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THE USE OF TELEHEALTH DURING AND AFTER COVID 19 AMONG PHYSIOTHERAPISTS IN IRELAND

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<p>Abstract:</p> <p>The main aim of this study was to explore the use of telehealth services among the Physiotherapists in Ireland in the presence of COVID-19 and after COVID-19 restrictions lifted. It analysed gaps in adoption, facilitators, and obstacles of telehealth solutions in Ireland. A cross-sectional survey research design was employed to collect the data from 133 physiotherapists and sample was provided while delivering Physiotherapy services during the COVID-19(from March 2020 to March 2022) pandemic. The data were collected through Qualtrics using a self-developed questionnaire. The validity and reliability of the questionnaire were examined through content validity, Kuder-Richardson (.73) and Cronbach's coefficient alpha (.76).</p> <p>The survey was available from 8th of June 2023 to 6th July 2023 to Physiotherapist currently working in Ireland. The results revealed that the use of telehealth services significantly reduced after the Covid-19 pandemic restrictions lifted and the most popular forms of telehealth modes were video consultations and telephone among the physiotherapists. The survey findings explored that improved patient's accessibility; public acceptance, cost-effectiveness, and seamless healthcare delivery were the major enablers of telehealth in Ireland. Additionally, current telehealth implementation was impractical and inappropriate for physiotherapy interventions including patient's preference for face-to-face contact, poor infrastructure, insufficient facilities, inadequate funding, and lack of job satisfaction. The prior findings exhibited that telehealth solutions can be blended with traditional methods through greater infrastructure development. It is suggested that investigations should establish telehealth efficient practices in complex therapeutic practices at a wider range.</p>	
Keywords Telehealth, Physiotherapy, Telehealth Enablers, Barriers to Telehealth, Continuity of eHealth care	

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ABBREVIATIONS:

EHR: Electronic Health Records

USA: United States of America

HSE: Health Service Executive

AI: Artificial Intelligence

ICT: Information and Communication Technology

F2F: Face to Face contact

1. INTRODUCTION

In the 1990s, telehealth was established to serve basic remote services beyond geographical limits. During those times, the telephone service was the best medium of communication. Since then, with the impressive and rapid development of digital technologies and the internet, telehealth has reshaped the delivery of patient-healthcare services (Wang and Xu, 2023). Today, the delivery of healthcare services is channelized using digital telecommunication technologies. Telehealth is the method that delivers healthcare solutions to patients by integration of professionals and digital technologies. Telehealth benefits healthcare providers, professionals, patients, and the general population (Sari *et al*, 2023). The term "digital health" is a subcategory of eHealth within the use of advanced computing, information technologies, and Artificial Intelligence (AI). The term "telehealth" is interchangeably used with telerehabilitation, telemedicine, and digital health practice and there is no universal definition and terminology for digital health (Lolich *et al*, 2019; Reynolds *et al*, 2021). This term can be understood under the umbrella of distance healthcare using Information and Communication Technology (ICT) devices. The selection of devices is based on what kind of healthcare solution is required whether synchronised or asynchronised (Cottrell and Russell, 2020).

Telehealth means to deliver remote health services including telecommunication devices, virtual consultations, and monitoring devices. It facilitates patients with healthcare solutions without physical visits (Lane and Clarke, 2021). It can be defined as implanting and practising health services through the means of digital technologies. It improves, develops, and expands health systems including diagnosing, imaging, recording, predicting, and monitoring consumers (Kaboré *et al*, 2022).

Digital health encompasses a wide range of services and solutions including telehealth, digital mobile apps, wearable devices, virtual reality, and AI. It has the potential to increase healthcare access, improve professional and patient connections, reduces costs, and prevents face-to-face contacts. New exciting opportunities and advancements accelerate healthcare coverage from urban to rural areas. Appropriate funding, a user-centred approach, and quality infrastructure can establish the best telehealth practices (Smith *et al*, 2020). Telehealth as a secondary category of eHealth services is rapidly gaining attention. Clinicians and professionals are utilizing healthcare delivery and technology as alternatives to face-to-face consultations. Though, this care pathway limited time wait and patient visits. However, this mode of healthcare delivery needs to be investigated either in the eHealth system or under specific settings (Tully *et al*, 2021) and this study evaluates telehealth sustainability within the discipline of physiotherapy profession in Ireland.

Ireland established an eHealth system as a national infrastructural investment in the year 2013 in collaboration with a system reform group (Jacquemard, 2021). Irish health providers introduced the eHealth strategy to integrate Information and Communication Technology (ICT) into the Irish health system (Lolich *et al*, 2019), especially the HSE. The Government of Ireland, the Department of Health and state agencies are responsible to implement digital health including public awareness, public acceptance, funding, enabling, developing a digital ecosystem, and public-professional engagements (Department of Health, Ireland, 2023). The eHealth strategy delivers healthcare seamlessly with five capabilities. These capabilities are healthcare delivery enablement, electronic health record, national

support system, gross setting information integration, and health services insight into information management (Lolich *et al.*, 2019).

The covid-19 pandemic has revolutionized healthcare. Virtual technologies are increasingly influencing healthcare models. Ireland is at the cusp of public health transition with advanced AI, automation, and digital therapeutics. Irish digital health is addressing enablers and barriers to underline healthcare opportunities. Digital health sustainability is influenced by several enablers such as government support, patient-centred approach, ethics, skills for consumers, risks, and safety, infrastructure with interoperability and public trust (Glynn, 2023). Besides these considerations, substantial gaps are found between policy framework and implementation (Reynolds *et al.*, 2021).

Fragmented Irish healthcare system and regulatory challenges slower down policy implementation (eHealth Ireland, 2023). These barriers delayed the scalability, new strategical adaption, and viability of sustaining digital health. Ireland is growing with the topmost biopharma, MedTech, and digital health globally. Ireland has a strong ecosystem that takes place in the convergence of AI, tech, and advanced analytics. The present “digital health thrives” is recognized as a centre of excellence. Digital health providers make sure of their availability, adaptability, and mobile workforce. Yet digital health integration is lagging due to the challenges of sustainability, commercialization, and development (Dermody, 2023; Galvin, 2020).

1.1 Telehealth Solutions and Irish Physiotherapists:

Telehealth solutions involve information technologies to reduce travel costs, physical visits, access professionals, and ensure continuous health services (O’Donovan *et al.*, 2020). Different eHealth devices are used around the world such as lung monitoring, blood pressure monitoring, glucometers, fitness monitors, sleep patterns monitoring, oxy meters, pulse rate monitors, and electric record systems (Irish Business and Employers Confederation, 2023; Jacquemard, 2021). All the data is transmitted back to the hospital where practitioners manage care flows for the patient. It is a proactive management process for chronic diseases. After piloted practices of telehealth care, several commercial telehealth deployments are being practised in different countries (Galvin, 2020; Reynolds *et al.*, 2021). Meanwhile, mainstream computing and AI are driving healthcare solutions with innovations and best practices. The number of telehealth solutions practices is increasing gradually in the segments of online professional consultation, ePharmacy, and eHealth digital apps.

In the Republic of Ireland, telehealth solutions are deployed by healthcare professionals, especially physiotherapists (Lolich *et al.*, 2019). This facility provides remote healthcare solutions through enhanced delivery services. The advantages of telehealth in Ireland included increased access levels for patients. For instance, individuals from rural areas can conveniently approach the efficiency of urban professionals. Ireland has slow development in its digital infrastructure and penetration for health services (Lolich *et al.*, 2019; O’Donovan *et al.*, 2020). Physiotherapists adopted this source of healthcare solutions to conduct virtual consultations through video conferencing, telephone and used exercise prescription software and exercise videos. This source allows them to examine, prescribe exercises, and monitor the progress of patients. Using this remote monitoring system, physiotherapists and professionals adhere to treatment strategies. It is a customized monitoring source that can be

accessed and managed upon receiving feedback. Telehealth platform serves them with collaborative consultations among physiotherapists, orthopaedics, and professionals in real-time settings. Nevertheless, these beneficial practices are attracting other healthcare users.

Despite the rapid growth and benefits of telehealth, telehealth sustainability is not as significant as it should be (Galvin, 2020; Reynolds *et al*, 2021). Indeed, several efforts have been made to deal with challenges and issues that hamper the progress of telehealth adaptation. Irish public health system is not viable for connecting telehealth with traditional healthcare solutions (Galvin, 2020). Yet, companies are interested to input digital healthcare solutions in the Irish environment (Dermody, 2023) due to the existence of multiple opportunities to commercialise and develop telehealth solutions in Ireland (Galvin, 2020; Glynn, 2023). Private healthcare solution system significantly pursues individual commercial model, however public telehealth solutions are facing a lack of national collaboration, visionary implementation, and an opaque procurement system (Galvin, 2020). Further, there are challenges and issues related to lack of reimbursement, financial outlay, affordability, aged consumers' adoption, digital literacy, quality and accuracy of devices, access, and lack of professionals (Cottrell and Russell, 2020; Reynolds *et al*, 2021; Tully *et al*, 2021).

1.2 The current state of telehealth in Ireland:

The use of digital technologies is valued unanimously during Covid-19. That adoption revealed that eHealth can play a critical role to deliver accurate remote health services (eHealth Ireland, 2023). However, the importance and benefits of eHealth are not related to digital technology endeavours only. This requires digital infrastructure, regulatory complaints, monitoring, access, and reimbursement. Telehealth solutions deployment is complex when it is projected at a larger scale. It requires a standardised policy framework to connect people, the healthcare process, and digital technology. Irish government develops multiple policies to integrate revolution, innovation, and digital healthcare solutions (Jacquemard, 2021). This vision is promised to be implemented for the next decades. Irish policy attributed a patient-centric healthcare system to cost-effective transformation, and these include policies and initiatives such as Slainthecare, eHealth strategy etc. The Program for Government, Project Ireland 2040 National Development, Health Information and Quality Authority (HIQA), The Health Service Executive (HSE), and corporate plans actively existed around eHealth Ireland (Jacquemard, 2021; eHealth Ireland, 2023). A maximum number of eHealth programs are governed and managed by the National Telehealth Steering Committee at the national level.

The most impactful segment is digital fitness and individual well-being. Keeping the digital health market expectations, health service continuity, advancement, and sustaining telehealth, the Irish government is expanding telehealth settings including protocols of primary care centres, mental health services, e-pharmacy, private and public hospitals, and community care (eHealth Ireland, 2023).

Currently, the state of telehealth in Ireland is identified as growing with key enablers, though there are several challenges to promoting telehealth use. Meanwhile, there are multiple initiatives underway as mentioned above to drive telehealth implementation sustainability. The HSE in Ireland monitor real-time consultations, remote monitoring, educating digital services, and mental health support systems (Jacquemard, 2021; IMSTA, 2023). The initiative aims to improve healthcare access, increased

convenient solutions, and reduce costs. Subsequently, the condition of telehealth is satisfactory but scuffled with challenges (Reynolds *et al*, 2021), over all the prospect of Irish telehealth supports ongoing telehealth solutions. A valuable improvement needs to be placed for futuristic sustained telehealth services (Lolich *et al*, 2019; Lane and Clarke, 2021). Nonetheless, an effective national policy, initiatives, and hierarchical connectivity can address challenges and issues. This active engagement of healthcare providers and an inclusive optimized healthcare system can bridge gaps in healthcare solutions accessibility.

1.3 Digital Health Sustainability: In-depth critical analysis of Global Perspectives:

The covid-19 pandemic exposed the impact of health vulnerabilities on every area of life (Cascini *et al*, 2022). Amid the global chaos, structural deficiencies, insufficient patient care system, overlooked advanced healthcare technologies, and disproportional responses identified in high, middle, and low-income countries (Saisó *et al*, 2022). Digital health system differs in every country significantly due to variation in economic, social, political, and geographical structure. The sustainability in this sector depends on the healthcare system, infrastructure, digital literacy, technology adaptation, practices, and regulatory framework. The goal of digital health sustainability strikes within either centralized or decentralized healthcare systems (Arias and Rickwood, 2022). Indeed, digital health sustainability is crucial and challenging due to varying levels of interoperability and ongoing practices. Meanwhile, rapidly evolving digital technology demands collaboration among healthcare stakeholders. This integration may address overcoming the inability to withstand vulnerabilities, barriers, and disruptions. Real-time vulnerable health surveillance provided a better understanding of digitalized systems to protect practitioners and patients. Digital healthcare solutions are accompanied for future public health safety (Lu *et al*, 2021).

Most countries developed a roadmap for digital transformation and healthcare coordination. Several countries exhibit varying levels of digital health development, adaptation, investment in the marketplace, and administrating implementation process (Meyerheim *et al*, 2021). The UK, Australia, the USA, and European countries are actively implementing digital health with significant strides in adapting their healthcare system to digital technologies (Bhasker *et al*, 2020).

