# Telemedicine Adoption during COVID-19 Pandemic

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## ABSTRACT

The coronavirus disease 2019 (COVID-19) pandemic has challenged health care services placing a consequential stress on clinical facilities, and transformed how clinicians attend to patients. Telemedicine can serve as an alternative for face-to-face medical consultations especially in sylvan and isolated areas during the COVID-19 pandemic. Telemedicine is expected to provide effective health care at an affordable cost. Hence, the need to carry out a systematic review on the benefits, challenges and current status in the deployment of telemedicine as a means of care delivery during COVID-19 era. A literature review was conducted and research studies published between 2020 and 2021, were searched on PubMed, Google scholar, ScienceDirect, PubMed, ProQuest, Springer, Wiley, Taylor & Francis, for evidences detailing the relevance of telemedicine in the remote treatment of patients during the COVID-19 pandemic era. Challenges facing telecare include lack of a clear cut regulations and quality control regarding the adoption of telemedicine during COVID-19 era. There were also challenges of infrastructure capacity, technical know-how, and data privacy. Telemedicine has raised awareness on the penetration of digital devices among the various population age groups. Delayed implementation is also a setback for critical health cases. The use of telemedicine during pandemic era also resulted in effective management of non-COVID patients' health. An overall preference for video technologies over telephone services was also observed. These notable acceptance of telecommunication facilities in not at risks patient has proven a promissory note for the use of telemedicine in post COVID-19 era. Thus, Telemedicine remains a significant improvement in health care delivery, irrespective of residence or location.

## BACKGROUND

Telemedicine referred to as 'telehealth', 'remote care' or 'telecare' as an alternative for face-to-face clinical diagnosis (Shirzadfar, 2017), and treatment by health care providers, involves the provision of health care services, under situations where distance serves as an hindering factor, using information and communication technologies for real time communication of diagnostic information, management of cases involving disease and injuries, research and assessment, and for continued training of health care givers, towards the provision of improved health services for individuals and their societies (Combi et al., 2016b; WHO, 2009). Telemedicine offers a comparable response when distance impairs the ability to deliver proper care to a patient. Developed and developing countries have both experienced situations whereby the lag between the response, from the onset of disease symptoms or injuries to the start of care, significantly affects the final result of the care service (Combi et al., 2016a).

While telemedicine is not necessarily meant for remote monitoring or diagnosing of a patient alone (Combi et al., 2016b; Wootton et al., 2012), it could also offer remote provision of educational services to both health care personnel, patients, and tele-education (that is a communication between the physicians and patients via a communication facility or digital link such as Skype, Facebook video etc., unlike "in person" conferring where ICT is not necessary for management of patient-physician interaction (Combi et al., 2016a).

Nowadays, the internet has become an essential component of our day-to-day life, with patients contacting Doctor Google to research their symptoms before going on to contact their physicians (Shirvani & Shirzadfar,

2016; Shirzadfar, 2017). The telemedicine market in Europe reportedly grossed between €4.7 billion in 2007 to €11.2 billion in 2012 – the European Commission (EU) estimates (Combi et al., 2016a; Comyn, 2008).

Telecare consultations also required the same level of detailed investigation and understanding to accurately maintain the desired standard of care (Colbert et al., 2020). The entire health management process (assessment, diagnosis, and treatment plan) needs to be detailed enough in order to ensure compliance with the Health Care Providers plan as may be required (Colbert et al., 2020).

Telemedicine powered by the advancement in digital technologies offers significant potential in improving access and delivery in remote settings (Bhaskar et al., 2020). This has also offered humanity the opportunity to exploit the power of artificial intelligence (AI) algorithms to design a better pandemic preparedness and response plan (WHO, 2018).

This study aims to address the following research questions

1. How has telemedicine been adopted for treating outpatients during and after COVID-19 pandemic?

2. What are the challenges impacting the adoption of telemedicine platforms during and after COVID-19 pandemic?

# METHODOLOGY

## Research design

The research study adopted a qualitative review of systematic literature review. Literatures detailing the adoption of telemedicine during the pandemic from published literature and articles regarding the use of telemedicine in COVID-19 era, in a method similar to that described by (Anthony, 2020; Grimes et al., 2020). The systematic review classified, analysed and synthesized the empirical evidence from primary studies in the research area. Qualitative research is very important to examine the knowledge, attitudes and experiences in depth. This method of analysis supplements quantitative analysis by providing detailed analysis of reviews and observations into the linkage between various observations (Baumeister, 2013). This approach is an effective tool for linking evidence from several different studies in a straightforward and systematic manner (Gough & Thomas, 2012). This is owing to the fact that systematic review uses existing primary research for secondary data analysis, eliciting common themes and results, and providing a solid evidence base to inform policy-making and practice (Neala, 2009). For the study of the adoption of telemedicine during COVID-19 era, there is the need for synthesis of a two pronged approach that is qualitative and systematic from a broad point of view.

