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Navigating Chronic Disease Management with Digital Healthcare Solutions amidst the COVID-19 Pandemic: A Systematic Literature Review

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Abstract

Purpose: The purpose of this paper is to critically evaluate data collected from various studies on Chronic Disease Management during the COVID-19 pandemic and the emergence of Digital Healthcare as a means of providing innovative approaches to manage chronic diseases.

Methodology: A systematic literature review was applied. Studies were found after a search in the Pubmed database with no publication date time limit, given that COVID–19 emerged in 2019. A Prisma diagram was created to record the way and the criteria by which we included and excluded studies for our research. Out of the 567 records identified through various sources 85 were used for a qualitative synthesis.

Results: During the first wave of the pandemic, a significant reduction or complete cancellation of scheduled health appointments was observed. Shortages of medication used to manage chronic conditions were also observed at the beginning of the COVID-19 pandemic due to global supply chain disruptions. Governments acted rapidly at the beginning of the

pandemic to promote the use of teleconsultations by introducing enabling legislation and revising laws ensuring continuity of care for people with chronic diseases, thus transitioning rapidly to remote care and monitoring. Conclusion: Telemedicine and involving community pharmacists in chronic patient management are key for sustained adherence. Long-term policies are vital to prevent pandemic-driven health disparities. Lessons should be derived for future preparedness, managing subsequent waves, and ensuring testing in primary care.

Keywords: Chronic Disease; Digital Healthcare; Telemedicine; COVID-19

Introduction

The COVID-19 disease first appeared in December 2019, when hospitals in the city of Wuhan, China recorded a large number of cases of severe acute respiratory syndrome coronavirus 2 (SARS-COV-2).The high transmissibility enhanced by the asymptomatic nature of the virus (Oran et al., 2020) has led almost all countries of the world to implement a series of public health protection measures. Containment and mitigation strategies were grouped into three broad policy categories: 1) social distancing measures, notably: closing workplaces and non-essential services, closing schools, banning mass gatherings, travel restrictions and total lockdowns. 2) Improved personal and environmental hygiene, including the use of personal protective equipment such as face masks. 3) Control, monitoring and tracing of infected individuals, with containment of infected individuals. This could involve targeted or large-scale sampling and quarantine policies (OECD and European Union, 2020). Countries have made significant efforts to respond to this crisis, which has affected all sectors of society. Pandemic preparedness has generally been inadequate, particularly in light of the large human and economic costs associated with global health crises such as the COVID-19 pandemic (OECD, 2022) .

Governments took swift and massive measures to mitigate the economic and financial impacts of the pandemic, but these were significant and multifaceted (OECD, 2022). The public health crisis has led to a major economic crisis, which has serious consequences for individual and social well-being both now and in the future. COVID-19 has exposed latent weaknesses in the health system that existed before its outbreak (OECD and European Union, 2020).

Healthcare services, particularly in routine care, have undergone a clear impact, greatly affecting individuals managing chronic illnesses. This encompasses diminished availability of primary care, deferral of elective medical and surgical procedures, and disruptions in screening initiatives (Iftekhar et al., 2021)(Wyper et al., 2020).

Results from a worldwide survey revealed that healthcare practitioners have embraced novel methods of providing medical assistance, employing telemedicine as a means to minimize in-person interactions. The growing utilization of telemedicine, coupled with the expanded engagement of community pharmacists in overseeing chronic patients, may serve as effective strategies to enhance adherence beyond the pandemic period (Olmastroni et al., 2023).

The purpose of this paper is to introduce research related to the Chronic Disease Management during the COVID-19 pandemic and the emergence of Digital Healthcare as a mean of providing innovative approaches to managing chronic diseases. The study tries to determine whether Telemedicine, Virtual Care, and other forms of digital solutions, which constitute the pillars of Digital Healthcare, enable healthcare providers to maintain a level of connection with their patients during the COVID-19 pandemic. This, in turn, helps address the disruptions that patients faced throughout the pandemic period. This presentation is done on two levels. In the first section, we present how the COVID-19 pandemic affected Chronic Disease Management. In the second section, we examine the effects of Telemedicine, and other forms of digital solutions, which constitute the pillars of Digital Healthcare, that enable healthcare providers to maintain a level of connection with their patients during the COVID-19 pandemic. Both sections were based on relevant literature published in recent years.