China and India have emerged as a vast market for telehealth and telemedicine across the world (Labrique *et al*, 2018). Asian countries like India are experiencing rapid growth in mobile penetration and the development of a teleconsultation ecosystem (Chivate *et al*, 2022; Singh and Landry, 2019). In Europe, there is a strong emphasis on promoting digital transformation in healthcare through the establishment of data exchange infrastructure (Jonsdottir *et al*, 2023). In Finland, an efficient electronic health record system with seamless data sharing is used at a larger scale in corporations with healthcare providers. Norway achieved milestones remarkably in telemedicine, and the accessibility of healthcare remotely (Nordic Innovation, 2018). European countries have strategic plans to produce and invest in digital health for long-term benefits (Cascini *et al*, 2022). However, despite these advancements, numerous challenges persist, particularly around interoperability, which can be attributed to various social, economic, political, and administrative factors (Kaboré *et al*, 2022; Zhang *et al*, 2022). A comprehensive comparative review of the current state, influential factors, and challenges related to the sustainability of digital health in these regions are presented on the following pages:

1.4 Sustainability of telehealth in Asia:

Digital health strategies have been piloted in Asian countries like India, Japan, China, Indonesia, etc. with limited effectiveness (Singh *et al*, 2021). The governments of these countries found it difficult to scale up existing and digital health systems. In a recent development, the government of India launched a national tele-mental health program and an open platform for the country's digital health vision (Hasani *et al*, 2021). In China, third-party platforms for digital healthcare and artificial intelligence investment in healthcare are projected for health sectors. Nevertheless, the growing population and patients make every development more challenging. There are several challenges to implementing digital health services from the pilot region to the greater population. In these countries, the concept of digital health sustainability evolves with national policies of continuation of inputs, processes, and outputs of responses (Lennox *et al*, 2018). Emerging literature relate to digital health sustainability in Asian countries lighted on the multidimensional nature to reflect sustainability, scaling larger geographical areas, social, professional, and political contexts about the implementation of digital health solutions. Studies identified that these factors play vital roles in adapting, embedding, and sustaining digital health systems (Agarwal *et al*, 2016; Greenhalgh *et al*, 2018; Nimmagadda *et al*, 2019).

After the COVID-19 pandemic, healthcare practitioners adopted digital procedures such as telehealth to decrease contact with patients. Many healthcare practitioners managed when, how, and where to provide healthcare services during the pandemic. Hence, the adoption of digital health increased to reduce in-person contact to avoid spread of infection (Shah *et al*, 2020). Yet, this adoption consisted of several consequences, as healthcare practitioners have reported encountering practical challenges during delivery of telehealth sessions (Greenhalgh *et al*, 2018). Indeed, the popularity of digital health services is increasing with benefits and challenges; yet, most practitioners believed that in-person interaction is requisite for optimal outcomes (Chivate *et al*, 2022).

Compared to developed countries, the practices of digital health services need more strategic implementation plans and resources. Asian countries like India, China, Indonesia, and Japan are culturally, economically, socially, and geographically diverse which poses several challenges and issues in healthcare implications (Jin *et al*, 2000; Agarwal *et al*, 2016; Sari *et al*, 2023). For digital health sustainability uniform awareness, policy, and appropriate funding are suitable for these regions. At present, no such guidelines and policies are available to resort to adopting digital health services at a large scale in Asian countries like Indonesia, India, etc. (D'Souza and Rebello, 2021; Sari *et al*, 2023). Through this approach, accessibility of health services increased in supporting rural area practitioners like in Indonesia (Jin *et al*, 2000; Sari *et al*, 2023). Digital health sustainability cannot be addressed without effective policy implementation, strong connectivity, internet infrastructure, digital literacy, widespread coverage, and awareness (Chivate *et al*, 2022). Despite that, insufficient implementation, inadequate funding, poor integration system, lack of supervision, lack of safety and security, disparities, and lack of digital learning are the most common barriers in Asian countries (Jin *et al*, 2000; Shah *et al*, 2020; Chivate *et al*, 2022).

1.5 Sustainability of telehealth in Europe:

The sustainability of digital health services is important as technology is reshaping every system of services through mobile applications, wearables, and digitalized ICT systems including Electronic Health Records (EHR). The European perspective of digital health services and solutions determines the reliable infrastructure (Jonsdottir *et al*, 2023). European countries are well developed with widespread accessibility to technologies, especially Scandinavian countries like Finland, Norway & Denmark. The Nordic countries (Sweden, Finland, Denmark, Norway, & Iceland) have stronghold "smart digital health" and aspiring strategies to enhance healthcare users' well-being. Such as "smart healthy" envisioned by Sweden utilized digital health and accessibility as a global leader remarkably. Norway emphasized more on user-centred information and improved service data quality. Finland is strengthening its healthcare system by enhancing resource and utilising it to empower digital health services for citizens. Denmark strategically developed a coherent healthcare ecosystem through secure data sharing, patient involvement, and collaborative practices. Iceland emerged as an interconnected healthcare information system to deliver the best quality health services (Nordic Innovation, 2018). Figure 1 presents personalized healthcare delivery management as the heart of the system to engagement for patients. The major purpose is to address health service demand by the population.

Urban areas are equipped with connectivity, high-speed network, and resources. All those countries have different digital health service systems that strike a balance between traditional and digital health administration (Cronin *et al*, 2023). Their financial system to promote and practice digital health solutions is adequate compared to Asian countries. The factors such as access, equity, funding viability, user acceptance, adaptation, and affordability are maintained better than in Asian countries. These factors foster the future and sustainability of digital health as enablers (Figure 2). These factors are administered in European countries for long-term sustainability in collaboration with governments, technology providers, practitioners, healthcare administrations, and social stakeholders (Aktan *et al*, 2022).

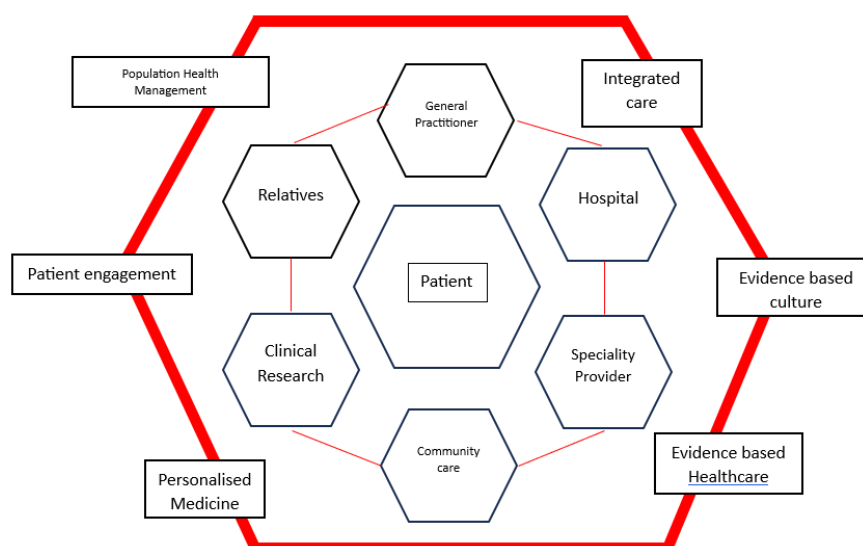


Figure 1: Patient-Centric Healthcare Ecosystems in Nordic Countries (Source: Business Finland, 2018)

However, some European countries are facing critical challenges for efficient digital healthcare provision. The impact of digitalization is significantly associated with the delivery of digital systems (Țăran *et al.*, 2022). After Covid-19, the future of digital health systems can be looked at through transformative innovation. European people strongly supported the digital healthcare system as the responsibility of governments (Wong *et al.*, 2022). Yet, those countries who are regularising centralized political administrative models (Portugal, Austria, France) are dealing with digital health sustainability more effectively in comparison to decentralized government systems (Spain, Italy, Germany). Despite evidence of better healthcare coordination in centralized systems, decentralized countries tested pilot digital health with better and swift management (Arias and Rickwood, 2022).

The prior literature reported that significant gaps are found concerning digital health sustainability in European countries too (Cronin *et al.*, 2023). Countries with the lowest health values like Estonia, Bulgaria, Croatia, Romania, Hungary, Estonia, Poland, and the Czech Republic, require effective policies, funding, and improvements. On the other hand, countries with a greater value on health like Italy, Germany, Austria, Spain, and the Netherlands are reaching an optimal functioning of the digital health systems, while France, Finland, Denmark, Ireland, and Belgium are considered the highest level of health representatives (Arias and Rickwood, 2022; Cascini *et al.*, 2022) and these countries could support other European countries with low-value healthcare. It is evident that significant disparity among European countries is found regarding health digitalization and the degree of expanding digital health systems. Thus, European countries need collaboration and cooperation to respond to challenges more efficiently (Țăran *et al.*, 2022). Moreover, the European countries' health sector has several challenges beyond digital health. Similar to other regions, European countries are also facing challenges to implement digital public healthcare that influence legal, technical, and framework to achieve interoperability (Wong *et al.*, 2022).

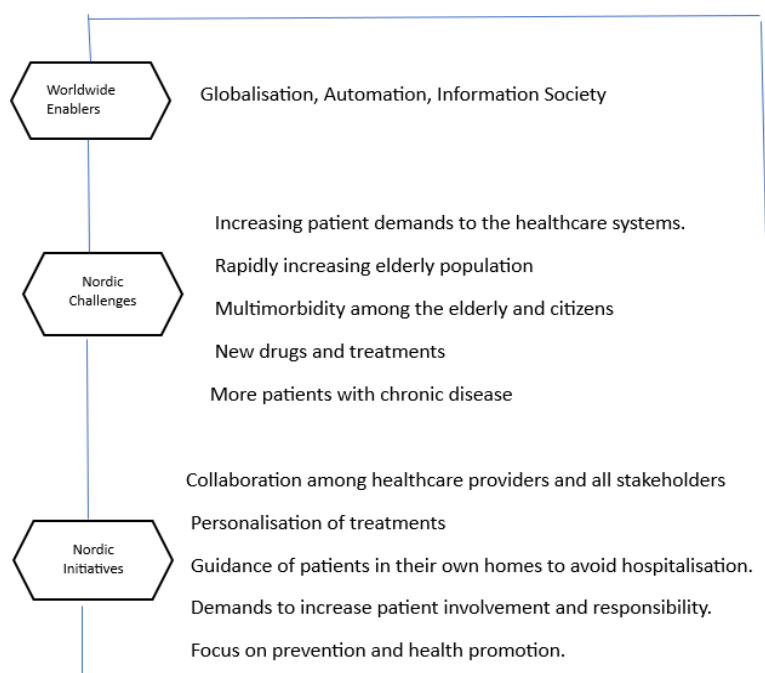


Figure 2: Patient-Centric Healthcare Ecosystem- Nordic Initiatives (Source: Business Finland, 2018)

The rural areas in Europe have existed with disparities and challenges including a shortage of practitioners, chronic diseases existence, financial inequality, and an ageing population (Petrazzuoli *et al*, 2023), however, European healthcare providers are embracing sustained technology more after Covid-19 than before. Three major challenges are influencing digital healthcare in Europe and these challenges are regulatory requirements, the fragmented technology market, and suitable funding for innovators (Meyerheim *et al*, 2021). The involvement of different healthcare providers and institutional bodies demands a greater degree of mechanism, coordination, and oversight for successful implementation and the data security and usability are also a challenge for clinical practices. Nevertheless, with development in the technology sector, European countries also facing challenges in the healthcare sector (Țăran *et al*, 2022).

1.6 Sustainability of telehealth in Australia:

In Australia quality healthcare solutions and outcomes are provided through accessible health infrastructure. The Australian National Digital Health strategy is successfully advancing healthcare solutions from a contemporary Australian standpoint (Haines *et al*, 2023). A strategic framework for action is established to empower practitioners and users through digitalized health services. It is a cohesive and information-sharing digital health system. Some studies investigated that Australian digital health protocol is implemented with effectiveness, feasibility, acceptability, and safety as innovative solutions for healthcare. Existing literature examined that the practitioners and patients who experience telehealth had positive outcomes (Bennell *et al*, 2022). They suggested that viable services and facilities should be considered in the future without barriers and issues (Grant *et al*, 2022). While other studies identified evidence that digital health programs are undergoing due to inadequate knowledge, experiences, digital learning acceptance, clinician resistance, and lack of reimbursement (Cottrell and Russell, 2020; Haines *et al*, 2023). However, the Privacy Act 1988 governs users' data privacy and security in the context of digital health in Australia. Still, there are safety and security concerns in this regard (Bennell *et al*, 2021, 2022). Practices of clinical trials require sophisticated potential and expensive accessible technologies to implement digital health.

The Covid-19 pandemic greatly and dramatically impacts the health sector across the world. In recent years, medical health services transformed and transitioned to digital health as rapidly as ever before (Lennox *et al*, 2018). That scenario was unprecedented uptake for developed countries like Australia to implement digital health across a wide population. This real-world setting experience helps to identify consequences, future developments, and sustainability (Bennell *et al*, 2022). Likewise, in other countries, rural locations are not allied with major cities in terms of equal opportunities for digital health practices with fancy infrastructure. The consequences of digital health service gaps increased compromised health outcomes in these areas (Haines *et al*, 2023). Compounding these influential factors, a shortage of professionals creates inaccessibility. Digital health solutions have the potential to reduce these geographical gaps with proper administration. The efficacy of digital health services is dependent on awareness, practices, and randomized controlled implementation. The more acceptance and adaptation by the users are perceived by the clinicians' usefulness, satisfaction, and perspectives (Grant *et al*, 2022). Conclusively, with all its benefits and consequences the digital environment of the Australian health sector is emerging with adaptability mode of practice (Bennell *et al*,

2021). The state, sustainability, and challenges in Australian digital health are not as complicated as in developing countries. As progressive administration, the Australian government tested the digital health framework with a breadth of improvements (Hasani *et al*, 2021; Cronin *et al*, 2023; Haines *et al*, 2023). The framework of digital health services can increase core capabilities in the health department. It can uplift guidance, knowledge, and skills to deliver digital health.