This study focused on;

1. information on telemedicine, its role and deployment during pandemic

2. a collection of secondary qualitative data of different researchers who reviewed the adoption of telemedicine during COVID-19 pandemic

3. the extraction and synthesis of data.

Research design detailing: research questions, search strategies, inclusion and exclusion criteria, quality assessment criteria, data extraction and synthesis, and lastly results and discussion are shown in Figure 1.

## Research philosophy

A research philosophy is an essential element used in conducting a research (Alharahsheh & Pius, 2020). A research philosophy involves the perception of the researcher regarding the design of, and the collection and analysis of data for research purpose as being true, and unbiased (Ryan, 2018). It also entailed the dissemination of the findings of the research study.

## Research approach

According to (Vaismoradi et al., 2013), two methods of research approaches were included to conduct this study, inductive and deductive approach. The inductive approach attempted to review from specific to general patterns, the data developed to answer the research queries. The deductive approach was used to test the general aim of content analysis, to view previous reports on the adoption of telemedicine during COVID-19 era under different situations (Bokolo, 2021; Vaismoradi et al., 2013).

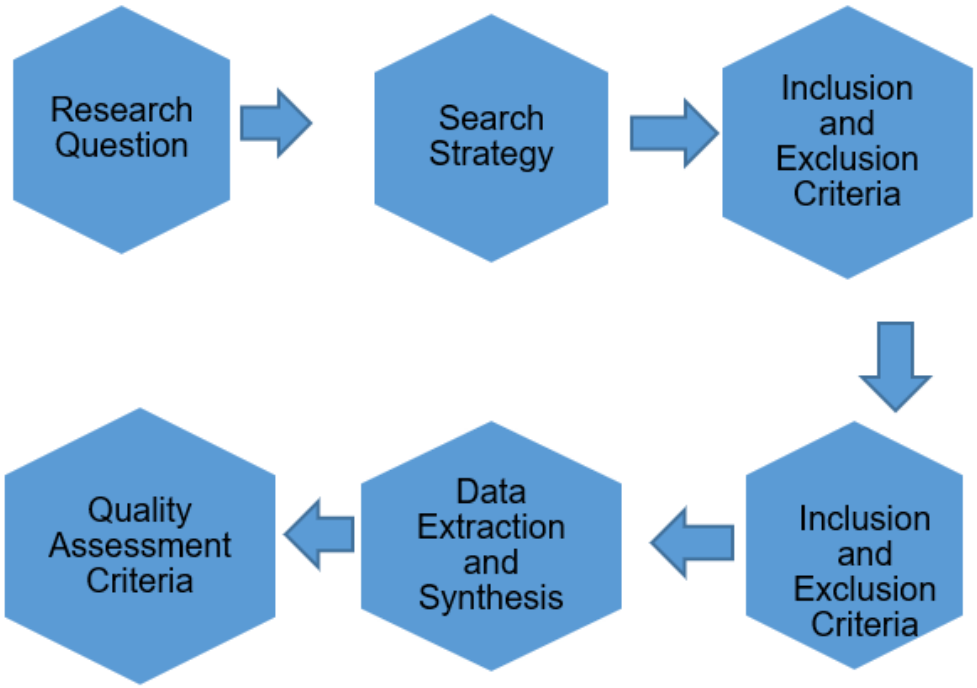


Figure 1: Research method (Anthony Jnr, 2020)

