guidelines for the routine clinical use of telemedicine in different contexts; (3) increasing in the level of integration of telemedicine with traditional healthcare services; (4) enhancing healthcare professionals’ and patients’ awareness of and willingness to use telemedicine; and (5) overcoming inequalities among countries and population subgroups due to technological, infrastructural, and economic hurdles.

While we may not accurately forecast the timing of natural disasters and infectious pandemics, we can be sure that they will occur again in the future (Smith et al., 2021). Hence, the use of telemedicine provides promising potential in the quest against pandemics such as COVID-19 pandemic (Alghamdi et al., 2020; Bokolo, 2021). The available literature has clarified that no one framework nor best-practice solution can be applied on all ICT innovations or for all countries. Barriers and challenges in applying one ICT innovation in a given country/organization may be very different – not for the same ICT innovation in another country/organisation nor for another ICT innovation in the same country/organization (Alaboudi et al., 2016).

Investigating adoption of telemedicine services can benefit both industry and policy in the health service sector. Thus, we seek through our research paper to answer the following questions: Q1: What factors influence the adoption of telemedicine during COVID-19 pandemic crisis? Q2: What are the challenges of adopting telemedicine? Therefore, the aim of our study is: (1) Identifying the factors that influence the adoption of telemedicine during COVID-19 pandemic; and (2) Identifying the main challenges and obstacles that could stymie telemedicine. Finally, we provide some

recommendations that may help hospitals transition smoothly and successfully towards telehealth services. To this end, a literature review has been conducted on the most recent available references on telemedicine published in indexed journals and research papers discussed at international scientific conferences. The rest of the paper is divided as follows. Section 1 describes the telemedicine during COVID-19 pandemic. Section 2 describes the methodology. Section 3 analyses the factors influence the adoption of telemedicine during COVID-19 pandemic and discusses the main challenges to adoption of telemedicine. The paper closes with a discussion of major findings, limitations and implications for both research and management

### **1- Telemedicine during COVID-19 pandemic:**

During the COVID-19 pandemic, interest in the implementation of telemedicine has increased rapidly during the crisis, as policymakers, insurers and health systems have searched for ways to provide care to patients in their homes to limit transmission of the COVID-19. In other words, the COVID-19 pandemic prompted significant and dramatic transition to video-based telemedicine use in home-based primary care (Kalicki et al., 2021; Vidal-Alaball et al., 2020). Telemedicine is the technology of conducting health examination from a distant place. Telemedicine reduces the use of resources in health centers, facilitates access to care, while reducing the risk of direct contamination of the infectious agent from person to person (Charles, 2000). Using the telemedicine has many benefits for adopters, such as improving the quality of care, enhancing access to healthcare, and providing patient care and management (El-Mahalli et al., 2012); reduce the risk of contagious diseases which are transmitted by person-to-person contact (Smith et al., 2020).

Telemedicine is reveals its potential in the COVID-19 pandemic, for example, e-triage, e-consultations, remote monitoring of the intensive care unit, and patients being attended to remotely by health personnel, including those currently in quarantine; and unfortunately, telemedicine has not been supported and widely used homogeneously in all countries (Ramírez-Correa et al., 2020). According to

Kadir (2020), telemedicine can play an important role during COVID-19 pandemic by alleviating virus spread, effectively utilizing the time of healthcare professionals, and reducing mental health issues. Monaghesh & Hajizadeh (2020) found that telemedicine is certainly adequate in minimizing the risk of COVID-19 transmission. In several developing countries such as Algeria, Djibouti, Egypt, Jordan, India, and Tunisia, the majority of people lives in rural areas (for example, nearly 70% Indians live in rural areas). So, there are shortages of qualified doctors in villages because most of the doctors are city-centric, leading to a geographic disparity in doctor's availability; thus, telemedicine services can reduce this geographic disparity of doctors' workload (Kadir, 2020).

## **2- Methodology:**

The main aim of systematic literature review is to present and evaluate the literature related to the research topic by conducting a thorough and auditable methodology. In this paper, the data has been collected through secondary sources. According to Kitchenham (2004), accomplishing systematic literature review includes several discrete activities which are broken down into three main stages named as (1) planning the review, (2) conducting the review, and (3) reporting the review. Initially, a total of 170 papers were identified from selected databases (such as Web of Science (WoS), Scopus, PubMed, Emerald, Sage, Hindawi, Science Direct, and Google Scholar), using the specified keywords (such as digital health, eHealth, telehealth, and telemedicine). Inclusion standards included papers clearly addressing any use of telemedicine services during COVID-19 pandemic crisis, published between January 2020 and June 2022, and written in English language. Thus, the final dataset includes 20 papers.