1.7 Sustainability of telehealth in United States of America:

Extensive literature concluded that digital health services can bring out significant quality improvements in United States of America (USA) healthcare solutions (Radhakrishnan *et al*, 2016). The emerging wave of innovative technology raised expectations, competition, and transformation in healthcare systems. Countries with rapid development potential offer efficient and effective health services with digital perspectives and technology driven healthcare policies are implemented with digital solutions and limitations. At the forefront adoption of the digitalized healthcare system, United States of America (USA) vanguard initiatives and implementation leveraging digital health framework. The digital health landscape in the USA is sustaining through growing and developing innovative services along with a challenging environment ('A Vision for Action in Digital Health', 2023).

The Health Information Technology for Economic and Clinical Health Act (2009) served with electronic health records adoption certificates for practitioners (Burde, 2011; 'A Vision for Action in Digital Health', 2023). The prominence of telehealth and telemedicine accessibility is made possible in rural, remote, and urban areas. Mobile health services like tracking, monitoring, managing, and communicating with professionals are developed for individuals. For patients' data safety and security, the US administration provides health information exchange facilities for privacy, coordination, and reducing duplicity.

In recent years, AI analytics are revolutionising healthcare departments like imaging, diagnosis, monitoring conditions, discovering, and decisions. Studies reported that digital health sustainability in the USA identifies with main priorities in planning, programming, and procurements (Snoswell *et al*, 2019). These prior four keys support digital health vision including advancing national digital health strategies, building digital capacity across the country, leveraging global goods, and strengthening digital health architectures. Pan-American health organisations introduced digital transformation in health sectors through eight principles (Pan-American Health Organization, 2021; Saisó *et al*, 2022). These principles are associated with achieving universal connectivity, promoting digital technologies to co-create equity, ensuring inclusive digital health for all, implementing open and sustainable digital health, mainstream human rights in digital transformation, AI cooperation in emerging technology, mechanism of trust and safety in the digital environment, and digital interdependence in designing health architecture (Radhakrishnan *et al*, 2016; Snoswell *et al*, 2019).

The USA has the leading and widespread digital health uptake. Especially, North America is the leading highest regional revenue around the globe. With its frontrunner invasion in telemedicine, the USA has disparities in healthcare regarding accessibility (Bhaskar *et al*, 2020). This country places the biggest digital health technology manufacturing services. The government is facilitating the population through quality products, digital health solutions, and quality health services.

Besides all strategic frameworks, resources, and implementation, digital health mechanism is challenging in the USA. The potential of digital healthcare services is based on cost-effective systems. The additional cost, corruption, abuse, safety, affordability, lack of technology validation, digital divide, and security are the major barriers to digital healthcare in the USA (Glynn, 2022; Radhakrishnan *et al*, 2016). Further lack of technology support and integration within clinical practices are the major hurdles to digital health sustainability. Indeed, digital healthcare services influence patients and practitioners significantly, yet clinical workflow requires validation, accuracy, and cost-effectiveness (Palacholla *et al*, 2019).

1.8 Review of telehealth sustainability in other countries:

The digital healthcare system started in the 1960s and accelerated in the last two decades. After Covid-19, digital healthcare solutions have been expanded through crucial development in health departments. Policymakers, healthcare providers, digital technology developers, practitioners, and caregivers unanimously managed healthcare services. Though, the adoption of digital health is uneven and non-uniform across the countries.

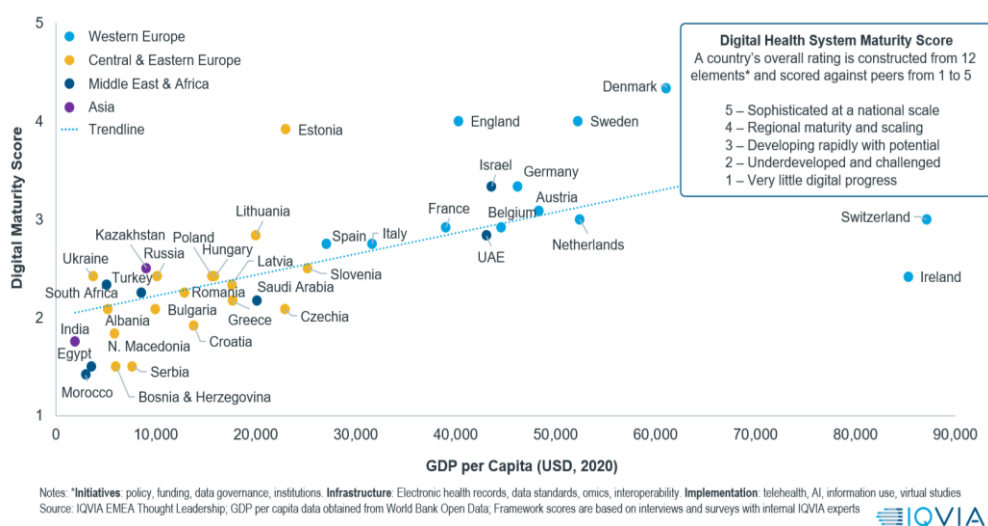


Figure 3: Global Digital Healthcare System by Maturity (Source: World Economic Forum, 2023)

As mentioned above, the starting point, procedural action, and outcomes of digital health varies country to country. Developed areas like the United States, Europe, and UAE implemented digital health systems at a larger scale with better resources. On the other hand, developing regions like Africa and Asian countries consist of digital health with multiple challenges, critical issues, barriers, and deficiencies. Initiatives, infrastructure, and implementations of digital health are different in high and low-income countries (Figure 3). Some countries have fancy and sophisticated digital health infrastructure at the national level like the USA, UK, Denmark, Israel, Estonia, Germany, Austria, Australia, and Switzerland (Arias and Rickwood, 2022), however, these are facing regulatory, safety and security, user acceptance, accessible practices, and equal implementation challenges (Chivate *et al*, 2022). African, Arab, and Asian countries like India, Bangladesh, Turkey, Egypt, Kenya, Tanzania, Nigeria and Albania, implemented digital health in an underdeveloped and challenged environment. These countries are enhancing digital health mechanisms through the compromised channels of suppressing disparities and inequalities (Labrique *et al*, 2018; McCool *et al*, 2020; Singh *et al*, 2021).

Subsequently, challenges and barriers vary concerning the country's resource ability and potential. Regions developed policies to grow the potential for the digital health market greater by 2030 (Figure 4). This vision encouraged countries to invest in digital health for the best value of health, advanced accessible facilities, and technological revenue. This investment is based on the country's economic condition that directly influences the healthcare system (Zhang *et al*, 2022). Nonetheless, visionary policies and strategies can be addressed through strong administrative enablers. A thorough review of related literature is explored to understand global perspectives regarding digital health sustainability. Every country faces issues and challenges when it comes to digital health testing, regardless of the level of development they have achieved (Wang and Xu, 2023). Asian countries are found with insufficient implementation, inadequate funding, poor integration system, lack of supervision, lack of safety, lack of digital literacy, and rural-urban disparities, as the most common barriers (Singh and Landry, 2019; Singh *et al*, 2021). The European countries face disparities, slow adoption, lack of understanding of complex digital technologies, shortage of practitioners, chronic diseases, financial inequality, an ageing population, and unsynchronised development (Tăran *et al*, 2022; Jonsdottir *et al*, 2023).

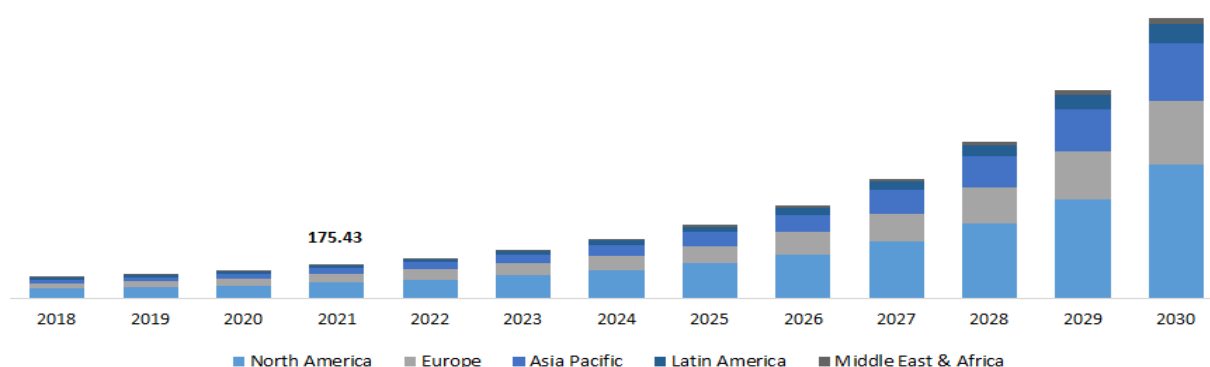


Figure 4: Global Digital Health Market Size by Region 2018-2030 (Source: Polaris, 2023)

In Australia, rural locations are not allied with major cities in terms of equal opportunities for infrastructure, limited practitioners, and inaccessibility to digital health. Gaps are identified in health outcomes in these areas (Cottrell and Russell, 2020; Bennell *et al*, 2022; Grant *et al*, 2022). While in the USA, cost-effective systems, regulatory framework, affordability, data abuse, safety, lack of technology validation, and uncertainty in payoffs are the major challenges and barriers (Palacholla *et al*, 2019; Snoswell *et al*, 2019; Kaboré *et al*, 2022).

1.9 The current state of telehealth sustainability in Ireland:

Studies have explored that geographic locations contribute to varied experiences in digital health services due to accessibility and connectivity difficulties. Ireland idealized the digital health ecosystem as an emerging platform for public healthcare. Ireland is the third largest exporter of digital devices in Europe. Ireland is flourishing digital health technology industry with home-grown services (EIT

Health Ireland-UK, 2023). With sector diversity, Ireland has a growing potential to sustain digital health as a global hub. Trillion dollars investment encompasses digital healthcare facilities by 2030 (Dermody, 2023). In collaboration with healthcare practitioners and providers, these companies are addressing digital health transformation. Though the collaborators are facing challenges of clinical adoption, sufficient leadership, ageing population, acceptance, high-quality maintenance, accessibility, skills acquisitions, sustainability, and regulatory system (Dermody, 2023; EIT Health Ireland-UK, 2023).

The existing literature demonstrated that digital health is a crucial enabler to practice quality healthcare services (Farren *et al*, 2022). An optimal and accurate connection between health practitioners and patients resulted in useful outcomes. Undoubtedly, the rise of digital health solutions brings challenging situation as expensive infrastructure, demographical diversity, staffing, and combining practices. Ireland is rapidly transforming health services through digital technology solutions as barriers ease. The department of eHealth Ireland has a clear vision and strategy in aligning its objectives with the European Union's eHealth plan and share's common values like other European countries like putting the patient at the centre of the healthcare delivery (Figure 2) to empower them by making themselves engage in their health and wellbeing. Irish digital health landscape included initiatives of national health identifier infrastructure, telehealthcare, eReferrals and ePrescribing, national Electronic Health Records (EHR), health services for chronic diseases, and a health mail electronic system (HSE, 2015; eHealth, 2020). In recent development, AI, telemedicine, predictive analysis, digital healthcare delivery, and digital applications become prevalent as emerging e-health systems (Jacquemard, 2021). A patient-centric approach is determined to accelerate the implementation of digital health. It enabled integration and efficiency. These initiatives also deal with challenges of accessibility, clinician practices, equality, and opportunities to optimise digital health technologies (Glynn, 2023). For future growth and development, the Irish digital health system needs to be commercialised to rank in the global market. A survey reported that 87% of companies are interested to invest in Irish digital health operations (Demody, 2023). Irish Medtech Association built a roadmap to develop digital healthcare services with an outlined set of actions (Reynolds *et al*, 2021; Glynn, 2023).

Besides digital health expansion, key initiatives, vision 2030, and growing expenditures, Ireland still has several challenges that are the main barriers to sustaining digital health (Glynn, 2023). Irish primary and community health sector is underdeveloped. Irish people have unequal access to public practitioners and healthcare. The gap between population and digital literacy is very substantial. Additionally, 47% of Irish adults do not know basic digital skills and 8% of adults never used internet. Four out of ten people lack digital health understanding. 7.8% of graduates have ICT skills, and females who were equipped with ICT specialists only constitute to 21% of the total number (Digital Economy and Society Index, 2022; Glynn, 2023).

The Irish government's initiatives to sustain digital health are very linear and focused on specific problems rather than population centered approach, however, present users of telehealth are found satisfied with remote services (Lane and Clarke, 2021). The utilization of healthcare systems, digital sensor technology, and AI posed serious privacy safety challenges (Glynn, 2023). Patients' information

risk and safety measurement are linked to digital health transformation. An adequate regulatory strategy requires dealing with this challenge. Further, overstretched health facilities and limited staffing constraints digital health phenomena in the changing regulatory environment are evolving with dynamics which is challenging for digital health in Ireland. A persistent focus is required to develop reflective skills in the workforce. A digital division is also increasing between the ageing population, digital users, limited professionals, and those who are struggling (Lolich *et al*, 2019; Reynolds *et al*, 2021; EIT Health Ireland-UK, 2023). Mentioned above development, condition, prospects, and challenges need collaborative efforts for digital health sustainability in Ireland.