## Search strategy

To extensively search for studies related to telemedicine deployment during COVID-19 pandemic, the search strategy was carried out using online databases/libraries. The search was carried out from August 2, 2021 and ended on September 10, 2021 in Google Scholar, ScienceDirect, PubMed, ProQuest, Springer, Wiley, Taylor & Francis. The research reported here was carried out on scientific literature between 2020 till 2021, previous studies were not considered because the COVID-19 started in 2019/2020. The online libraries selected were considered appropriate search engines for studies in medical/health science, social science, and information systems research. Additionally, they offered options of carrying out advanced search filtering by keywords and by publication year, type, and research area (Bokolo, 2021). The search was conducted using the search terms on the data sources to be searched. Thus, search strings were developed for use in the electronic databases by using keywords strings with Boolean operators (AND) utilized in the search terms (Anthony, 2020; Nittari et al., 2020). The search keyword strings used comprised telecare, telemedicine, telehealth, coronavirus disease 2019, COVID-19, SARS-CoV-2, pandemic, digital health, remote care, outpatient, digitized health care, and virtual health care. This review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2009 checklist.

## Inclusion and exclusion criteria

After conducting a detailed search from the online databases, literatures were examined based on the inclusion and exclusion criteria formulated in a method similar to that employed by (Bokolo, 2021). Studies selected, were written or translated in English language, included journal articles, and document reports, published between 2020 till date, studies that offered possible answers to research questions based on title and abstract content, included literature review, quantitative, qualitative, and experimental studies that provide evidence (Anthony Jnr, 2020; Bokolo, 2021). While the exclusion criteria excluded studies that offered no theoretical,

empirical, or statistical evidence, studies not related in any way to COVID-19 pandemic, and studies published before 2020.

The inclusion criteria helped to minimize the reviewers bias, ensuring that studies were chosen based on predefined, justified criteria only. The research articles were published between 2019 - 2021 to ensure that the research discussed recent developments and insights. The exclusion criteria included articles published before 2010, and non-peer-reviewed articles. The reviewed papers are shown in Table 1.

**Quality assessment criteria**

The quality assessment criteria was checked alongside with the inclusion and exclusion criteria (Bokolo, 2021). Thus, a higher level of thoroughness of studies was employed to check quality of papers. A quality assessment checklist indicated that more than 55% of the selected articles were indexed in the web of science and Google scholar database.

**Data extraction and synthesis**

The extraction and synthesis of data was aimed at synthesizing and grouping the selected papers based on their relevance relative to the deployment of telemedicine during COVID-19 pandemic (Anthony Jnr, 2020). Thus, the selected studies were reviewed in detail and relevant data extracted, analysed, and synthesized to answers the research questions. The risk of bias were however not determined, as limited data on the exclusive use of telemedicine for the management of some cases such as telemedicine existed in published literature.