## **3- Findings and Discussion:**

### **3-1- Factors that influence adoption of telemedicine:**

The examination of behaviors related to telemedicine acceptance is a growing field of study. This topic is currently very important than ever, due to the COVID-19 pandemic

which made resources scarce within the health industry (Ramírez-Correa et al., 2020). The importance of telemedicine in healthcare during COVID-19 pandemic crisis has widely been accepted by academics and practitioners in developing countries (Alghamdi et al., 2020; Kadir, 2020). Telemedicine has helps in inhibiting any sort of direct physical contact, guarantee continuous health services to the community, and finally reduce morbidity and mortality in COVID-19 pandemic (Monaghesh & Hajizadeh, 2020).

Despite several benefits which telemedicine applications provide to patients and physicians, the adoption of telemedicine health services is still in its infancy (Rahi et al., 2021). There are several factors that impact adoption of telemedicine, such as the quality of network communication (Bokolo, 2021); information quality and trust (Yulaikah & Artanti, 2022), trusting beliefs and self-efficacy (Baudier et al., 2022). Octavius & Antonio (2021) found that initial trust in mobile health platform, facilitating conditions, and performance expectancy are the main three significant drivers of intention to adopt mobile health applications by Indonesian customers. Rho et al. (2015) found that performance expectancy, effort expectancy and social influence have positive impact on behavioral intentions to use telemedicine service. Rahi et al. (2021) investigates the factors that influence the patient's intention to adopt telemedicine health services during COVID-19 pandemic. The results show that intention to adopt telemedicine health services is influenced by attitude; and attitude is influenced by information quality, system quality, service quality, performance expectancy, social influence, facilitating condition, perceived vulnerability, perceived severity and response efficacy. However, Yulaikah & Artanti (2022) found that the perceived fear has no significant effect on the decision to use telemedicine during the COVID-19 pandemic.

Gong et al. (2019) found that subjective norm, trust in providers, and perceived benefit positively influences the behavioral intention to adopt online health consultation services, while offline habit has a negative effect. Ramírez-Correa et al. (2020) found that attitude has the most significant direct effect on behavioral intention to use

telemedicine systems. Jacob, Sanchez-Vazquez, & Ivory (2020) conducted a systematic literature review to understanding of the factors impacting clinicians’ adoption of mHealth tools. They found that clinicians’ adoption of mHealth is influenced by many factors such as usefulness, ease of use, design, compatibility, technical issues, content, personalization, and convenience. Recently, Jacob et al. (2022) performed a systematic literature review to determine the socio-technical factors affecting patients' adoption of mobile health tools. Table (1) shows an overview of these factor themes and subthemes

**Table n°1:** Socio-technical Factors Affecting Patients’ Adoption of Mobile Health

Factors	Key themes and subthemes
<b>Social and Personal Factors</b>	Demographic factors: age, gender, education, technology skills, technology experience, ethnicity, socioeconomic factors, geographic residence, and marital status.
	Personal characteristics: patient attitudes and preferences, psychological factors, time constrain and distraction, motivation, the locus of control, awareness, habits,
	Cultural and social elements: Social influence, language, and culture.
<b>Technical and material factors</b>	Usefulness: perceived benefits and performance expectancy, convenience and accessibility, communication, health education, self-management, quality of care, health benefits, monitoring, early detection of symptoms, personalized feedback, and quality of life and well-being.
	Ease of use: privacy and security, quality and credibility, and relevance.
	Monetary factors: cost and reimbursement, user experience, the usability of the tools and personalization.
	Technical factors: infrastructure and log-in problems, access to technology, training, and technical support.
<b>Health-related factors</b>	The disease or health condition, the care team’s role, health consciousness and literacy, health behavior, relation to other therapies and integration into patient journey, and the patients’ insurance status.

Source: Jacob et al. (2022). pp. 5-9.

### **3-2- Barriers to adopting telemedicine:**

Ensuring primary healthcare during the COVID-19 pandemic was the big challenge (Kadir, 2020). Despite emerging evidence about the benefits of telemedicine, there are still many barriers and challenges to its adoption (Alaboudi et al., 2016). Its adoption is often considered as failed project as 75% of them are abandoned or 'failed outright' and this percentage account for 90% in developing countries (Alaboudi et al., 2016). Thus, addressing specific barriers will better the use and quality of telemedicine.

In fact, there are several barriers identified to telemedicine adoption, such as the lack of knowledge about telemedicine (El-Mahalli et al., 2012); the lack of funding (Smith et al., 2020); the initial investment required (Driessen, Castle, & Handler, 2018); physicians' unwillingness (Bokolo, 2021); lack of caregiver support and lack of access to appropriate technology (Kalicki et al., 2021); demographic factors (such as lack of technology skills, lower level of education) (Jacob et al., 2022); providing adequate sustainable financial support to apply operate, and maintain the telemedicine system, guaranteeing conformity of telemedicine services with core mission, vision, needs and hurdles of the healthcare facilities, and the reimbursement for telemedicine services (Alaboudi et al., 2016).