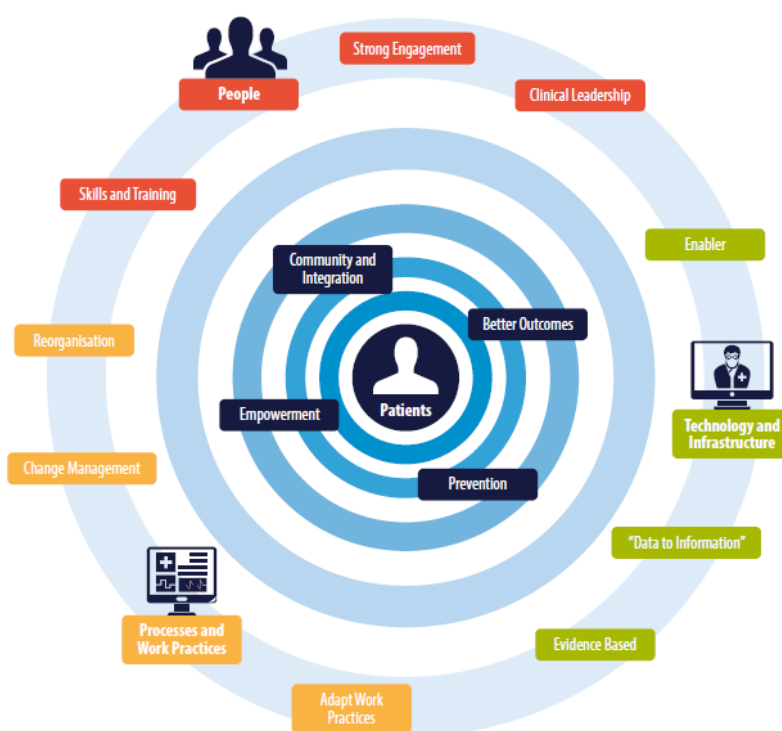


Figure 5: Patient Centric focus (Source: Department of Health, 2020: An eHealth Strategy for Ireland)

1.10 The future of telehealth in Ireland:

Digital health solutions enhance the healthcare system with administrative efficiency. It reduces burdens and workflows through optimized resource allocation. For instance, it enables remote consultations, brings down strain on hospitals, lifts economic conditions, and monitors healthcare systems (Zhang *et al*, 2022). It considers greatly robust confidentiality and privacy measures. Further, it achieves interoperability and technical standardization within the healthcare system. It is an important landscape that is evolving healthcare facilities and programs under the footprints of digitalisation. Besides numerous benefits (Saisó *et al*, 2022; Zhang *et al*, 2022), there are multiple challenges and issues of socioeconomic disparities, lack of digital literacy, adaptation, environmental impact, inequalities, especially in developing countries, lack of reliable connectivity, data security issues, need for regulatory programs for healthcare, technological errors, and barriers (Meyerheim *et al*, 2021; Kaboré *et al*, 2022). These factors significantly influence the future and sustainability of the digital health system (McCool *et al*, 2020). The accessibility and proper utilization of digital health technologies

across the world depend on how stakeholders address these challenges and issues. Through the collaboration of governments, digital operators, technology developers, regulatory authorities, administrators, healthcare practitioners, healthcare users, and community engagement the development of digital health can be fostered for better and advanced e-health services.

The Covid-19 pandemic has brought forth numerous trends and fresh insights in the realm of digital health and its sustainability. There were wearable devices, remote patient monitoring, digital health applications, telemedicine, and condition-tracking devices have emerged as key areas of research and development. Existing literature suggested that digital health technologies are rapidly increasingly feasible and adaptable, holding great potential to enhance healthcare access, cost-effectiveness, and overall outcomes (Singh and Landry, 2019; Lu *et al*, 2021; Saisó *et al*, 2022; Zhang *et al*, 2022). Developed countries such as the USA, UK, and China have harnessed digital health technologies integrated with AI to align with treatment strategies (Bhaskar *et al*, 2020). Furthermore, digital health interventions incorporating machine learning algorithms have shown promise in delivering accurate diagnoses and effective treatments in the future. These advancements signify the ongoing evolution and transformative power of digital health in improving healthcare practices and outcomes (Mohammed *et al*, 2022). While developing countries are practising digital health solutions within resource utilization. As digital health interventions are practised in both developed and developing countries (Kaboré *et al*, 2022). Though, not all countries have piloted it successfully. Beyond the initial scale, those countries are concerned to achieve sustainable digital health systems. Governments are engaging and contributing regarding routine health services and digital health facilities integrations. However, all the efforts remain elusive due to the above-mentioned challenges and issues.

2. BACKGROUND FOR THE STUDY

It is evident from the literature that, Irish healthcare professional's uptake on telehealth practice during Covid 19 was significant and widespread. According to Farren *et al*. (2021), Speech and Language Therapists (SALT) in Ireland found the use of telehealth beneficial during Covid 19 and showed interest to continue to use telehealth as a complementary service delivery model. A study by Reynolds *et al*. (2021) shows that majority of Physiotherapists who participated in the survey has considered telehealth as a sustainable alternative method of their service delivery. Furthermore, a survey conducted by the National Coagulation centre showed that the seventy nine percent of survey participants who are healthcare professionals, would like to continue to offer telehealth consultations as routine patient care and interestingly, the survey showed that majority of the patients agreed, strongly agreed that telehealth gave them improved access to healthcare services, and was convenient and easy to use the technology (O'Donovan *et al*, 2020). This shows the acceptance of telehealth by patients as well as healthcare professionals. However, there are perceptions that face-to-face contacts are gold standards of care and sustainability of telehealth solutions is difficult without frameworks and strategies in place (Thomas *et al*. 2022). Likewise, some healthcare professional feel that telehealth is a temporary solution to mitigate the effects of COVID 19 (Reynolds, 2021) and telehealth adoption adherence decreases over prolonged durations of time (Kinoshita *et al*, 2020).

It is evident that healthcare professionals and patients are willing to adopt telehealth solutions as part of their care (O'Donovan *et al.*, 2020) and the fact that the Irish government has invested twenty-three billion euros in Ireland's healthcare and social care services (Department of Health, 2023) which includes Slainthecare that covers the aspects of connected care and eHealth Ireland. It would be worthwhile to understand the current usage and sustainability of telehealth among the healthcare professionals to see if they still offer their patient telehealth option as part of their care delivery, if so, are they using telehealth solutions as their mainstream of service delivery or if they are using a hybrid model and if not have, they completely returned to in person care. It would be useful to know what percentage of their care delivery is through telehealth, which leads to the research question, on how healthcare providers, especially Physiotherapist in Ireland were dependent on telehealth solutions during COVID 19 and after the ease of COVID-19 restrictions.

Currently there are no such studies carried out in Ireland and this gap in study is what this paper seeks to fill, since it will focus on how Ireland depends on telehealth programs during the current wave of the Covid-19 pandemic and determine the improvements necessary on the same if healthcare providers in the country will depend on telehealth programs going forward. This way, the topic becomes essential to healthcare providers, Department of Health, the government, and scholars by creating the need to investigate sustainable healthcare solutions within the COVID-19 pandemic. Therefore, this paper considers the definition of the research a valuable topic in the analysis and discussion of telehealth solutions in terms of utilization, the role played, the impacts they create, opportunities, and their future implications and future sustainability of Ireland's telehealth systems. The Covid-19 pandemic resulted in massive transformation and originated expensive telehealth solutions. This method of intervention rolled out before, during, and after the Covid-19 restrictions eased, with its significant impact on healthcare providers, professionals, and consumers as well (Tully *et al.*, 2021), however the effectiveness and sustained delivery of this model is unclear.

3. PURPOSE, OBJECTIVE AND RESEARCH QUESTION:

The objective of the study is to analyze the use and sustainability of telehealth solutions among the Physiotherapist in Ireland during Covid-19 and after the ease of Covid-19 restrictions.

This paper considers the definition of the research, a valuable topic in the analysis and discussion of telehealth solutions in terms of utilization, the role played, the impacts they create, opportunities, and their future implications and future sustainability of Ireland's telehealth systems. The purpose of this thesis is to get answers to the following research questions.

- What telehealth solutions were adopted by Physiotherapists in Ireland in response to Covid-19?
- How Physiotherapist in Ireland were dependent on telehealth solutions during Covid-19 and after the ease of Covid-19 restrictions
- What are the current enablers and barriers associated with telehealth solution sustainability?

4. RESEARCH METHODOLOGY & IMPLEMENTATION:

4.1 Data Collection Method:

The research questions for this paper are based upon review of various studies done before, regarding the importance of telehealth programs in Ireland. Therefore, such literature makes a starting point for the study topic and forms the foundation upon which the research questions will be answered. The current healthcare situation in Ireland seeks to analyse how healthcare providers implement current innovative medical solutions to mitigate the COVID-19 pandemic. Moreover, it is hypothesized that telehealth solutions have the potential to promote public health and this newly adapted healthcare delivery methods should be sustained by the Irish government and the healthcare system (Galvin, 2020; O'Donovan *et al.*, 2020; Farren *et al.*, 2021).

This study was employed using a quantitative survey design including a cross-sectional research design. This is more practical and cost-effective as opposed to the longitudinal survey where data is collected many times over the same or longer period (Fah & Hoon, 2021). This cross-sectional study will measure participants' attitudes, perceptions, opinions experiences, and concerns of the Physiotherapists about telehealth during and after Covid-19 restrictions ease in Ireland (Creswell, 2012). This way of data collection is clear, focused, and appropriate. The quantitative data were gathered using a questionnaire as a research instrument in this study. The questionnaire is a widely employed and valuable tool for gathering survey information, offering structured data that is often numerical in nature. It can be administered without the physical presence of the researcher and is relatively easy to analyse (Cohen *et al.*, 2007). A structured form of questionnaire was designed including a series of statements presented in sequence. So, the respondents can rate the way they believe the statement.

After a thorough review of the related literature, the questionnaire was designed under closed and open-ended statements (Kaboré *et al.*, 2022; Meyerheim *et al.*, 2021; Palacholla *et al.*, 2021). Structured questions both open and closed, offer significant advantages as they facilitate the generation of response frequencies suitable for statistical analysis and they can be coded faster and allow for comparisons to be drawn among different groups (Cohen *et al.*, 2007). The major purpose of the questionnaire (Appendix 1) was to measure the participants' perceptions and experiences regarding telehealth usage during and after the Covid-19 pandemic restrictions. The dimensions and directions of the statements revolved around the kind of telehealth service participants have experienced telehealth enablers, setbacks, and prospects of telehealth solutions followed by the studies of D'Souza and Rebello, (2021), Haines *et al.* (2023), Jonsdottir *et al.* (2023), and Tsekoura *et al.* (2022). Each statement was constructed appropriately to present study. A research protocol, questionnaire development process, and usefulness incorporated relevant and validated statements. This process underwent rigorous feasibility, reliability testing, validity, and relevance to the research objectives (Boynton and Greenhalgh, 2004).

Fifteen main Statements (S) covered the variables of telehealth enablers, barriers, and prospects within the physiotherapy field in Ireland (Appendix 1). The initial section of the questionnaire collected demographic information of the participants as gender, professional role, location of operating

services, age, and IT literacy (Statements 1 to 5). Statements 6 and 7 were related to whether the participants used telehealth from March 2020 to March 2022 or not, and what media they adopted to serve healthcare solutions. Statements 8, 9, and 10 represented the present engagement of participants with telehealth services, estimated percentage or usage, and what type of telehealth service they currently use. Statement 11 was developed to measure participants' experiences and perceptions about the enablers of telehealth such as government, cost-effectiveness, support system, rapid solutions, acceptance, access, and job satisfaction. While statement 12 explored the barriers to telehealth including inadequate funding, patients reluctance, unsupportive organisational structure, traditional practices, and poor infrastructure. Statement 13 identified the participants' perceptions of telehealth prospects. Statement 14 examined whether telehealth has potential in long-term service delivery for reasons other than Covid-19 or not, and their views on telehealth solutions' long-term usage in Ireland. This statement comprised a section including 5 questions. The last statement was open-ended to explore participants' views, opinions, recommendations, and suggestions regarding the current phenomenon of telehealth.

The researcher employed content validity to examine the extent to which statements of the questionnaire are truly representative of the research objectives. This type of validity verified how well each statement of the questionnaire is constructed to achieve predetermined objectives (Cohen *et al*, 2007). The validity process is completed through the opinion of experts in the field of telehealth use for Physiotherapy. The experts evaluated the design of the questionnaire, length of the statements, language, meaning, and adequacy to measure the intended construct (Creswell, 2012). After confirmation of the questionnaire's sufficiency, validity, and adequacy, the researcher piloted the questionnaire.