Methodology

A systematic literature review of the chronic disease management and digital healthcare during COVID-19 was conducted. The online database used was Pubmed with no publication date time limit, given COVID – 19 emerged in 2019. The database was searched using not only the appropriate terms but also their combinations. The following search terms performed in the online database were:

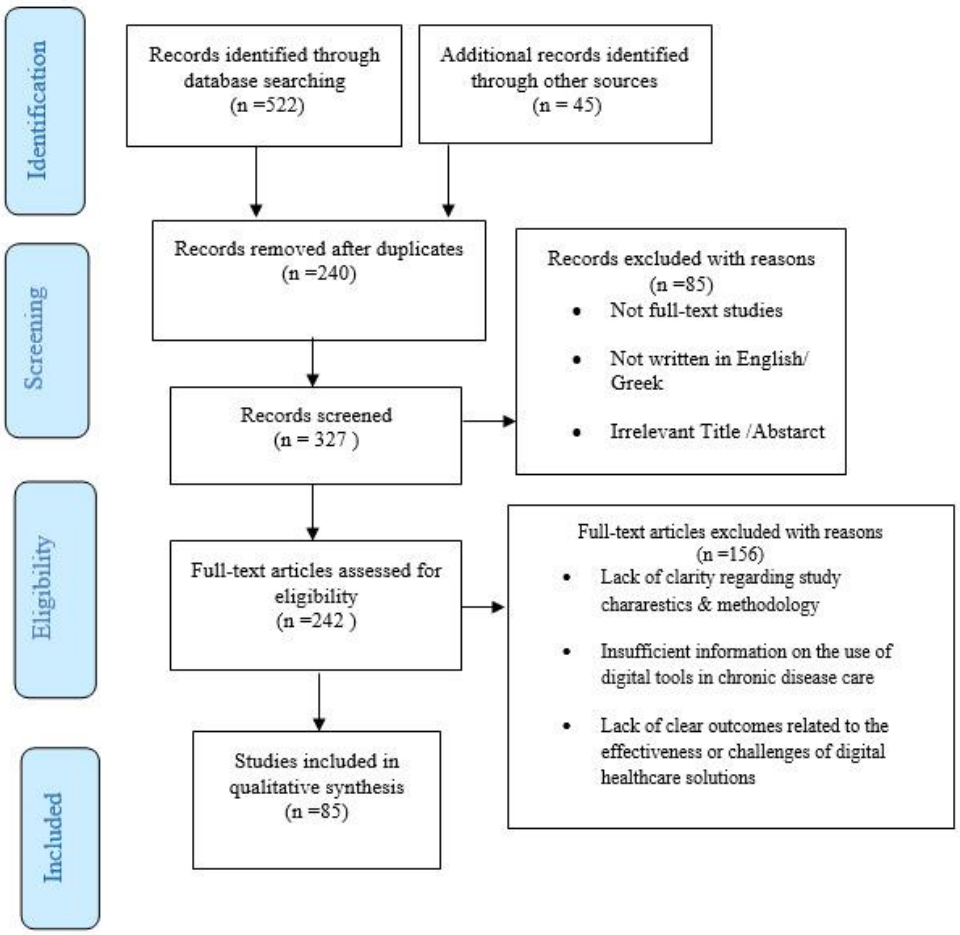
("Chronic Disease Management" OR "Chronic Disease") AND ("COVID-19 Pandemic" OR "COVID-19" OR "Coronavirus") AND ("Digital Healthcare" OR "Telemedicine" OR "Telehealth")

("Chronic Disease") AND ("COVID-19") AND ("Digital Healthcare" OR "Telemedicine")

After the data was collected and categorized, a detailed summary of the findings will be written. Publications that include empirical studies will also be included. Publications will be excluded if they do not include information relevant to the purpose of the study. Papers and references will be excluded when only the abstract and not the full text are available. Posts will be excluded if they are not written in English or Greek. A detailed

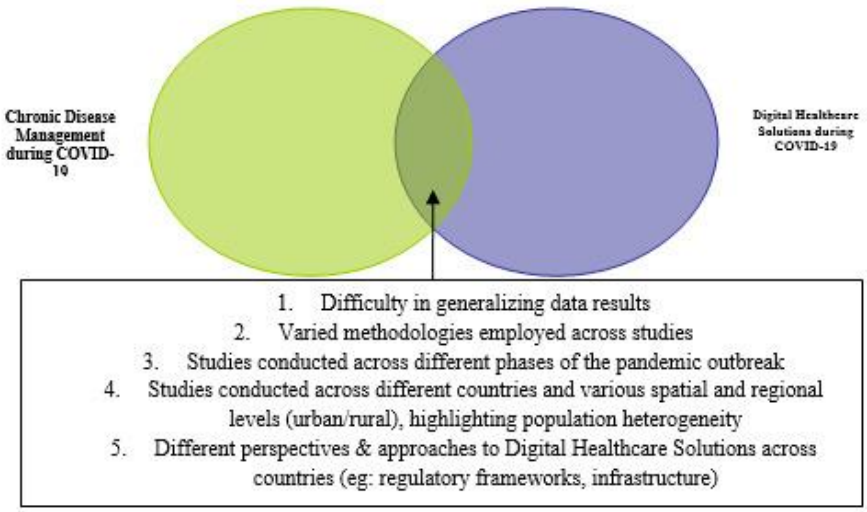
breakdown with all selection criteria from identification to inclusion of papers are also presented in the above Prisma diagram (Moher D, Liberati A, Tetzlaff J, 2009)

Figure 1. Prisma Flow Diagram (Moher D, Liberati A, Tetzlaff J, 2009)



To address limitations of the studies we intend to employ a Venn diagram that uses overlapping circles to illustrate unions between areas. For that reason, we created a Venn diagram comparing study limitations for both sections of our study: 1) Chronic Disease Management and 2) Digital Healthcare solutions during COVID-19. The detailed diagram is presented below.