Bouarar, Mouloudj, & Mouloudj (2022) found that major barriers to digital transformation include lack of knowledge, lack of digital expertise, poor digital leadership, resistance to change, inflexible culture, unclear vision and objective, lack of collaboration and alignment. De Leeuw, Woltjer, & Kool (2020) assert that nurses who are digitally lagging often have had poor and weak digital education. This result in stress, frustration, feelings of incompetency, and postponement or avoidance of health information technology use. In Canada, Peddle (2007) found that the barriers to telemedicine use are not simply technical, but associated to issues of privacy, culture and trust.

During the COVID-19 pandemic, Kalicki et al. (2021) found that among patients who had not used telemedicine, providers deemed 27% “unable to interact over video” due to cognitive or sensory impairment and 14% had no access to a caregiver to help them with technology. Van Citters et al. (2021) found that barriers to implementing telemedicine services included documentation to maximize billing; reimbursement of multi-disciplinary team members, distant monitoring, and telephone-only telehealth; and lower volume of patients. Fernandes et al. (2022) discovered that barriers to engaging in telemedicine interventions were as follows: (1) impersonal, (2) technological challenges, (3) irrelevant content, and (4) limited digital (health) literacy.

In sum, barriers to telemedicine adoption vary from one country to another, these barriers can be broken down into the following: (1) organizational barriers, such as: medical staff resistance to change and switch towards digital health, lack of strategic vision among health responsible, lack of technical support from senior managers, and poor infrastructure, (2) Funding barriers, such as low allocated budget to acquiring digital medical devices, and low budget dedicated to research and development, (3) technological barriers, such as lack of experienced staff in digital due to lack of training programs in digitalization in the healthcare sector, digital gap and difficulty to keep-up with technological development in the field of health technology; poor internet flow; barriers related to patients such as lack of patients awareness of telemedicine benefits, poor control over healthcare applications and devices among elderly people, difficulty in conducting electronic payment of telemedicine treatments cost. Obviously these barriers may seem far more challenging in poor countries suffering from food insecurity and poverty where attention and efforts are more dedicated to improving population living conditions over improving health sector.

### **Conclusion:**

Telemedicine does have a critical role in emergency responses (Smith et al., 2021). It has become pivotal to integrate telemedicine into the healthcare system to combat any possible pandemic in the future (Ali et al., 2020). The adoption of telemedicine

improves service provision in the health care sector. Consequently, telemedicine should be an important tool in healthcare services while keeping patients and health providers safe during pandemics and epidemics outbreak (Monaghesh & Hajizadeh, 2020). This paper aims to analyze the factors that influence the adoption of telemedicine and identify the challenges of adopting telemedicine.

The result reveals that telemedicine adoption may be influenced by factors related to both patient and medical staff alike, such as positive attitude towards telemedicine, ease of using telemedicine applications, perceived usefulness of telemedicine, past experience in telemedicine, perceived quality of telemedicine, and confidence in telemedicine. The results also indicated that poor infrastructure of digitalization (Internet), resistance to digital transformation, lack of digital knowledge among doctors and patients, are the main barriers to effective telemedicine adoption. Therefore, we conclude that telemedicine is an effective tool to enhance healthcare services and reduce healthcare costs in general and during health crisis in particular. Nevertheless, telemedicine is not effective to all patients' categories, especially those with low educational level and elderly people.

### **Recommendation:**

Based on the result of the study, we recommend decision makers in health sector in developing countries the following: (1) implementing gradual digital transformation through a clear and thorough vision, (2) improving technical medical staff skills through training programs, conferences, in the field of telemedicine technologies; and (3) increasing patient's awareness level and knowledge and their families regarding telemedicine benefits, by disseminating knowledge and broadcasting educational contents through the different media outlets, finally, based on the conducted literature review several research gaps has been discerned especially in the Algerian context since the Algerian government is keen to implement telemedicine and digital health to improve the quality of healthcare and reduce costs, therefore we recommend future studies to explore the following areas: (1) studying the impact and challenges of digital

health transformation in Algeria, (2) from marketing perspective, studying the impact of telemedicine adoption in enhancing medical healthcare services, or in patients satisfaction; (2) from financial perspective studying the impact of telemedicine in reducing medical healthcare services costs; and (3) from management perspective studying the impact of telemedicine in employee commitments, job satisfaction, medical staff organizational loyalty.

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