A pilot test was conducted to examine the reliability, validity, and usability of the questionnaire. Constructive feedback was used to revise and refine the content of the survey questionnaire. Such as easiness of the questionnaire, time length of the questionnaire, and simplicity of the sentences. 12 participants volunteered for pilot testing (Appendix 2). The collected data was used to analyze the reliability of the questionnaire. In this study, the researcher utilized Cronbach's coefficient and the Kuder and Richardson split-half formula to assess the questionnaire's reliability. Cronbach's coefficient alpha, an extension of Kuder and Richardson's generalized split-half reliability coefficient (known as the KR-20 coefficient) is the most used reliability coefficient in classical test theory. This coefficient alpha serves as an indicator of internal consistency, measuring the extent to which test takers respond consistently to the items in the questionnaire. However, it's worth noting that the coefficient's value may be influenced by the number of items included in the set, potentially inflating its magnitude (Meyers *et al*, 2017). The Kuder-Richardson Formula 20 was applied to dichotomous variables such as enablers, barriers, and prospects statement (S) (S6, S8, S11, S12, S13). Moreover, Cronbach's coefficient alpha was applied to the continuous variable perception of telehealth (S14) reported on a 5-point Likert scale. It is identified that the Kuder-Richardson value of .73 and Cronbach's coefficient alpha value of .76 (Table 1) verified the questionnaire's reliability.

Table 1: Reliability of the Questionnaire

Variable	Items	α
Enablers	7	.73
Barriers	7	.73
Perceptions	5	.76

4.2 Target Group:

The target group of this study comprised of Physiotherapists who are working in Ireland, especially Physiotherapist who were members of Irish Society of Chartered Physiotherapist (ISCP), as ISCP is the professional body for Physiotherapist in Ireland and the sample population included HSE and community Physiotherapists. The researcher calculated the sample size through Qualtrics sample size calculator at the criteria of using 90% of confidence level within the $\pm 7\%$ of margin of error. The true representative of the targeted population was $n=133$ (10%). The participants were selected despite if they were using telehealth or not during and after the Covid-19 pandemic restrictions lifted in Ireland. The participants may or may not be practising telehealth at the time of data collection. In alignment with the study objectives, the researcher randomly selected physiotherapists who were working during Covid-19 situation in Ireland. The participants were requested to complete an online survey. From the selected sample, $n=133$ participants responded to the questionnaire, of which $n=8$ participants had not given consent. The researcher discarded $n=7$ questionnaires based on their missing, incomplete, and incorrect responses and lack po consent. A total of $n=118$ responses were compiled for further research analysis.

4.3 Data collection

The Qualtrics platform was adopted to construct the online survey. This platform provides services of general data protection and regulations to deliver remote survey processes (Farren *et al*, 2022). All the participants were approached via email to click on the survey link to complete this survey. Requests and reminders were sent during the month of June 2023. This survey was available from 8th June 2023 to 6th July 2023. Remote surveys offer various benefits, such as cost-effectiveness, time-saving, and convenience, which contribute to reducing participant dropouts. These surveys ensure that respondents are more likely to complete the online questionnaire, making them particularly valuable when intrinsic motivation alone may not be sufficient to guarantee survey completion (Cohen *et al*, 2007). In this study, all physiotherapists and professionals were asked to provide their consent before participating in the survey. For the survey's commencement, patients were required to give informed consent before completing the questionnaire. The participants' responses were recorded based on completion, dichotomous, 5-point Likert scale, and multiple responsive options. All the participants were briefed about the objective of the study and the collected data usage. They were directed to complete the questionnaire online. The detailed questionnaire is presented in Appendix 1 and included the participants leaflet and consent request letter in Appendix 4.

5. RESULTS:

This section demonstrates the data analysis techniques, results, and findings to examine the state of telehealth users, enablers, barriers, and prospects of telehealth services under the perceptions and experiences of physiotherapists. One hundred and thirty-three respondents (n=133) participated in this study. While after screening and scrutiny, the data from n=118 participants were used for analysis. In Qualtrics, the survey data can be exported in different formats. The author initiated the data export, and Qualtrics generates the Excel file containing the survey data. A Microsoft Excel file compatible with spreadsheet software was used for analysis. The Excel software was adopted as it has powerful analytical features that enable the computation of statistics, and the creation of visualizations. After compiling the data, the process of coding, screening, scrutiny, and organisation was employed. Descriptive statistical techniques were applied to analyse the data such as mean, standard deviation, frequency, and percentage (Meyers *et al*, 2017). The dichotomous responses yes and no were coded as 1 and 0 and presented in percentage form. While frequency is applied to textual responses such as type of telehealth usage. Likert-scaled responses are calculated using mean and standard deviation. Partially agreed answers were united with agreed answers. The results are presented in tables, charts, and graphs within this unit. The generation of interpretation and reporting is based on data computation without any human bias sharing.

Table 2: Demographic Information of the Participants

	Groups	Percentage
Gender	Male	33%
	Female	67%
	Total	100%
Professional Role	Clinical Specialists	21.5%
	Physiotherapy managers	11.8%
	Staff grade physiotherapists	7.5%
	Senior physiotherapists	59.1%
	Total	100%
Age	25-44 years	50.4%
	45-64 years	45.3%
	Above 65	43.0%
	Total	100%

Total participants n=118, one person prefers not to say his/her gender. There was 33.0% male (n= 39), 67.0% (n= 78) female participants. These participants were aged from 25 to 44 years (50.4%), 45 to 64 years (45.3%), and above 65 years (4.3%) Of which 21.5% of participants were clinical specialists, 11.8% of participants were physiotherapy managers, 7.5% of participants were staff grade physiotherapists, and most participants were senior physiotherapists (59.1%).

Figure 5.1. Information Technology Literacy of the Participants

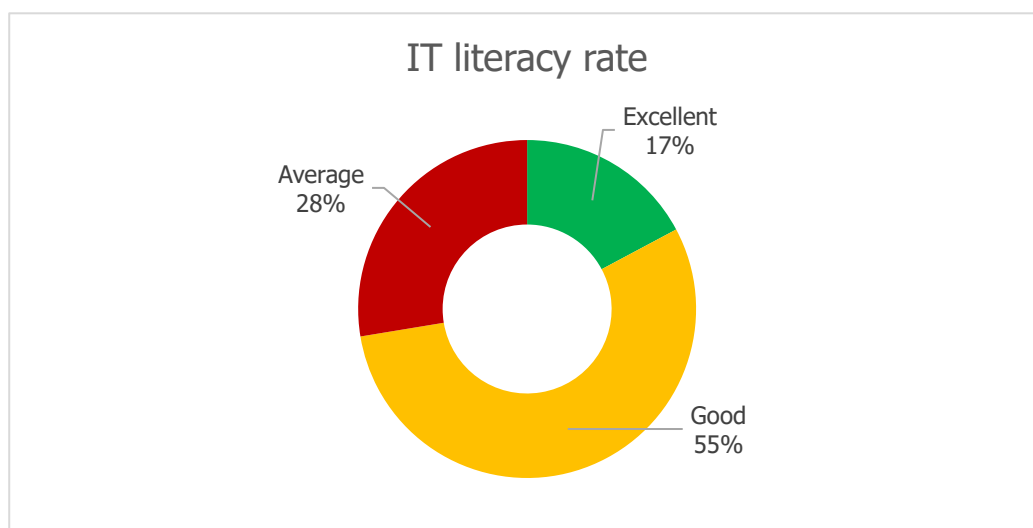


Figure 5.1 explains that over half of the participants had IT literacy to use telehealth solutions at good level 55% (n=65). Some of the participants had the literacy to use telehealth services at an excellent level 28% (n=33). Only 17% (n=20) had an average level of IT literacy.

Figure 5.2: The Participants' Location of Work

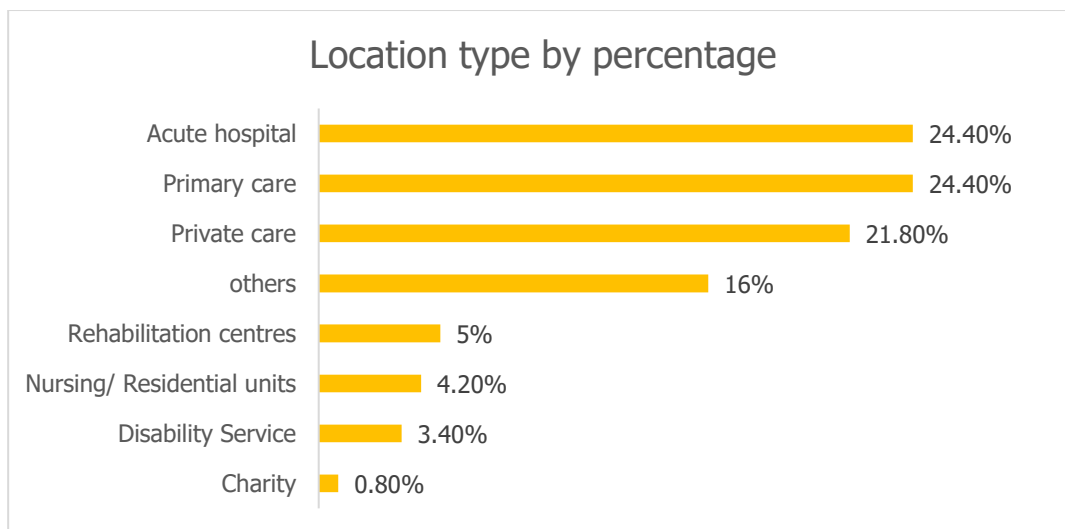


Figure 5.2 represents the work location of the participants in percentage. Most of the participants were in acute hospitals 24.4% (n=29) and primary care centers 24.4% (n=29) while 21.8% (n=26) of the participants were associated with private practice.

Figure 5.3 Comparison of Participants' Use of Telehealth during and Post-COVID-19 restrictions ease

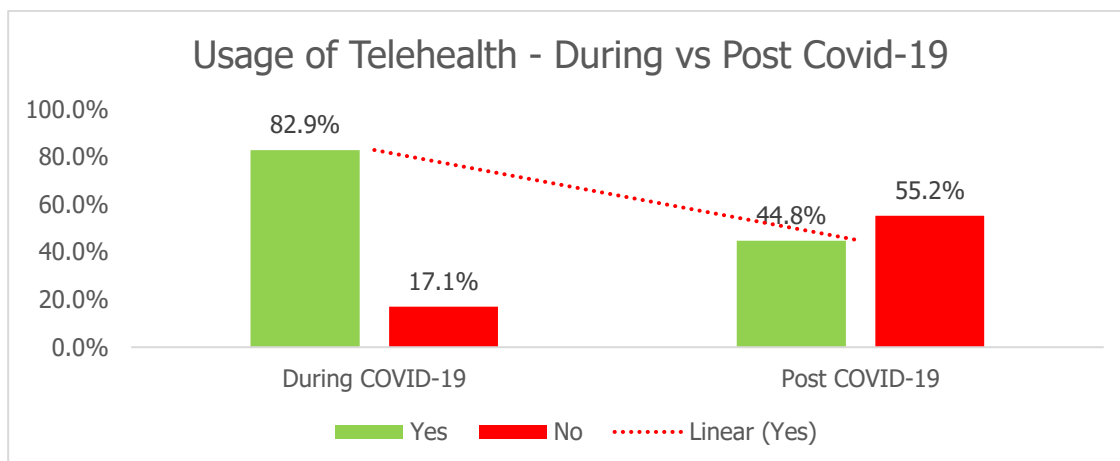


Figure 5.3 states the participants' engagement with telehealth practices during the Covid-19 pandemic and after Covid-19 restrictions were lifted. The percentage analysis revealed that 82.9% (n=96) were using telehealth during Covid-19 17.10% (n=20) did not account for telehealth during the COVID-19 pandemic. And this percentage increased after the COVID-19 restriction eased 55.20% (n= 64). Nearly, 44.8% (n=51) of the participants admitted that they are not practising telehealth after the COVID-19 restrictions.

Figure 5.4 Form of Telehealth during COVID-19 and Present

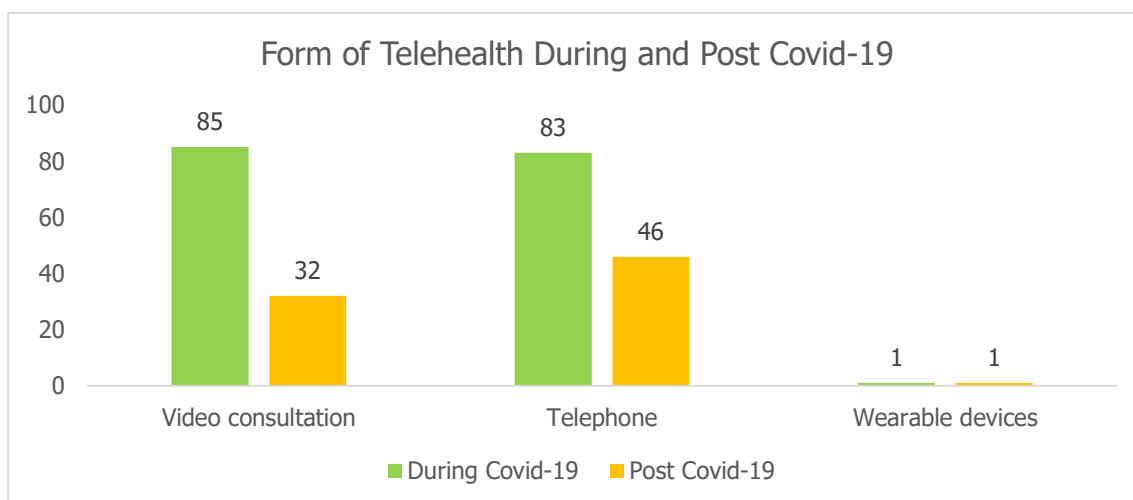


Figure 5.4 illustrates the type of telehealth used by physiotherapists during the Covid-19 and after the Covid-19 restrictions. It is identified that a vast number of participants voted for video consultation (n = 85) and telephone (n = 83) as telehealth means during the Covid-19. On the contrary, the number of telehealth devices usage decreased however most physiotherapists are using the telephone as a greater source (n = 46) after the Covid-19 restrictions.