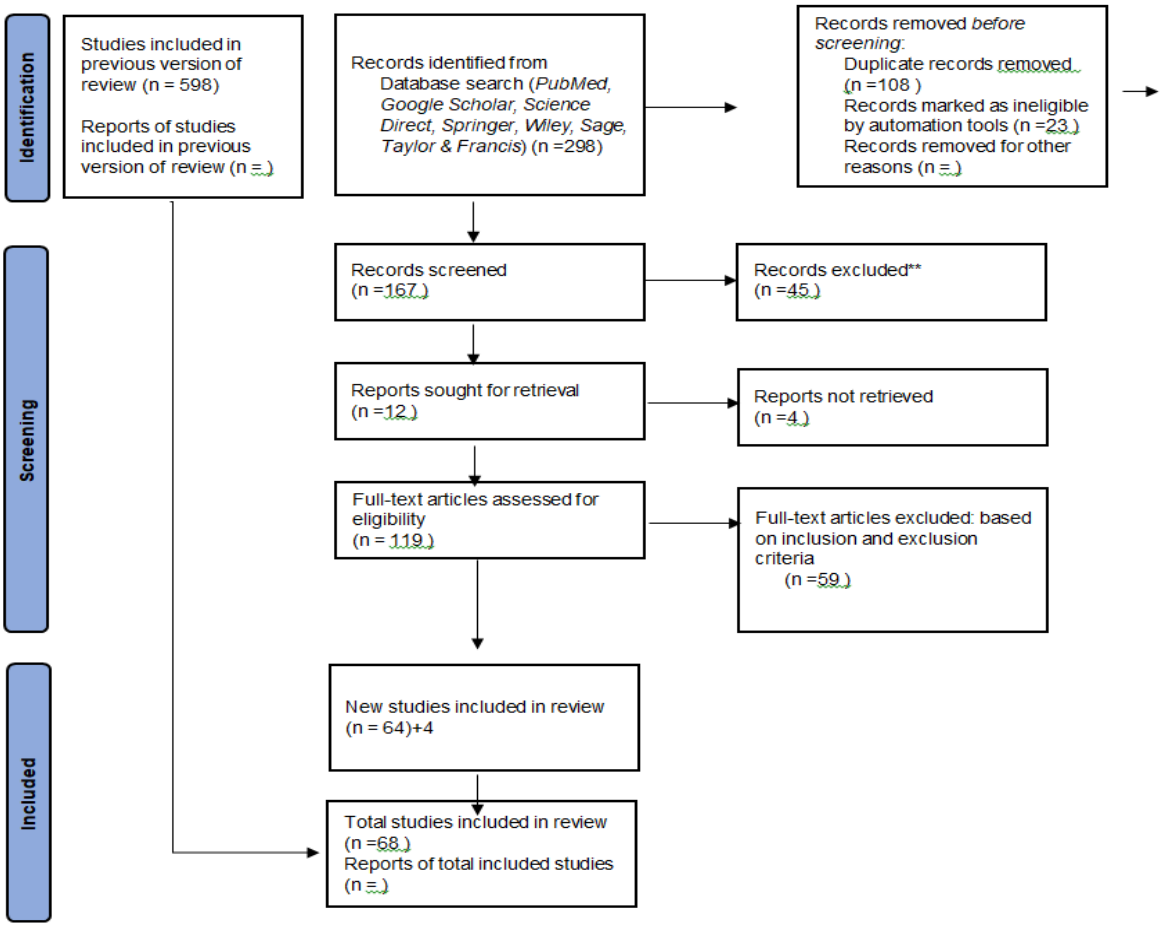


Figure 2 PRISMA FLOW CHART Source: (Page et al., 2020)

## RESULTS

This study reviewed the deployment of telemedicine during the COVID-19 era, the challenges and successes. Findings are presented based on the thematic analysis of the data extracted. Studies published from 2020-2021.

All of these are qualitative studies of primary analysis. Studies included reports conducted across several countries.

**Management of patients with diabetes and obesity in the COVID-19 era: Experiences and learnings from South and East Europe, the Middle East, and Africa.**

Several peer reviewed articles and case reports have implied that, persons with diabetes and obesity are not necessarily prone to COVID-19 infection than those without, however, the risk of hospitalisation rises three times in someone diabetic or obese, who contracts COVID-19, and is 4.5 times higher if they are both (Kumar et al., 2020). This study reviews the adoption of telemedicine in the management of patients unable or unwilling to visit healthcare settings during COVID-19 era in South and East Europe, the Middle East, and Africa (Giorgino et al., 2021).

Several reports have also revealed a higher risk of death resulting from in patients with predisposing conditions such as older age, diabetes, obesity, hypertension, and cardiovascular diseases (Giorgino et al., 2021; Kumar et al., 2020; Malik et al., 2020). This might be attributable to the metabolic effects of diabetes on the lungs by increased circulating levels of protease enzymes which typically supports SARS-CoV-2 fusion with host cells (Giorgino et al., 2021), suggesting the ease at which the virus infects diabetic patients lungs unlike non-diabetic individuals (Caruso & Giorgino, 2020; Catrinoiu et al., 2020).

Hence, the need for a review of standards of operations and recommendations to assist clinicians in the management of their patients during this COVID-19 pandemic (Giorgino et al., 2021; Skelin et al., 2020).

Systematically effective responses to the pandemic were limited within these regions. Owing to peculiar challenges such as inadequate infrastructure, antipathy, and lack of reactiveness (Belkhadir, 2020; Giorgino et al., 2021). Under these conditions, many had difficulty adhering to treatment, routine glucose monitoring, less exercise, and healthy eating habits (Giorgino et al., 2021).

Despite the quick implementation of telemedicine in some countries, it took some time to provide dependable services in countries lacking needed infrastructure, resulting in a reduction in quality of disease management and patient health. As observed, in pandemic era Romania, an online application, Telediabet.ro, was designed to enlighten patients about the importance of monitoring their diabetes and co-occurring conditions while also providing free telemedicine consultations (Giorgino et al., 2021). Other applications to provide guidance regarding complications, diet, and wellbeing were also developed (Giorgino et al., 2021).