Figure 2. Venn Diagram Study Limitations



Chronic Disease Management & COVID-19

Chronic diseases impose a tremendous burden on society and the economy (Yu et al., 2023). Conversely, evidence suggests disruptions in health services occur during pandemics (Javanparast et al., 2021). Indeed, the prevalence of COVID-19 infection has become a clinical threat to the general population and healthcare staff around the world (Haybar et al., 2020). As an example, during the pandemic, there was drastic reduction in the number of hospital admissions for any medical conditions different from COVID-19 (Mauro et al., 2020). Healthcare services have experienced a direct influence, especially in routine care, which has significantly affected patients dealing with chronic diseases. This includes reduced access primary care, postponement of elective medical and surgical interventions, and disturbances in screening programs (Iftekhar et al., 2021)(Wyper et al., 2020).

Disruptions in delivery of care

During the first wave of the pandemic, a significant reduction or complete cancellation of scheduled health appointments was observed, as reported by a comprehensive survey involving health professionals from 47 countries (Chudasama et al., 2020). This survey also revealed that only a small percentage of appointments, around 14%, were conducted in person, while the majority of visits were replaced by virtual sessions.

The Survey of Health, Ageing and Retirement in Europe (SHARE) found that people aged over 50 with a chronic condition were, on average, 40% more likely to report forgoing or postponing medical care during the first few months of the pandemic than those without a chronic condition (OECD/European Union, 2022). On average, 37% of people with a chronic health condition had some care cancelled or postponed compared with 26% among those without a chronic condition (OECD/European Union, 2022).

Cancer screenings, dropped during the pandemic. Decreases in screening have resulted in the diagnoses of fewer cancers and precancers. The delayed screening and treatment for breast and colorectal cancer results in otherwise preventable deaths in the United States (Hacker et al., 2021). A study on the impact of delays in cancer diagnosis in adults and children estimated that between 3291 and 3621 avoidable deaths will have occurred from 5 cancer types in the 5 years after diagnosis compared with the pre-pandemic period. An additional 59,204 – 63,229 years of life lost will be attributable to delays in cancer diagnosis alone as a result of the first COVID-19 lockdown in the UK (Lignou et al., 2022).

There was an 81–90% reduction in regular laboratory re-examinations in two of the most common chronic diseases managed in Primary Healthcare: diabetes mellitus and dyslipidemia (Stachteas et al., 2022).

Apart from poorer health outcomes due to COVID-19 infection, access to transplantation and dialysis for patients with kidney failure was limited during the pandemic. Organ donation as well as transplantation rates have fallen, notably during the early phases of the pandemic, due to logistical barriers in organ transportation, reduced number of donors as well as reductions in trauma and other emergency department admissions. Additionally, many transplantation centres suspended their programs due to concerns of post-transplant acquisition of COVID-19, thereby redeploying medical teams and limiting hospital capacity. Anticipating surgical procedure scale-backs and cancellations will not only affect patients with CKD requiring immediate vascular access, but also create greater strain on medical staff in the future to clear the growing backlog of cases (Deng et al., 2022) (Kapuria et al., 2021).

Mental health impact of COVID-19 to people with chronic disease

The social disruption accompanying the response to the COVID-19 pandemic has in turn adversely affected the management of chronic diseases, as well as the socioeconomic circumstances of the poorest counties (Islam et al., 2021). The COVID-19 pandemic has required rapid adaptation of care delivery, supported by governmental and national body recommendations, but has created a conflict around where care priorities should lie (Wake et

al., 2020). Chronic diseases are influenced by a range of individual, social and economic factors, including our perceptions and behavior (Fekadu et al., 2021). The psychological or mental health impact of the COVID-19 pandemic on both people with chronic diseases and their related healthcare providers has affected the safety and quality of care (Mboweni & Risenga, 2022). Studies indicated that individuals with a chronic illness experienced reduced psychological wellness and increased anxieties and concerns related to the COVID-19 pandemic (Rapelli et al., 2020).

The role of pharmacists in managing chronic diseases during the COVID-19

During the pandemic period, telephonic mode of counselling was widely being used by the pharmacists to provide the information regarding disease and medication related queries. As health care professionals, pharmacists are at the forefront of the pandemic in providing testing and educating the public about the virus, the tests used to detect the virus and antibodies, and the different treatment options for symptoms associated with the virus (Como et al., 2020). Shortages of medication used to manage chronic conditions were also observed at the beginning of the COVID-19 pandemic due to global supply chain disruptions (Kendzerska et al., 2021). Pharmacists reported that they faced shortage of medications which were used for chronic illness like diabetes, hypertension, HIV and oncology drugs. (Ramakrishnan et al., 2023).