Figure 5.5 Percentage of your current care involves telehealth.

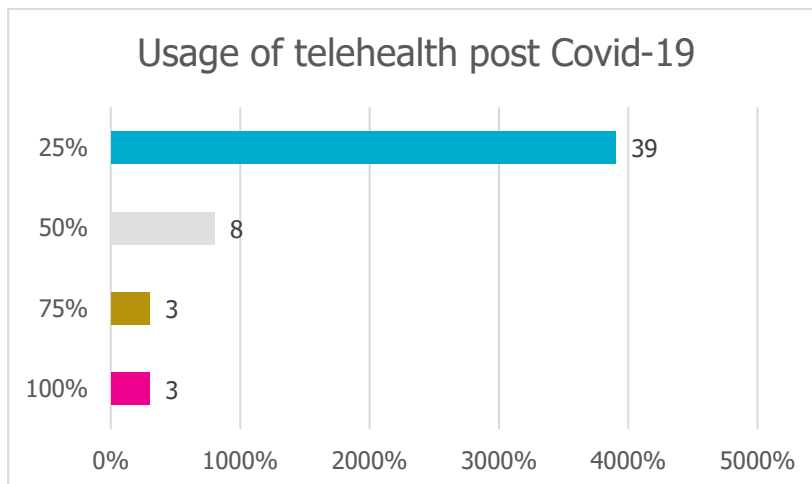


Figure 5.5 displays the number of participants' and estimated percentage of their present involvement in telehealth. Only 5.66% (n=3) of the participants claimed that they are involved 100% in telehealth in the current situation and during Covid-19 time. Likewise, 5.66% (n=3) agreed they take 7-8 out of 10 sessions through telehealth and the rest are face-to-face sessions. 15.09% (n=8) agreed that they engage with telehealth and face-to-face sessions equally and (n=39) which is 73.58% of participants believed that they are utilizing telehealth in physiotherapy only 25% or less. Most of the respondents briefed that they deliver only 1-3 out of 10 sessions and the maximum time they engage with face-to-face practices. It is identified that the participants' involvement in telehealth after Covid-19 restrictions decreased.

Figure 5.6 Major Enablers of Telehealth Services

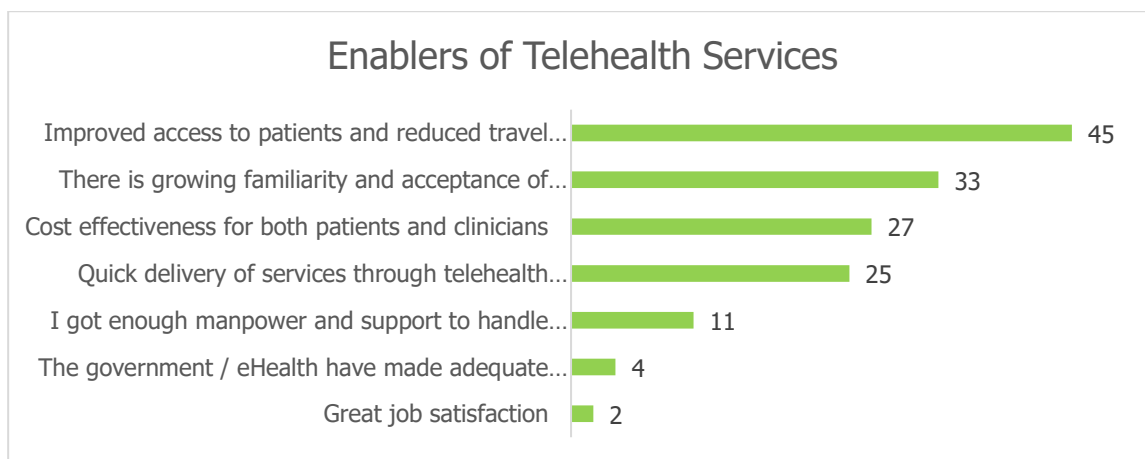


Figure 5.6 demonstrates the major enablers of telehealth services through the perceptions and experiences of physiotherapists (N = 118). The participants voted for the most prominent enablers for the use of telehealth in service provision. A maximum number of respondents (n = 45) stated that improved access to patients and reduced travel is one of the biggest enablers. The topmost ascending order of enablers of telehealth services based on participants' suggestions is "there is growing familiarity and acceptance of telehealth solutions by the public" (n = 33), "cost-effectiveness for both patients and clinicians" (n = 27), "quick delivery of services through telehealth solutions" (n = 25), and "I got enough technical support to handle the telehealth technologies" (n = 11).

Figure 5.7 Barriers to Telehealth Sustainability

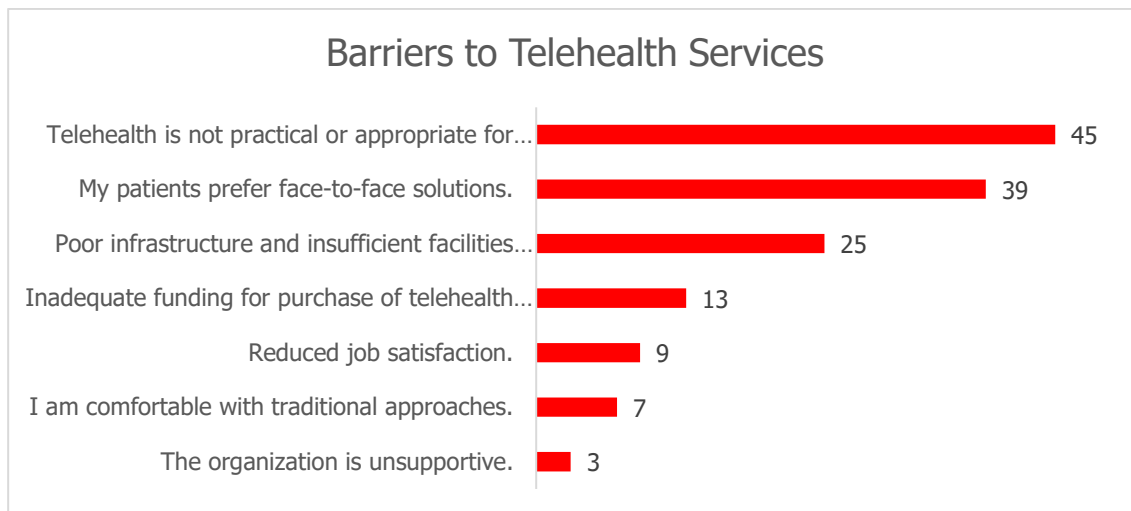
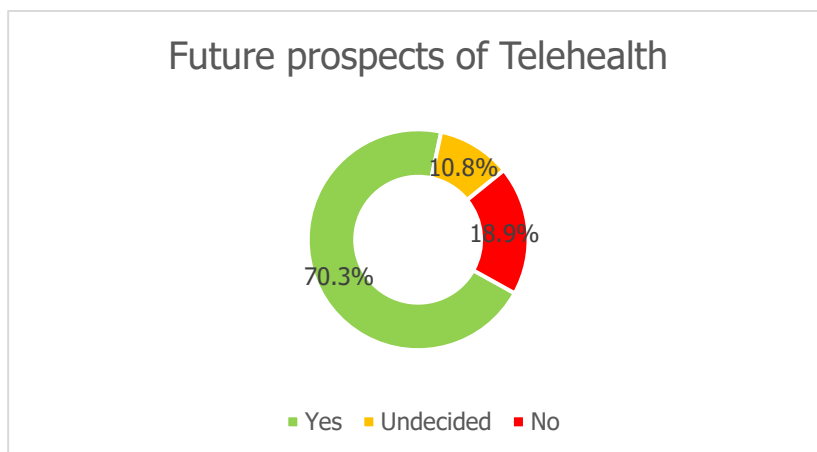


Figure 5.7 states the barrier to sustaining telehealth services. The participants selected the most influential barriers in ascending orders. The frequency of the data explains respondents believe that telehealth is not practical or appropriate for some/all aspects of their intervention or treatment ($n=45$). While 39 respondents agreed that their patients prefer face-to-face healthcare solutions rather than telehealth. Furthermore, the participants claimed that poor infrastructure and insufficient facilities including network connection challenges are the biggest barriers to sustaining telehealth services within their field ($n=25$). 13 participants complained that there is inadequate funding for purchasing telehealth solutions/devices.

Figure 5.8 Prospects of Telehealth in Physiotherapy



Withstanding with multiple barriers to telehealth sustainability, the participants view the potential of telehealth within physiotherapy services. Figure 5.8 exhibits the percentage of respondents who believe in the prospects of telehealth sustainability. This cross-sectional survey explored that a significant majority of respondents 70.3% ($n=77$) hold optimism about the prospects of telehealth besides challenges and barriers. 18.9% ($n=21$) of respondents are found with pessimistic perceptions of telehealth sustainability for good. While 10.8% ($n=12$) of participants remained undecided over this statement.

Statements on Telehealth Solutions in General	M	SD	SDA	DA	N	A	SA
The current use of telehealth solutions is better than traditional methods (Face to Face)	2	0.98	37.6	29	27	5.5	0.9
Service delivery has improved with the introduction of telehealth	3.2	1.14	11.9	16	23	43	6.4
The use of telehealth programs is more or less the same as traditional methods (Face to Face)	1.9	1.02	47.7	30	10	12	0
I believe telehealth has a role to play in future delivery of healthcare services	4	0.94	2.7	7.3	3.7	56	30
Greater infrastructure development is required to further enable the use of telehealth	4.2	0.9	1.8	0.9	18	32	47

M = Mean, SD = Standard deviation, SDA = Strongly Disagree%, DA = Disagree%, N = Neutral%, A = Agree%, SA = Strongly Agree%.

Table 5.2 consists of mean scores and percentages of participants' views on telehealth solutions in general. The analysis explored that a greater mean score is found on participants' belief (32.2% agree & 46.8% strongly agree) that greater infrastructure development is required to further enable the use of telehealth in Ireland (M = 4.21, SD = 903). As they have the vision that telehealth can play a significant role in the future delivery of healthcare services (56% agree & 30.3% strongly agree). Approximately 47.7% of participants strongly disagreed and 30.3% of participants disagreed that the use of telehealth programs is the same as traditional methods (Face to Face). Most participants strongly disagreed (37.6%) and 29.4% of participants disagreed that the current use of telehealth solutions is better than traditional methods (Face to Face), though the service delivery has improved with the introduction of telehealth (43.2%).

6. THEMATIC ANALYSIS OF THE SURVEY:

The open-ended question which was question 15 in the survey was analysed using a descriptive qualitative approach to get in-depth facts and to determine the participant's perceptions to ensure that this analysis covers themes that the survey question would have missed and also to ensure that appropriate information that can be relevant to the research study could be captured (Byrne, 2022).

It was quite interesting to note that few new concepts emerged from the thematic analysis on question 15 of the online survey questionnaire. Lot of participants gave mixed comments, and few were focusing on the five themes that was constantly popping up from the survey and from those five themes many sub themes evolved (Appendix 3) as follows:

1. Infrastructure
2. Skills set/ hands on Practice
3. Digital Literacy
4. Awareness and Promoting telehealth
5. Telehealth: No buy in

6.1 Infrastructure:

This theme focused on infrastructure factors that influenced the use of telehealth and the recommendations by the participants to the eHealth and Irish government. There were many subthemes formed under this heading like Broadband, equipment and funding.

6.2 Broadband & Equipment:

Participants felt that the broadband is something major that the government has to focus on, especially in rural areas. One participant wrote:

"Improve Internet provision/speed in HSE hospitals"

"Poor interoperability issues need to be addressed. Greater broadband availability for people living rurally"

Broadband and speed:

"Improve Internet connection throughout Ireland. Offer free telehealth educational courses"

"National broadband access for patients - especially in rural areas"

Improved access and stability of IT within hospital (we have no Wi-Fi and only 3G access in our hospital)"

"I think ensuring adequate IT infrastructure is vital. Often internet speed is inadequate and there is no access to laptops. Ongoing training and support is needed"

"A much better network system is required for telehealth to work effectively down the country - 1. my clients had no connection at all, 2. Poor connection only in one small, dark room, where I was unable to see the child's movements correctly mainly due to his image dragging out, 3. Intermittent/staccato-like movements' online, making movements difficult to decipher, among the difficulties I experienced"

Equipment as a requirement:

"Each clinician has their own laptop.... bare minimum requirement. Improve national internet coverage".

6.3 Funding:

This theme focussed particularly on allocation of funds to buy equipment like laptops, smart phone to facilitate the use of telehealth.