A common denominator when setting up telemedicine services was also the challenges of data privacy and accuracy. Similarly, in Italy, these factors, alongside medical safety concerns and technical materials for clinicians, were considered in a telemedicine guideline from the Italian Ministry of Health, and some scientific societies who developed a standard operating procedure for the management of diabetic patients through telemedicine protocols during the COVID-19 pandemic (Giorgino et al., 2021).

Nevertheless, telemedicine offers benefits viz: reduced travel time and cost, as well as the opportunity for more frequent monitoring (Giorgino et al., 2021). In-person visits will also have to be arranged for issues that prove difficult to resolve via telemedicine (Giorgino et al., 2021). Even with the use of telemedicine, patients' without COVID-19 were being effectively managed according to global and local guidelines, with frequent blood glucose monitoring, healthy eating, exercise, and vitamin/mineral supplementation (Giorgino et al., 2021). Countries like Israel, for example, adopted the decision to give vitamin D earlier, before the establishment of scientific evidence to support its use in the management of SARS-CoV-2 infection (Giorgino et al., 2021; Grant et al., 2020; Martineau & Forouhi, 2020).

Some of the resultant challenges resulting from the deployment of telemedicine was observed in Serbia, when at the resumption of outpatient services, many of the patients did not attend in-person consultation appointments, it was observed that others were still sceptical about visiting an hospital environment (Giorgino et al., 2021). Consequently, there occurred a relapse in the effective management of their disease conditions with associated side effects, and a large rise in the number of patients with diabetes visiting the emergency unit – hence, a return to conventional disease management is necessary (Giorgino et al., 2021).

In spite of the noted successes observed in the management of COVID-19 in diabetic and obese patients during the pandemic through the adoption of telemedicine, a general decline in basic self-management (such as lack of adequate exercise, unhealthy eating, lack of compliance with treatment protocols) was observed, and it might take time for patients to re-familiarise themselves with good practice (Giorgino et al., 2021). It is, therefore, imaginable that an imminent rise in the burden of diabetes and obesity complications could be observed after the pandemic (Ceriello et al., 2020; Giorgino et al., 2021; Sardu et al., 2020).

**Potential effects of digital inequality on treatment seeking for opioid use disorder.**

During the onset of COVID-19 pandemic, the use of telemedicine has accelerated the use of technology to deliver substance use disorder (SUD) services (Molfenter et al., 2021), without much guidelines in ensuring equality in the utilization of telemedicine for management of opioid misuse. This study investigated the challenges of digital inequality in the use of telemedicine in the management of opioid use disorder.

Opioid misuse and abuse continues to rise, affecting thousands of lives (Garett & Young, 123 C.E.). Approximately 21–29% of US patients prescribed opioids for pain management reportedly misused them, and between 8 and 12% develop opioid use disorder (OUD) (Garett & Young, 2023; Grebely et al., 2020)). Effective treatment for opioid use disorder exist, however, the treatment uptake is low due to factors including logistical, attitudinal, geographical, regulatory, and financial (Florence et al., 2016).

Digital inequality refers to differences and limitations in people's access to and use of digital technologies in their daily life. Kang and Pamukcu (2009) noted that digital inequality could be evident in: access to bandwidth, ability to use independently, skill, social support from experienced users, and leveraging technology for improved outcomes (Kang & Pamukcu, 2009).

A recent study also observed lower broadband access for Blacks and Hispanics, low income earners, and rural dwellers (Anderson, 2021).

Although limited research has studied whether and how racial/ethnic groups have less access to information about opioids and management of opioids use disorder, data on broader lack of access to health information suggests that racial/ethnic groups with opioids use disorder might similarly have less access to information about its management as a result of digital inequality (Garett & Young, 2023). Beyond access to information, digital health literacy is important to ensure that patients with access are able to understand online health-related information (Garett & Young, 2023) which has become more evident with the outbreak of COVID-19 pandemic. Digital inequity can result to people with opioids use disorder not having access to information regarding treatments.

Access to high end technology and internet have become more beneficial as healthcare provision shifted to online therapy and telemedicine during the COVID-19 pandemic (Hulvershorn, 2021). This also has implications for participation in mutual help groups such as Narcotics Anonymous that offers phone and online meetings (Molfenter et al., 2021). However, more studies are needed to determine digital inequalities among individuals misusing opioids and are not in treatment programs (Garett & Young, 2023). Given the lower rate of broadband access for some segments of the population (rural), an understanding of access to the Internet may offer insight to treatment options for specific key populations, regarding treatment facilities.