In some cases, stockpiling was observed at the beginning of the lock-down, probably induced by patients' fear of running out of medication; this tendency was described for treatments of epilepsy and chronic cardiovascular diseases, and seems to have somewhat preserved adherence in the following months. Some authors have suggested a potential downside to this behaviour, associating the tendency to stock- piling drugs believed to be potentially effective against COVID-19 (often in the absence of adequate evidence-based support) with shortage episodes (Olmastroni et al., 2023).

Lifestyle disruptions of people with chronic disease during COVID-19

Patients with chronic conditions faced lifestyle disruptions due to the COVID-19 pandemic, specifically in physical activity, sleep, stress, and mental health, which needed to be better addressed (Kendzerska et al., 2021). Individuals dealing with chronic illnesses had to oversee their day-to-day tasks, dietary intake, physical activity, and maintain consistent ongoing monitoring. Navigating their preexisting conditions presents a formidable obstacle, particularly exacerbated by challenges in acquiring necessary provisions and encountering barriers to healthcare facilities and providers. The imposition of lockdown measures is anticipated to have disrupted their

established disease management routines. A study showed that the implementation of lockdown to contain the COVID-19 has affected the routine life and health of patients with chronic diseases like diabetes, mental health and hypertension (Saqib et al., 2020).The pandemic has highlighted the need for targeted psychosocial intervention for vulnerable families, to mitigate current mental health burden and prevent chronic psychological distress. Parents expressed profound anxieties regarding their unwell child's heightened susceptibilities. (McLoone et al., 2022).Chronic conditions pose challenges for children, adolescents, and young adults, affecting their mental health and overall well-being thus prompting a shift to telemental health from in-person care (N. Lau et al., 2021).

Digital Healthcare for Chronic Diseases & COVID-19

Pandemics and other public health emergencies typically lead to a surge in demand for medical care, which overwhelms local capabilities (Hong et al., 2020). In health-care settings where resources are constrained, or where patient access is challenging, equivalence of telemedicine with usual care might represent substantial benefit. (Ramanathan et al., 2022). Medical examination remains the cornerstone of practice, but telemedicine decreases the number of patient attendances as consultations take place on the telephone, video calls, exchanges of photographic documentation, mobile phone messages, e-mail or other support applications for computers or mobile phones (Perrone et al., 2020).

During the COVID-19 pandemic, in-person care for individuals with chronic conditions have been decreased due to government restriction of elective and non-urgent healthcare visits, greater instilling fear over potential COVID-19 exposure during in-person visits (Kendzerska et al., 2021). A cause for concern associated with this pandemic is the severe and widespread disruption of prevention and treatment services for populations affected by chronic conditions. Outpatient care for children and adolescents with chronic conditions needs to be continuous and programmed, encompassing comprehensive care, with periodically scheduled consultations, exams, and procedures, to promote quality of life and reduce mortality (da Silva Casemiro et al., 2022).

Governments acted rapidly at the beginning of the pandemic to promote the use of teleconsultations by introducing enabling legislation and revising laws ensuring continuity of care for people with chronic diseases, thus transitioning rapidly to remote care and monitoring. In parts of the United Kingdom, there was a rapid expansion of remote monitoring programs to keep track of people with chronic conditions in their own home. The data allowed health professionals to spot trends in a patient’s condition

and identify signs of deterioration before they require hospital admission (OECD/European Union, 2022).

During the recent COVID-19 pandemic, more attention has been drawn to telehealth to emphasize its role in reducing hospital visits from both COVID-19 and non–COVID-19 patients and supporting home isolation in patients with mild symptoms. The needs of patients with chronic diseases tend to be overlooked during the pandemic. With reduced opportunities for routine clinic visits, patients with chronic diseases are adopting various telehealth services. Telehealth for patients with chronic diseases during the pandemic is increasingly important, and researchers suggest that the innovative adoption of digital technologies can continue to provide valuable patient-clinician communication, not only for clinical care but also for maintaining adherence and behavior changes in patients (Liu et al., 2020).

The widespread adoption of telehealth, which many proponents have advocated for years, is one of the most significant shifts in healthcare triggering regulatory changes that lowered the barriers to telehealth in several countries worldwide, resulting in the large-scale expansion of its use (Gonçalves et al., 2023). Health systems have adopted telemedicine with remarkable speed not only for COVID-19 related care, but also for chronic disease management. But without proactive effort to ensure equity, the current wide-scale implementation of telemedicine may increase disparities in health care access for vulnerable populations with limited digital literacy or access, such as rural residents, racial/ethnic minorities, older adults, and those with low income, limited health literacy, or limited English proficiency (Khoong et al., 2020). Virtual care, using a person's in-home technology, has created an opportunity for people with chronic conditions to maintain access to their health-care team while limiting in-person contacts. Virtual care presents the added benefits of reducing travel time and cost, and time away from school or work (Wittmeier et al., 2021).