"I work with older adults (over 75s) and we are heavily reliant on the charity Alone to get broadband/tablet/IT support for our patients. It would be great to not have to rely on a charity to educate our older adults. There are also so many software programs in the HSE; a more streamlined approach would be great"

"Funding should be given for adequate infrastructure, equipment, training & tech support (if required). It is cost effective, more accessible & reduces wait times"

"IT depts. are the main limiting factor in telehealth, they need to be resourced but mandated to support rather than inhibit telehealth"

6.4 Skills set/ hands on Practice:

In this theme, participants believe that Physiotherapy practice is hands on and practical approach and telehealth can influence the treatment outcomes. One participant wrote:

"I think ehealth for physio served a purpose to provide assessment and treatment for patients but has many limitations. As a hands-on profession, a lot of our skills can't be offered via video ie adequate observation, temp of an area, manual treatment, correction of poor exercise technique".

"We are losing the skill set that makes our profession unique".

"Telehealth has a place most definitely however unfortunately I believe it is going in the wrong direction- some people that I see that have had telehealth intervention through health providers can't believe it is the same profession"

6.5 Few participants wrote from patient's perspective:

"Somehow people want to do his treatment like traditional treatments such as myofascial release, muscles stretching and perform exercises in front of therapist like Pilates exercises. In this condition patients has issues to do his physical therapy session on telehealth".

Psychological aspect of patient:

"We need to get away from the idea that a physio will 'fix' a patient. That is the biggest barrier my patients report- they want the hands on because they feel something is being done to them. Good luck!"

One participant commented on safety issues that some findings could be missed:

"Too many things can be missed or not discussed and patients using phones and tablets don't allow us to view pt movement as well as we need to assess. Generally, not clear enough for good communication or objective measures and pts are distracted by other people at home".

"As Physios to me by definition we need to be hands on to be accurate in our care Where this isn't possible for whatever reason then telehealth is better than nothing but should carry the caveat that when able go see your therapist"

6.6 Digital Literacy and training:

Interesting to note that participants commented on training and educating on use of telehealth for both patients and the therapist:

"Within our organization and disability services and physiotherapy, you need to be with the person to provide the intervention and care. We did try various IT systems during the initial stages of COVID but found within our population (ID sector) that there were challenges including person's access to IT and understanding how to use it, inability to demonstrate fully for the person, inability to provide tactile cues when needed, challenges engaging with individuals through a screen which is likely quite small, inability to assess equipment via telehealth etc. Telehealth is not a viable option for work within our sector and discipline"

Physiotherapist getting educated on IT

"Educate the professionals for telehealth, More IT training to all staff"

"Improved access for all patients, especially those with financial difficulties/lower socioeconomic areas Education classes on how to use telehealth for elderly people"

6.7 Awareness and Promoting telehealth:

Few participants recommended eHealth and Irish government on promoting awareness to improve the engagement and use of telehealth for the public. This was something that didn't come up in the survey questionnaire.

"It needs to be sold to the public as a useful and viable option, a lot of service users still feel they aren't getting a service unless it is face to face"

"Advertise the benefits of telehealth services, while at the same time making it clear that a face-to-face appointment will be scheduled with minimal delay if the telehealth appointment is found to be unsuitable"

6.8 Telehealth: No buy in:

It was also interesting to note that few participants don't believe that telehealth is an option or mode of service delivery; however, these participants were less in numbers

"The use of telehealth is not a full aspect of physiotherapy. Unfortunately, we have young Physio's coming out & think that it is - make sure the young clinician doesn't depend on it too much"

"Telehealth not an option"

"Not to be relying on telehealth, you can't beat F2F!!"

"Don't force the public to accept AI as the new normal. Humans are conscious beings and supersede AI. Never coerce the public and healthcare staff into taking experimental mRNA gene therapy ever again"

7. CONCLUSION AND DISCUSSION:

7.1 Reflecting on the research:

The major purpose of this study was to explore the sustainability of telehealth during and after the Covid-19 pandemic restrictions through the lenses of physiotherapists and to see if telehealth can be used as a mode of service delivery for reasons other than Covid-19. Three objectives were investigated by the researchers how physiotherapists adopted telehealth solutions in response to Covid-19 in Ireland, the extent to which physiotherapists were dependent on telehealth solutions during and after the Covid-19 restrictions, and their perceptions of the enablers, barriers, and prospects to telehealth sustainability.

Most of the participants were in acute hospitals and primary care centers. The results reflected that over half of the participants had IT literacy at a good level. Physiotherapists' perspective on telehealth practices and prospects is reflected by their clinical experiences. Their responses underpinned telehealth considerations, enablers, barriers, and futuristic approaches in the Irish context. The findings explored that a maximum number of the participants used telehealth services during the Covid-19 pandemic. During and after the Covid-19 pandemic restrictions, the most popular forms of telehealth were video consultations and telephone among physiotherapists. On the contrary, most participants decreased telehealth use after Covid-19 restrictions were lifted. Nearly, 88% to 45% reduction was identified as the participants admitted that they are not using telehealth after the Covid-19 restrictions. Similarly, Farren et al. (2022) discussed that participants utilized telehealth practices when Covid-19 breached the world, though universal support needs to be embedded for upcoming adoption. The analysis revealed that a small number of the participants claimed that they are completely involved in telehealth in the current situation. A limited number of the participants agreed they take a few sessions through telehealth and the rest are face-to-face sessions. Many of the respondents briefed that they deliver only 1-3 out of 10 sessions as part of their service delivery and the maximum time they engage with face-to-face practices.

The participants were asked to select the most prominent enablers of telehealth solutions in Ireland. The results indicated that telehealth accessibility, patients' acceptance, cost-effectiveness, and seamless healthcare delivery to the patients are the major enablers. The participants stated that they believe current telehealth solutions have barriers to sustain in Ireland such as impractical and inappropriate method of physiotherapy interventions, lack of patient acceptance, poor infrastructure and insufficient facilities, inadequate funding, and lack of job satisfaction. Lolich et al. (2019) concluded that telehealth is not a substitute for traditional autonomy but is helpful with a blended structure. They further discussed that improper budgeting allocation is the greater barrier to telehealth initiatives. Patient's acceptance for telehealth from the participant's point of view seems to have an overlapping statement. Majority of Physiotherapist (n=39) stated that their patients preferred face to face treatment and some Physiotherapist (n=33) has reported that their patients accepted telehealth as a mode of treatment delivery.

The barriers such as Impracticality and inappropriate implementation of telehealth for certain types of disease conditions and treatment approaches like palpation and hands on treatment were top barriers for few of the participants. Impractical and unrealistic telehealth strategies only provide insufficient solutions to the population (Kaboré *et al*, 2022). Moreover, Farren *et al*. (2022) highlighted this as a limitation of telehealth in dysphagia interventions, and Tully *et al*. (2021) critically reviewed telehealth solutions for pediatrics. It is because clients have different and complex profiling and require variation in therapies. The participants were found optimistic based on their clinical experiences. They acknowledged that telehealth has numerous advantages as convenience remote physiotherapy consultation and cost-effectiveness. Literature suggests that telehealth poised the healthcare landscape positively (Bhaskar *et al*, 2020). To accomplish these essentials considerable infrastructure, appropriate management, and accessibility are required (Farren *et al*, 2022; Lolich *et al*, 2019). Covid-19 played an important role in value telehealth delivery. It bridges geographical and professional gaps with flexible and diverse delivery. Lolich *et al*. (2019) signified that it is necessary to provide quick services for exchanging information among telehealth users.

Some participants were found dissatisfied with the current telehealth solutions practices as an alternative to traditional methods, this may be due to various reasons including the lack of opportunity to use hands on treatment approach by the Physiotherapist. As Farren *et al*. (2022) identified that tele practice is not sufficient as an alternative to face-to-face experiences. Reynolds and O'Donovan *et al*. (2020) recommended that a hybrid model can describe telehealth success. This blended individualised healthcare facilitates flexible telehealth adaptation. However, they visioned a significant future of telehealth delivery. They believe that their service delivery has improved with the introduction of telehealth. Most of the participants agreed that greater infrastructure development is required to further enable the use of telehealth. Such as Farren *et al*. (2022) argued that the lack of technology infrastructure is a considerable barrier to sustaining telehealth. Reynolds *et al*. (2021) supported that a combination of telehealth and traditional mode of healthcare can be supported through training, accessibility, adequate resources, and support services.

Conclusively, the findings insight into variation between telehealth practices during Covid-19 and after Covid-19 restrictions by the physiotherapists. The priorities are identified with greater differences between both conditions. Majority of the participants reduced their remote healthcare services, though they believe that it is starting point of telehealth that brought a hybrid model of healthcare solutions. Within the coordination of telehealth enablers such as telehealth accessibility, patients' acceptance, cost-effectiveness, and quick service delivery further progress can be expected. Subsequently, the positive impact of telehealth can accelerate its worth in future by shutting down barriers and challenges.

7.2 Ethics Approval:

The study was approved by the Research Ethics Committee of Savonia University of Applied Sciences 28th April 2023 (appendix 3). The actual assessment was carried out as per the guidelines of The Finnish National Board of Research Integrity TENK publication 3/2019: Guidelines for ethical review in human science.

Permission to complete the study was received from the Physiotherapy Manager in HSE CHO- 9 Dublin North Central and clearance received from the HSE – National Research and development department for non-requirement of research permit for this study.

Other ethical considerations included the clear identification of the need for this study, communicating clearly the storage of the dataset on the HSE server and Savonia University server, receiving consent from the participants before the start of the survey.

7.3 Validity and reliability of the research

The validity and reliability of the research result refer to the authenticity, accuracy, and usability within the specific generalization. The response rate in this study was significant (88.72%). A randomized selection of participants provided equal opportunity to reduce human biases (Creswell *et al*, 2012). These participants considerably completed the online survey. The reliability of the results is enhanced through the validated and reliable research instrument. Another adequacy can be in closed and open-ended questionnaires to stimulate respondents to explore their perspectives. The research method, data collection tool, analysis, and interpretation were aligned and appropriate with the research objectives. The relevant outcomes are robustly captured research objectives under the true influence of data analysis. The collected were original and authentic as it was self-reported by the physiotherapist without any influence of the researcher. Further, data analytics and computation maintained the simplicity of data to carry out different research goals. The prior questionnaire development, research design, and findings contributed to the body of knowledge. However, the sample size of this study was limited to saturate the generalizability of findings. The above-mentioned ensures that the findings and conclusion of this study were trustworthy and accurate.

7.4 Recommendations

Based on the study findings, the following recommendations have been made for eHealth, HSE, Department of Health, researchers, and healthcare professionals. First, it is important to improve telehealth users' experiences whether practitioners or patients and investment in developing a better infrastructure is crucial. The telehealth strategy developers should consider collaboration and co-creation projects among healthcare stakeholders, as this will improve the developmental and implementation of any new telehealth initiative. Second, a national telehealth campaigning and advertising as recommended by the participants should be considered to create awareness not only for the patients but also for the Physiotherapists and other healthcare professionals. Third, the e-Health, HSE and Department of Health should assess whether the enablers of telehealth such as accessibility, users' acceptance, cost-effectiveness, and fast service delivery are possibly implemented with scalability. The prior recommendations such as a patient-centred approach may reduce the barriers like impracticality, inappropriateness for complex interventions, lack of patient acceptance, and job satisfaction. In a nutshell, poor infrastructure, insufficient facilities, inadequate funding, and job dissatisfaction demonstrate crises in sustaining telehealth. These barriers need to be addressed through investing in infrastructure, standardised interoperability systems, staff and patient education, with considerations of professionals' needs, collaboration, and community engagement.

7.5 Suggestions for Future Research

It is recommended that further consideration within the physiotherapy context can be investigated by future researchers, especially when majority of Physiotherapist accept that telehealth has a prospective future but still the survey results have shown poor or reduced uptake of telehealth after Covid-19 restrictions were lifted. The absence of a larger sample size greatly infringes on issues related to complex clinical settings and telehealth compliance. A broader evaluation to examine risks in patients' telehealth acceptance, a blended model of healthcare solutions, and data privacy can be a useful investigation. The feasibility of this research is based on self-reporting only and future researchers can assess telehealth implementation with mixed-method research approaches. This functional capacity of research may explore the participants' perspectives deeply. Beyond physiotherapy, many other disciplines can be assessed within telehealth initiatives and can be compared with current study. The upcoming investigations can focus on the applicability of telehealth in more technical and hands on healthcare disciplines, and ongoing practices from the patients' perspectives. Patient's perspectives and their acceptance on telehealth satisfaction and future of telehealth should be evaluated in detail as this study aimed only on Physiotherapist's perspective and not the direct views of their patients. Factors such as, their concerns about cost-effectiveness, accessibility, acceptance, and security should be investigated from patient's point of view and how inclusive and exclusive equity is served by the healthcare providers.