Although, a study by (Molfenter et al., 2021) highlighted a relative ease of use and usefulness of telephonic and video services during COVID-19, suggestive of an impressive outcome post-COVID-19 era (Molfenter et al., 2021). More research still needs to be conducted to examine the effects of digital inequalities and digital literacy on treatment decisions for opioid use disorder. Molfenter *et al.* (2021) observed a rapid transition to widespread use of telephonic and video services—owing to enforced COVID-19 stay-at-home orders and social distancing rules was associated with high levels of care provider's receptivity to telephone technology. Clinicians tended to prefer video services over telephonic services, which is also easily accessible, suggesting that both outlets play a role in the management of opioid use disorder services (Molfenter et al., 2021).

**Cardio-oncology in the COVID-19 era**

The huge spread of COVID-19 outbreak to several countries with its attendant impact on patients with pre-existing cancer and cardiovascular conditions have again highlighted the susceptibility of these populations. Cancer and cardiovascular diseases have been frequently implicated in the causes of morbidity worldwide, alongside, an increased risk of contracting COVID-19 infection, they have also proven to exhibit severity in the outcome (Bisceglia et al., 2021). Other than the direct effects of COVID-19 infection, the pandemic has negatively impacted screening programmes, with tests classified as non-essential being postponed (Bisceglia et al., 2021; Maringe et al., 2020). Maringe *et al*. (2020) reported reductions and delays in the identification of new cancers, and treatment across the United Kingdom, which will significantly result in a rise in preventable deaths for the more frequent types of tumours (Maringe et al., 2020). Di Pasquale *et al*. (2021) attributed an increase in pandemic era excess cardiac deaths to reduced hospitalizations for acute coronary symptoms, the increase in out-of-hospital cardiac arrests, decrease in outpatient cardiac visitations, diagnostic and therapeutic services, and the adverse effects of the lockdown on cardiovascular health (Di Pasquale et al., 2021). Individuals with cardiovascular diseases and cancer have been reported as being more vulnerable to Sars-CoV-2 infection with fatal outcomes (Amraei & Rahimi, 2020; Ganatra et al., 2020), with a mortality rate of 28% in cancer patients who visited a New York hospital, with a mortality rate of 37% for haematological malignancies and 25% for solid tumours (Dai et al., 2020; Mehta et al., 2020).

The practical approach to cardio-oncological consultations during pandemic era involved the adoption of telemedicine, while also grouping patients based on their conditions to determine if a clinical or instrumental cardiologic evaluation was needed, through an accurate risk stratification based on the anamnestic criteria alone, which should be done in the oncology clinic (Bisceglia et al., 2021). Preliminary evaluation can now be integrated by some telemedicine tools, for example, the transmission and subsequent filing of the instrumental tests held by the patient. This was hitherto not common before the COVID-19 pandemic, but the first few months of 2020 heralded, an increase in the frequent utilization of online platforms, some already known, others even conceived ‘ad hoc’, as a tool to keep the access of patients to the hospital to a minimum and therefore to contain infections (Sardu et al., 2020; Smith et al., 2020). The regulatory framework was still observed to be readily poor in some countries, making the reimbursement procedure very difficult. Furthermore, even if it is certainly very useful for patients residing in rural or decentralized areas compared with tertiary reference centres, the impossibility of having the technology at the basis of telemedicine could accentuate the inequalities in access to specialized medical care that are already the prerogative of the most disadvantaged population groups, such as patients of low socioeconomic status, the elderly and immigrants (Smith and Bhardwaj, 2020).

Table 1: List of reviewed articles

| S/n | Articles | Authors |
|---|---|---|
| 1 | COVID-19, Renin-Angiotensin System and Endothelial Dysfunction | Amraei & Rahimi, 2020 |
| 2 | Demographics of Internet and Home Broadband Usage in the United States | Anderson, 2021 |
| 3 | Use of Telemedicine and Virtual Care for Remote Treatment in Response to COVID-19 Pandemic | Anthony, 2020 |
| 4 | COVID-19 and diabetes from IDF MENA region | Belkhadir, 2020 |
| 5 | Telemedicine as the New Outpatient Clinic Gone Digital | Belkhadir, 2020 |
| 6 | ANMCO POSITION PAPER: cardio-oncology in the COVID era (CO and CO) | Bisceglia et al., *2021* |
| 7 | Exploring the adoption of telemedicine and virtual software for care of outpatients during and after COVID-19 pandemic | Bokolo, 2021 |
| 8 | The diabetic lung: An easy target for SARS-CoV-2? Diabetes/Metabolism | Caruso & Giorgino, 2020 |
| 9 | Diabetes And Renin-Angiotensin-Aldosterone System: Implications For Covid-19 Patients With Diabetes Treatment Management | Catrinoiu et al., 2020 |
| 10 | Issues of Cardiovascular Risk Management in People With Diabetes in the COVID-19 Era | Ceriello et al., 2020 |