These issues have led to a renewed focus on telehealth, as a means of providing care to both patients with COVID-19 infections and those requiring other routine clinical services without increasing the risk of potential exposure for patients, clinicians, and staff (Lapão et al., 2021). There is increasing uptake of digitally enabled remote care. A growing body of evidence suggests that care delivered via telemedicine can be both safe and effective, in some cases with better outcomes than conventional face-to-face care (Kaye et al., 2020). During the COVID-19 pandemic, telehealth was expanded without the opportunity to extensively evaluate the adopted technology's usability (Gonçalves et al., 2023). The existing provincial telehealth infrastructure has been able to accommodate some of the need for video-based appointments during the pandemic but lack the flexibility and capacity to meet increasing demands, and still require patients to attend a

telehealth site in person to receive care. Nevertheless, its impact on telemedicine usage in rural and remote regions remains uncertain. While telemedicine adoption did surge in rural and remote areas during the pandemic, its growth was comparatively higher in urban and less rural locales. Future research should be done into potential obstacles that rural patients face in accessing telemedicine and explore how rural telemedicine affects patient healthcare utilization and outcomes (Chu et al., 2021).

Advantages of Digital Healthcare for patients with chronic diseases

Application of information and communication technologies as the core component has contributed to routing of COVID-19 patients resulting in lower infection level both among patients and healthcare providers (Samofalov et al., 2020). Participants of study specifically noted that virtual care allowed them to receive care safely by preventing unnecessary exposure to the virus. Virtual care was seen as valuable for follow-up appointments or receiving prescriptions because they were not required to be physically present. Nearly half of all respondents noted the reduction or elimination of travel and associated costs to the hospital (e.g. parking, gas) as benefits of virtual care. In particular, respondents residing in rural areas expressed that virtual care reduced the burden associated with the travel, cost, and stress of travelling to in-person appointments (Chan-Nguyen et al., 2022)(Smithson et al., 2021). The absence of travel allowed patients to spend less time on their consultation in a primary care clinic. In addition, many patients reported not having to ask their employer to be released from work, not having to deal with unexpected road conditions (traffic jams, winter driving), losing time to find a parking space and waiting several minutes in a waiting room (Poitras et al., 2022).

Whether it is in the form of video visits, telephone calls, or other means, the use of virtual communication has sharply increased due to the COVID-19 pandemic. Results of study showed that the use of digital health services can be extensive and can be used for many different purposes and in different population groups. The development of digital services reflects a shift toward the provision of care regardless of time and place. It also reflects a shift toward emphasis on patient-centered care, meaning activating and engaging patients in their own care as they use digital services for various health-related purposes. Despite the development of digital services, many challenges (eg, adequate infrastructure) still prevail worldwide (Rosenlund et al., 2023). Although there is no singular strategy to apply digital health tools across the affected countries for pandemic control, these tools are among the primary policies that governmental and private companies have considered for disease control (Niakan Kalhori et al., 2021).

Telemedicine has promoted the transition of chronic disease treatment from hospitalized treatment to interactive communicative remote/mobile treatment (Wang et al., 2021). Recent changes to federal regulations have allowed more patients to receive care and more providers to deliver care through telehealth during the COVID-19 pandemic. Telehealth visits with a clinical pharmacist offer several advantages, including flexibility in scheduling chemotherapy education, pain management, anticoagulation visits, primary care, and specialty care disease management; however, limitations involving patient factors and technological issues may be encountered (Segal et al., 2020). A study explored the effect of tele-visit program on chronic patients' medication adherence during the COVID-19 pandemic, before and after the intervention. The present findings showed that there is no significant difference between phone-based tele-visit program for chronic patients versus face-to-face visits. This study revealed no statistically significant difference in patients' medication adherence before and after the tele-visit program (Norouzi et al., 2023).

Between 2019 and 2020, in-person consultations fell by almost 20% on average across EU countries. In-person consultations fell by more than one-third in Lithuania and Spain, and by less than 10% in the Czech Republic and Finland. However, the declines in in-person consultations were completely offset by increasing numbers of teleconsultations in Poland, Denmark and Spain, and partly offset in many other countries. The share of teleconsultations doubled during the first year of the COVID-19 pandemic, from 11% in 2019 to 22% in 2020 (on average across EU countries). Before the pandemic, consultations via phone or video accounted for fewer than 10% in all but two EU countries. Denmark had the highest share of teleconsultations pre-pandemic, at 45%. The Eurofound e-survey data highlight that the proportion of adults who reported having a medical consultation online or by phone increased dramatically during the pandemic: by mid-2020, almost one in three adults had used a teleconsultation, a proportion that went up to 40% by early 2021. Countries where the use of teleconsultations was highest in mid-2020 also had higher growth rates between mid-2020 and early 2021, suggesting an increasing divergence. (OECD/European Union, 2022).

A study that covers a wide range of patient with chronic diseases interests in various types of telehealth. showed a positive attitude towards telemedicine among participants. 91% of participants thought that telemedicine could save time, and that people with COVID-19 symptoms or diagnoses should use telemedicine for medical care. In total, 90% of the participants were willing to learn about telemedicine, and 86.9% thought that telemedicine had the potential to play an important role in providing healthcare. In this study, 85.3% of participants thought people with chronic

diseases should use telemedicine for their mental healthcare. (Haque et al., 2022). Further research showed that when chronically ill patients believe that a telehealth care system's information, system and service quality are good, they will feel that the telehealth care system is easy to operate and can be learned and used without much effort. (Lan & Chen, 2022).