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| 11 | Utility of telemedicine in the COVID-19 era | Colbert et al., 2020 |
| 12 | Patients with Cancer Appear More Vulnerable to SARS-CoV-2: A Multicenter Study during the COVID-19 Outbreak | Dai et al., 2020 |
| 13 | COVID-19, type 1 diabetes, and technology: why paediatric patients are leading the way | Danne & Limbert, 2020 |
| 14 | Indirect effects of the COVID-19 pandemic on cardiovascular mortality | Di Pasquale et al., 2021) |
| 15 | COVID-19 outbreak and pediatric diabetes: perceptions of health care professionals worldwide | Elbarbary et al., 2020 |
| 16 | Pain Management During the COVID-19 Pandemic | El-Tallawy et al., 2020 |
| 17 | An Official Learning Resource of AASLD review Telemedicine and Telehepatology During the COviD-19 Pandemic | Fix & Serper, 2020 |
| 18 | The Novel Coronavirus Disease (COVID-19) Threat for Patients With Cardiovascular Disease and Cancer | Ganatra et al., 2020 |
| 19 | Management of patients with diabetes and obesity in the COVID-19 era | Giorgino et al., 2021 |
| 20 | Evidence that Vitamin D Supplementation Could Reduce Risk of Influenza and COVID-19 Infections and Deaths | Grant et al., 2020 |
| 21 | COVID-19 and the health of people who use drugs: What is and what could be? | Grebely et al., 2020 |
| 22 | Pancreatic Injury Patterns in Patients With Coronavirus Disease 19 Pneumonia. Gastroenterology | Wang et al., 2020 |
| 23 | Disparities in the use of telehealth during the COVID-19 pandemic | Smith and Bhardwaj, 2020 |
| 24 | Telehealth for global emergencies: Implications for coronavirus disease | Smith et al., 2020 |
| 25 | Implications of Telemedicine in Oncology during the COVID-19 Pandemic | Shirke et al., 2020 |
| 26 | A guide for urogynecologic patient care utilizing telemedicine during the COVID-19 pandemic: review of existing evidence | Grimes et al., 2020 |
| 27 | Telemedicine for substance use disorders: Coronavirus: Our Strengths. | Hulvershorn, 2021 |
| 28 | Is diabetes mellitus associated with mortality and severity of COVID-19? A meta-analysis | Kumar et al., 2020 |
| 29 | The impact of the COVID-19 pandemic on cancer deaths due to delays in diagnosis in England, UK: a national, population-based, modelling study | Maringe et al., 2020 |

## DISCUSSION

The COVID-19 pandemic has heralded a transformation in health delivery systems, with telemedicine and other forms of virtual health care being the drivers. Telemedicine has always possessed the potential to improve access and reduce the costs of health care (Fix & Serper, 2020). This study also observed the need for an urgency in updating clinicians' information technology equipment and their training, since the utilization of telemedicine full potential, requires specific training on its use (Postorino et al., 2020).

This study systematically reviewed twenty nine articles, journals and reports to synthesize their findings and identify the current challenges and milestones in the adoption of telemedicine during COVID-19 era. This study seeks to address how telemedicine has been adopted for treating outpatients during COVID-19 pandemic, and the challenges impacting the adoption of telemedicine platforms during and after COVID-19 pandemic. Findings from this study also highlighted challenges facing the deployment of telemedicine even as the pandemic abates.

From these findings, the challenges associated with the use of telemedicine during COVID-19, patients and care practitioners acceptance, technological savviness, infrastructure challenge, data and privacy issues. Also, (Postorino et al., 2020) opined that the huge amount of clinical data generated may not be efficiently analysed and compared in an acceptable period of time with clinical records in order to plan the related diagnostic, therapeutic follow-up; and the challenges regarding the reliability of the patient self-assessment, and associated risks of diagnostic and therapeutic delays due to an underestimation of the symptoms by the patients (Postorino et al., 2020).