Virtual care will likely have many advantages that are not yet recognize. Many inter-professional teams transitioned to telehealth to continue to provide care while minimizing in-person interaction to reduce risk of transmission (Tewksbury et al., 2021). Perhaps virtual care will be more tailored to the pedagogical demands of today's digital generation, and benefit health-care outcomes more profoundly than in-person visits, in which patients may be less inclined to engage. However, it will also introduce new barriers related to technology, connectivity, communication and relationship building that risk perpetuating care inequities (Wittmeier et al., 2021).

Digital Healthcare & Pharmacists

Several countries expanded the roles of community nurses and pharmacists to ensure care continuity during the pandemic (OECD/European Union, 2022). Telehealth tools are now integral to healthcare, improving access, enhancing patient experiences, and ensuring care continuity. Pharmacists can contribute to disease management telehealth efforts though the utilization of a comprehensive collaborative practice agreement, allowing medications to be started, stopped, or adjusted based on patients' needs (Stulock et al., 2022). Implementing a telehealth model for medication management can also boost patient engagement, improve health outcomes, cut costs, and elevate clinical care. Tele-medication management clinic services offer improved patient care access, lowered hospital infection risks, and enhanced convenience, thus elevating care quality during health crises. The implementation of this model demonstrated a significant improvement in the clinical outcomes of patients and might help to improve the overall satisfaction during and after the peak pandemic period (Mohiuddin et al., 2021).

Community pharmacists' roles and responsibilities during the COVID-19 emergency suggest that they are able to play an important role not only in the management of emerging infectious diseases, but also in preserving continuity of care for people with chronic disease. This process, which had already started in some countries a few years ago, was also greatly and effectively accelerated during the pandemic. In many countries, the community pharmacist is now in charge of some of the tasks usually covered by doctors, so that doctors are allowed to spend their time more effectively on most complex cases, minimizing the number of medical consultations. The increasing use of telemedicine, as well as the greater involvement of

community pharmacist in the management of chronic patients, could be successful strategies for increasing adherence even after the pandemic (Olmastroni et al., 2023).

Digital Healthcare Solutions & Chronic Diseases: Evidence from studies

Individuals with kidney failure faced restricted availability of transplantation and dialysis treatments during the pandemic (Deng et al., 2022). The process of organ donation and transplantation has been notably disrupted, particularly in the initial stages of the pandemic, owing to challenges in transporting organs, a decrease in the number of donors, and reductions in trauma and other emergency admissions to hospitals (COVIDSurg Collaborative, 2020). The COVID-19 pandemic required an urgent pivot from traditional office visits to alternate models of clinical care. Care was initially provided by telephone, which has not been evaluated for its effectiveness by patients and providers. A study reporting patients' and nephrologists' perceptions and preferences surrounding telephone consultation showed that patients were very comfortable with telephone consultation and felt their concerns and preferences were addressed equally well compared with in-person visits. Most patients preferred telephone consultation due to less time spent on waiting and traveling to the clinic and less financial resources spent on parking. (Heyck Lee et al., 2022).

The COVID-19 pandemic necessitated a swift shift from in-person visits to teleneurology consultations. While teleneurology is common in acute stroke care, its use in other neurological fields was limited. This review explores the pandemic's impact on caring for chronic neurological conditions and how academic institutions have adapted. The requirement for "social distancing" has led to a significant increase in teleneurology visits, likely to persist for several months. This shift may mark a lasting move towards incorporating virtual technology into medical care (Roy et al., 2020).

The use of telemedicine has surged among rhinologic patients amid the COVID-19 pandemic. However, this shift in practice might raise concerns about perceived lower-quality interactions with healthcare providers, potentially affecting patient satisfaction. Remarkably, patient contentment with telemedicine during the pandemic mirrors that of in-person visits. Video consultations offer a feasible substitute to clinic appointments, ensuring elevated satisfaction levels are upheld (Morisada et al., 2021).

Accurate monitoring of physiological parameters without the need for periodic testing or frequent hospital visits is highly beneficial, especially during the COVID-19 pandemic (Jiang et al., 2022). Tele-monitoring interventions can range from low to high complexity and should match the risk profile of the patient. Regardless of the tele-monitoring platform, the

integration with clinical support for medical therapy optimization cannot be overemphasized (Alvarez et al., 2021).

Chronic obstructive pulmonary disease (COPD) is an escalating epidemic with significant economic implications. Education, physical activity, and pulmonary rehabilitation are crucial components of COPD management, often facilitated through telemedicine. According to a study during COVID-19 regarding telemedical interventions for COPD Management showed that such interventions have demonstrated comparable or even improved outcomes compared to conventional care. (Koh et al., 2023).