The COVID-19 pandemic recommendations in most countries include people with obesity and diabetes within the 'at risk' population (Elbarbary et al., 2020). (Pranata et al., 2021) posited that attention is now being shifted towards the increased frequency and severity of acute life-threatening complications associated with diabetes in hospitalized patients, which is suspected due to COVID-19 potential diabetogenic effect (Pranata et al., 2021; Wang et al., 2020). The increased risk of death amongst persons with predisposing health conditions like older age or chronic conditions (Giorgino et al., 2021), combined with the reduced contacts between patients and their care givers, this has necessitated the early adoption of telemedicine in care management (Danne & Limbert, 2020), where patients families now gather around the phone or video conference after uploading their pump, smart pen, or sensor data. While in countries with little or no regulation, patients and doctors communicate using their private telephones via Whatsapp or other messaging applications, which by most standards would not be compliant with data protection. Challenges posed by COVID-19 has encouraged independent interpretation of data and decision making by young diabetic and obese people and their families (Danne & Limbert, 2020).

Specifically, obesity will have to be given an aggressive management approach, and awareness as a disease itself, and not just a risk factor (Chooi et al., 2019; Giorgino et al., 2021).

The COVID-19 pandemic has brought to light the significance of opioid misuse, and the challenges of its management during pandemic era. (Narayan & Balkrishnan, 2021) reported that the U.S. in particular, has remained the nation with one of the fastest growing case counts in the world resulting in other areas not receiving the needed resources and attention. Challenges in its treatment have been exacerbated by digital inequality. The use of information and communication technology has been very useful, especially for patients who are immobile due to chronic pain disorders (Nanda et al., 2021). The management of those conditions necessitates a different approach that personalizes and delivers care variables through a biopsychosocial approach (Nanda et al., 2021). The goals hitherto remain unchanged from an in-person patient-provider experience (El-Tallawy et al., 2020; Nanda et al., 2021). Telerehabilitation could be successfully implemented in pain management with appropriate consideration for staging an evaluation, a structured approach to the visit, and application of standard clinical metrics.

Although, the simple act of participation, or lack thereof, in the surveys can provide meaningful insight into the risk profile of each individual patient, nevertheless, the ease of completing these screening tools and their general reliability, is still dependent on honest self-reporting (Lawrence et al., 2017). King et al. 2009 reported that although results were encouraging, several studies have reported the administration of drug and alcohol screens can be carried out telephonically with high levels of reliability and validity, and that outpatient treatment can be delivered via videoconferencing with relative effectiveness with in-person care (King et al., 2009).

An attempt was also made to review the deployment of telemedicine in the management of cardio-oncology cases during COVID-19 pandemic. Cancer and cardiovascular diseases have been reportedly implicated in the causes of morbidity, and increased risk of contracting COVID-19 infection. COVID-19 has resulted in a seemingly compromising state in the management of cardiology and cancer cases (El-Tallawy et al., 2020; Shirke et al., 2020). Tele-cardio and tele-oncology services have become indispensable tools in minimizing the risks of cancer patients' exposure to the deadly pathogen. Several national health institutes have encouraged the use of tele-cardio and tele-oncology during COVID-19 era. This has drastically minimized room for exposure, hence, virus spread from patient to caregiver, and vice versa in the hospital (Colbert et al., 2020).However, telemedicine in oncology still has certain drawbacks that can be improved upon. Albeit, telemedicine has shown great promise, not only in the management of cardiovascular diseases and cancer care not only during this pandemic but also become a part of normal care delivery in the future (Shirke et al., 2020).

## CONCLUSION

- As the COVID-19 pandemic fluctuated towards a stalemate, the use of telemedicine which offers health care using information technology become invaluable tools during/post pandemic, with a range of promises with regards health care delivery.

- There was an increase in the deployment of online patient-care giver education programmes based on smartphones.

Nevertheless, their use should be optimized in conjunction with in-person visits as we move into the post-pandemic era, helping patients gain prompt access to clinical consultations, while also easing the burden on healthcare professionals in primary and secondary care. Online patient-care giver education programmes and smartphones should be better utilised to improve patient and disease management.

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