Research indicates the feasibility of remote consultations for Parkinson's disease, yet the practical experiences of individuals, particularly those with cognitive decline, remain underexplored. The complex interplay of communication challenges, cognitive impairments, and involving both patients and caregivers in discussions about the future pose unique challenges. Research highlights the pros and cons of remote consultations for this group, underscoring the need for enhanced support, training, preparation, and heightened awareness of pertinent issues to optimize these consultations. (Pigott et al., 2022).

The COVID-19-period represented a challenge for patients' quality of life particularly for social life and relationship. According to a study about Psychological teleconsultations in patients suffering from chronic skin diseases during the COVID-19 era results remark the importance and the benefits derived from both psychological supports and teledermatology services for patients suffering from chronic skin-diseases which may have constituted a major risk for the occurrence and recurrence (Marasca et al., 2022).

COVID-19 pandemic has boosted telemedicine in medical clinical practice. A study evaluated patients' satisfaction and opinion about televisits in a large group of patients with chronic neurological disorders. Results showed that patients with chronic neurologic disorders rated experience with televisits satisfactory. (Rosellini et al., 2023).

A study explored Telemental health providers' post-pandemic intentions to sustain telemedicine, a transformative shift prompted by COVID-19's impact on mental health care delivery. A significant portion expressed commitment to ongoing telemedicine utilization, indicating a potential long-term trend. Enhanced intention correlated with factors like social influence, perceived usefulness, telemedicine caseload, ease of use perception, and facilitating conditions (Wilczewski et al., 2022).

The swift expansion of telemedicine during the COVID-19 pandemic has proven its efficacy, especially in cases of epilepsy compared to traditional in-person visits. This study aimed to assess the clinical

characteristics of pediatric epilepsy patients who received telephone-based consultations during the pandemic. Consequently, utilizing telemedicine through telephone calls could offer valuable support for managing childhood-onset epilepsy during the pandemic(Kikuchi et al., 2022).

Barriers of Digital Healthcare

Telemedicine visits were perceived as patient-centered, given that they occurred at more accessible times and settings for patients. However, challenges arose due to the absence of in-person interaction and the perceived increase in workload for clinical staff. While telemedicine raised privacy concerns, it also provided a way to involve family members and other care team members in healthcare delivery. (Harsono et al., 2022).

A survey demonstrated that patients are willing to use telehealth, but barriers still exist (Portnoy et al., 2020). Technological challenges were cited as a concern for older adults or those with little technological literacy(Chan-Nguyen et al., 2022). It is interesting to note that according to results from a study a large number of the participants stated that they adopted eHealth only out of necessity, while others stated that they adopted it because no other services were available (Alsharif, 2022).

It is important to note that the feasibility and effectiveness of remote interventions remain uncertain. A study addresses this gap, revealing that while remote treatment during COVID-19 can engage patients and families, the understanding of its efficacy, target groups, contexts, and comparison with in-person therapy is still evolving (N. Lau et al., 2021).

Digital health and telemedicine solutions, which exploded during the pandemic, may address many inefficiencies and deficiencies in chronic disease management, such as increasing access to care. Optimizing healthcare, especially for diverse and vulnerable patients with chronic diseases during this COVID era, will move healthcare and medicine to actualize its highest virtues (Seixas et al., 2021).

After examining patients' Willingness to Pay for telemedicine among those with chronic health conditions, a study determined that this willingness varied significantly across different studies for countries like the United States, Italy, Australia, United Kingdom, South Korea, Norway and Belgium, ranging from 19% to 70%. Among the reported factors, age and proximity to preferred healthcare facilities were the only variables significantly associated with Willingness to Pay for telemedicine interventions. Based on the findings, practical recommendations are suggested to enhance Willingness to Pay for telemedicine in future interventions. (Chua et al., 2022). Moving forward, a better understanding of telehealth acceptance is needed in the context of patient sociodemographic factors (e.g. age, digital literacy, type of chronic illness), and in terms of

emerging concerns such as patient privacy and confidentiality of biodata. Moreover, prospective research should evaluate the long-term cost-effectiveness of adopting such systems, compared to the primary care clinical practices that telehealth seeks to supplement or even substitute(J. Lau et al., 2021).

Relying solely on telehealth is not a universal solution for enhancing healthcare. This endeavor will require a united commitment from government bodies, institutions, and community volunteers to guarantee accessible and enhanced healthcare, encompassing both advanced and simpler technology solutions(McElroy et al., 2020).

Health inequalities & Digital Healthcare

Difficulties in accessing healthcare services are a long-standing challenge in the healthcare system. Health inequities are delineated by race, ethnicities, geographic regions, socioeconomic status, and other social determinants of health. Inequities in access have considerable influence on quality of life and related outcomes (Williams & Shang, 2023). Disparities in access to telemedicine care today can easily exacerbate the preexisting challenges in providing primary care and chronic disease management for vulnerable populations. By employing simple, effective strategies for increasing the reach and adoption of digital health now, we may mitigate disparities resulting from the current crisis and be better positioned to ensure more equitable telemedicine in the future (Khoong et al., 2020). Findings highlight the potential for mHealth tools to improve disease self-management and reduce health disparities among individuals with chronic health conditions (Camacho-Rivera et al., 2020). Telemedicine access differences may compound disparities in chronic disease and COVID-19 outcomes. Institutions should monitor video visit use across demographics and equip patients, clinicians, and practices to promote telemedicine equity (Rodriguez et al., 2021).

In response to the COVID-19 pandemic, many low and middle-income countries (LMICs) expanded access to telemedicine to maintain essential health services. As COVID-19 spread, many governments expanded regulatory permissions rapidly, and some incorporated reimbursement policies to facilitate conversion of in-person visits to telemedicine consultations. Telemedicine can play a key role not only in maintaining essential health services for chronic disease patients in LMICs during the Covid-19 pandemic, but also in long-term primary health care strengthening. Despite the advantages of telemedicine for treating chronic, non–urgent medical problems, there must be a clear pathway to referral for in-person care when a face-to-face physical examination or procedure is indicated (Hoffer-Hawlik et al., 2020). It is important to continue to monitor

access to health care services to prevent the growing of health inequities, particularly as cost sharing is reintroduced for telehealth for many health plan members (Gordon & Kim, 2022). Moving forward, medical and public health professionals may continue to take an active approach to engaging patients with underlying conditions in available telehealth services, particularly those who are members of lower socioeconomic status and aging populations (Horrell et al., 2021).

Results

Chronic diseases impose a tremendous burden on society and the economy (Yu et al., 2023). During the first wave of the pandemic, a significant reduction or complete cancellation of scheduled health appointments was observed, as reported by a comprehensive survey involving health professionals from 47 countries (Chudasama et al., 2020).

The Survey of Health, Ageing and Retirement in Europe (SHARE) found that people aged over 50 with a chronic condition were, on average, 40% more likely to report forgoing or postponing medical care during the first few months of the pandemic than those without a chronic condition (OECD/European Union, 2022). On average, 37% of people with a chronic health condition had some care cancelled or postponed compared with 26% among those without a chronic condition (OECD/European Union, 2022). The psychological or mental health impact of the COVID-19 pandemic on both people with chronic diseases and their related healthcare providers has affected the safety and quality of care (Mboweni & Risenga, 2022).

Shortages of medication used to manage chronic conditions were also observed at the beginning of the COVID-19 pandemic due to global supply chain disruptions (Kendzerska et al., 2021). Pharmacists reported that they faced shortage of medications which were used for chronic illness like diabetes, hypertension, HIV and oncology drugs. Among the other drugs, Hydroxychloroquine (HCQ) was one of the drugs with great demand due to its prophylaxis use in the COVID-19 (Ramakrishnan et al., 2023). Several countries expanded the roles of community nurses and pharmacists to ensure care continuity during the pandemic (OECD/European Union, 2022).

Telemedicine visits were perceived as patient-centered, given that they occurred at more accessible times and settings for patients. However, challenges arose due to the absence of in-person interaction and the perceived increase in workload for clinical staff. While telemedicine raised privacy concerns, it also provided an avenue to involve family members and other care team members in healthcare delivery (Harsono et al., 2022). Technological challenges were cited as a concern for older adults or those with little technological literacy (Chan-Nguyen et al., 2022). It is interesting to note that according to results from a study a large number of the

participants stated that they adopted eHealth only out of necessity, while others stated that they adopted it because no other services were available (Alsharif, 2022).

Conclusion

The COVID-19 pandemic has highlighted the fragility of healthcare systems and existing inequities in access to care and health outcomes for vulnerable populations across the globe (Mobula et al., 2020). Effective COVID-19–era chronic disease management involves the development of synchronous and asynchronous virtual platforms that harness the power of virtual social networks to overcome social and economic barriers to access, supporting critical healthy lifestyle changes that form the bedrock of chronic care (Mirsky Jacob & Daniel, 2019). Findings from a global survey showed healthcare professionals have adapted to new ways of delivering care using telemedicine in order to reduce face-to-face contacts. Adapting new ways of virtual healthcare and digital technologies is imperative to allow healthcare professionals to continue routine appointments (Chudasama et al., 2020). The increasing use of telemedicine, as well as the greater involvement of community pharmacist in the management of chronic patients, could be successful strategies for increasing adherence even after the pandemic (Olmastroni et al., 2023). However, this course of action requires multiple partnerships to rebuild, reframe, and support community resilience (Balasuriya et al., 2023). These changes should aim to maximize the capacity and effectiveness of primary care but must also ensure that health inequalities are narrowed not widened (Levene et al., 2020). In general, longer-term public health policy responses are needed to ensure that the COVID-19 pandemic does not increase health inequalities across different groups of patients (Kim et al., 2022). Policy makers must learn from this experience for future pandemic preparedness, to manage any second waves, and to ensure sufficient and efficient testing is readily available in primary health-care facilities. (The Lancet Respiratory Medicine, 2020).

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