By investigating deeper aspects of telehealth sustainability in Ireland, valuable contributions intervened for telehealth policies such as this study. By investigating deeper aspects of telehealth sustainability in Ireland, future studies make a valuable contribution to telehealth policies as this study. Moreover, telehealth should be addressed in long-term prospects by breaking down the barriers. By considering these suggestions, a comprehensive understanding of telehealth's potential, practices within different healthcare services, patients' expectations, and intervention consequences facilitate sustainable integration into digital healthcare systems in Ireland. To brief, it is required to establish telehealth efficiency and efficacy in complex therapeutic practices at a wider range. This evidence-based intervention will explore telehealth services in Physiotherapy clinical settings. To conclude, the researcher proposed an evaluation of physiotherapists' intentions towards telehealth sustainability as telehealth practices intake reduced after Covid -19 restrictions were lifted.

8. REFERENCES:

- Agarwal, S., LeFevre, A. E., Lee, J., L'Engle, K., Mehl, G., Sinha, C. & Labrique, A. (2016). Guidelines for reporting of health interventions using mobile phones: Mobile health (mHealth) evidence reporting and assessment (mERA) checklist. *National Institute of Health, BMJ*, i1174.
- Aktan, R., Yilmaz, H., Demir, İ. & Özalevli, S. (2022). Agreement between tele-assessment and face-to-face assessment of 30-s sit-to-stand test in patients with type 2 diabetes mellitus. *Irish Journal of Medical Science (1971 -)*, 191(6).
- Ahmed, F., Wysocki, R.W., Fernandez, J.J., Cohen, M.S. & Simcock, X.C (2021) Patient Perspectives on Telemedicine During the COVID-19 Pandemic. *American Association for Hand Surgery, HAND*, 18(3) 522–526.
- American Medical Association (2016). *Digital Health Study_Physicians' motivations and requirements_for adopting digital clinical tools*. Digital Health Study, The American Medical Association (AMA).
- Arias, A. & Rickwood, S. (2022, 11 August). *How can countries achieve digital maturity in healthcare?* [Health & Healthcare]. World Economic Forum. Retrieved 8 July 2023 from <https://www.weforum.org/agenda/2022/08/countries-achieve-digital-maturity-healthcare/>
- Bennell, K. L., Jones, S. E., Hinman, R. S., McManus, F., Lamb, K. E., Quicke, J. G., et al. (2022). Effectiveness of a telehealth physiotherapist-delivered intensive dietary weight loss program combined with exercise in people with knee osteoarthritis and overweight or obesity: Study protocol for the POWER randomized controlled trial. *BMC Musculoskeletal Disorders*, 23:733.
- Bennell, K. L., Lawford, B. J., Metcalf, B., Mackenzie, D., Russell, T., Van Den Berg, M., et al. (2021). Physiotherapists and patients report positive experiences overall with telehealth during the COVID-19 pandemic: A mixed-methods study. *Journal of Physiotherapy*, 67(3), 201–209.
- Bhaskar, S., Bradley, S., Chattu, V. K., Adisesh, A., Nurtazina, A., Kyrykbayeva, S., et al. (2020). Telemedicine Across the Globe-Position Paper From the COVID-19 Pandemic Health System Resilience PROGRAM (REPROGRAM) International Consortium (Part 1). *Frontiers in Public Health*, 8:1-15.
- Boynton, P., M., and Greenhalgh, T. (2004). Selecting, designing, and developing your questionnaire. *BMJ*, 328:1312-1315.
- Burde, H. (2011). The HITECH Act: An Overview. *AMA Journal of Ethics*, 13(3), 172–175.
- Business Finland (2018). *A Nordic Story About Smart Digital Health*. Retrieved 8 July 2023 From <https://www.diva-portal.org/smash/get/diva2:1297054/FULLTEXT01.pdf>
- Byrne, D.(2022) A worked example of Braun and Clarke's approach to reflective thematic analysis. *Quantity and Quality*, 56, 1391-1412, Retrieved 8 July 2023 from <https://link.springer.com/article/10.1007/s11135-021-01182-y>

- Cascini, F., Altamura, G., Failla, G., Gentili, A., Puleo V, et al. (2022) Approaches to priority identification in digital health in ten countries of the Global Digital Health Partnership. *Frontier Digital Health*, 4:968953.
- Central Statistics Office. (2023). *Internet Usage by Households—CSO - Central Statistics Office*. CSO. Retrieved 8 July 2023 from <https://www.cso.ie/en/releasesandpublications/ep/p-syi/statisticalyear-bookofireland2021part1/soc/internetusagebyhouseholds/>
- Chivate, S., Sharma, M., Shaikh, A. & Satarkar, C. (2022). Benefits and Challenges of Telerehabilitation Use By Pediatric Physiotherapists During the COVID-19 Pandemic In Western and Southern India: A Cross Sectional Survey. *International Journal of Telerehabilitation*, 14(1), 1-8.
- Cottrell, M. A. & Russell, T. G. (2020). Telehealth for musculoskeletal physiotherapy. *Musculoskeletal Science & Practice*, 48:102193.
- Cohen, L., Manion, L. & Morrison K. (2007). *Research Methods in Education* (6th edn). Routledge, Taylor & Francis Group, London & New York
- Creswell, J. W. (2012). *Educational research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research* (4th, edn). Boston: Pearson.
- Cronin, E., McCallion, M. & Monaghan, K. (2023). "The best of a bad situation?" A mixed methods survey exploring patients' perspectives on physiotherapy-led online group exercise programmes. *Irish Journal of Medical Science (1971 -)*, 192(2), 1-12.
- D'Souza, A. F., & Rebello, S. R. (2021). Perceptions and Willingness of Physiotherapists in India to Use Telerehabilitation During the COVID-19 Pandemic. *International Journal of Telerehabilitation*, 13(2), e6425
- Davies, L., Hinman, R. S., Russell, T., Lawford, B., Bennell, K., Billings, M., et al. (2021). An international core capability framework for physiotherapists to deliver quality care via videoconferencing: A Delphi study. *Journal of Physiotherapy*, 67(4), 291–297.
- Department of Health, Ireland (2020). *eHealth Strategy for Ireland* (pp. 1–80). Retrieved 8 July 2023 from <https://assets.gov.ie/16174/092e7c62f97b472b83cdb6dfdcd5c7.pdf>
- Dermody, J. (2023, 1 June). Ireland poised to be a leader in global rise of digital health. *Irish Examiner*. Retrieved 8 July 2023 from <https://www.irishexaminer.com/business/technology/arid-41152555.html>
- Digital Economy and Society Index (2022). *Digital Economy and Society Index (DESI) 2021 Ireland*. Retrieved 18 July 2023 from <https://digital-strategy.ec.europa.eu/en/policies/desi>
- eHealth Ireland. (2023). *Telehealth Programme Overview*. EHealth Ireland. The Health Service Executive (HSE). Retrieved 18 July 2023 from <https://www.ehealthireland.ie/ehealth-functions/community-health/telehealth-programme/ehealth-telehealth-programme-overview/http://www.ehealthireland.ie/ehealth-functions/community-health/telehealth-programme/ehealth-telehealth-programme-overview/telehealth-programme-overview.html>

- Farren, E., Quingley, D. & Lynch, Y. (2022). Telepractice in service delivery: A survey of perspectives and practices of speech and language therapists in Ireland during COVID-19. *Advances in Communication and Swallowing*, 25(1), 5-16.
- EIT Health Ireland-UK (2023). *Digital health on prescription – Is Ireland ready?* (pp. 1–17). EIT Health. European Institute of Innovation and Technology. Retrieved 8 July 2023 from <https://eithealth.eu/wp-content/uploads/2023/02/Whitepaper-EIT-Health-Ireland-UK-Health-Apps-On-Prescription-1.pdf>
- Galvin, E. (2020). Commercialising connected health solutions in the Irish public health system- Key barriers and enablers [Electronic version]. *Health Innovation Hub Ireland*, Retrieved 11 July 2023 from <https://hih.ie/downloads/knowledge-network/innovation-publications/Commercialising-connected-health-solutions-in-the-Irish-public-health-system.pdf>
- Glynn, R. (2023). Seven key enablers in transforming Ireland’s digital health landscape. *Ernst and Young Ireland Health Sector*. Retrieved 11 July 2023 from https://www.ey.com/en_ie/health/seven-key-enablers-in-transforming-irelands-digital-health-landscape
- Glynn, E., H. (2022). Corruption in the health sector: A problem in need of a systems-thinking approach. *Frontier Public Health*, 10: 910073.
- Grant, C., Jones, A. & Land, H. (2022). What are the perspectives of speech pathologists, occupational therapists and physiotherapists on using telehealth videoconferencing for service delivery to children with developmental delays? A systematic review of the literature. *Australian Journal of Rural Health*, 30(3), 321–336.
- Greenhalgh, T., Wherton, J., Papoutsis, C., Lynch, J., Hughes, G., A’Court, C., et al. (2018). Analysing the role of complexity in explaining the fortunes of technology programmes: Empirical application of the NASSS framework. *BMC Medicine*, 16(1), 66.
- Haines, K. J., Sawyer, A., McKinnon, C., Donovan, A., Michael, C., Cimoli, C., et al. (2023). Barriers and enablers to telehealth use by physiotherapists during the COVID-19 pandemic. *Physiotherapy*, 118:12–19.
- Hasani, F., Malliaras, P., Haines, T., Munteanu, S. E., White, J., Ridgway, J., et al. (2021). Telehealth sounds a bit challenging, but it has potential: Participant and physiotherapist experiences of gym-based exercise intervention for Achilles tendinopathy monitored via telehealth. *BMC Musculoskeletal Disorders*, 22(1), 138.
- Irish Medical and Surgical Trade Association (IMSTA) (2023). *Digital Health Insights: A report on the digital health sector in Ireland* (2248; pp. 1–24). Retrieved 11 July 2023 from <https://www.abhi.org.uk/resource-hub/file/9328>
- Irish Business and Employers Confederation (2023). *Ireland Where Digital Health Thrive*. An ibec campaign, Dublin, Ireland.
- Jacquemard, T. (2021). eHealth in Ireland Social and Ethical Values in Irish Policy on eHealth. *Oireachtas Library & Research Service*, 3:1–53.

- Jin, C., Ishikawa, A., Sengoku, Y. & Ohyanagi, T. (2000). A telehealth project for supporting an isolated physiotherapist in a rural community of Hokkaido. *Journal of Telemedicine and Telecare*, 6(2), 35–37.
- Jonsdottir, J., Santoyo-Medina, C., Kahraman, T., Kalron, A., Rasova, K., Moumdjian, L., et al. (2023). Changes in physiotherapy services and use of technology for people with multiple sclerosis during the COVID-19 pandemic. *Multiple Sclerosis and Related Disorders*, 71:104520.
- Kaboré, S. S., Ngangue, P., Soubeiga, D., Barro, A., Pilabré, A. H., Bationo, N., et al. (2022). Barriers and facilitators for the sustainability of digital health interventions in low and middle-income countries: A systematic review. *Frontiers in Digital Health*, 4:1014375.
- Labrique, A. B., Wadhvani, C., Williams, K. A., Lamptey, P., Hesp, C., Luk, R., et al. (2018). Best practices in scaling digital health in low and middle-income countries. *Globalization and Health*, 14(1), 1-103.
- Lane, A. & Clarke, V. (2021). *Report on the Findings of the First National Evaluation of the Use of Video Enabled Health Care in Ireland* (pp. 1–140). The National Telehealth Steering Committee.
- Lennox, L., Maher, L. & Reed, J. (2018). Navigating the sustainability landscape: A systematic review of sustainability approaches in healthcare. *Implementation Science*, 13(1), 1-27.
- Lolich, L., Riccò, I., Deusdad, B. & Timonen, V. (2019). Embracing technology? Health and Social Care professionals' attitudes to the deployment of e-Health initiatives in elder care services in Catalonia and Ireland. *Technological Forecasting and Social Change*, 147:63–71.
- Lu, W.-C., Tsai, I.-C., Wang, K.-C., Tang, T.-A., Li, K.-C., Ke, Y.-C., et al. (2021). Innovation Resistance and Resource Allocation Strategy of Medical Information Digitalization. *Sustainability*, 13(14),14.
- Ma, C. & Tg, R. (2020). Telehealth for musculoskeletal physiotherapy. *Musculoskeletal Science & Practice*, 48:102-193.
- Mace, R. A., Mattos, M. K. & Vranceanu, A. M. (2022). Older adults can use technology: Why healthcare professionals must overcome ageism in digital health. *Translational Behavioral Medicine*, 12(12), 1102–1105.
- Meske, C., Amojó, I., Poncette, A.S. & Blazer, F (2019) The Potential Role of Digital Nudging in the Digital Transformation of the Healthcare Industry. *Springer Nature Switzerland*, 11585, 323-336.
- Meyers, L., S., Gamst, G. and Guarino, A., J. (2017). *Applied Multivariate Research: Design and Interpretation* (3rd, edn) SAGE Publications Asia-Pacific Pte. Ltd. India
- McCool, J., Dobson, R., Muinga, N., Paton, C., Pagliari, C., Agawal, S., et al. (2020). Factors influencing the sustainability of digital health interventions in low-resource settings: Lessons from five countries. *Journal of Global Health*, 10(2), 020396.

- Meyerheim, M., Burns-Gebhart, A., Mirzaie, K., Garani-Papadatos, T., Braun, Y. & Graf, N. (2021). Challenges and Pitfalls for Implementing Digital Health Solutions in Clinical Studies in Europe. *Frontiers in Digital Health*, 3(2), 730680.
- Mohammed, M. A., Mohammed, M. A. & Mohammed, V. A. (2022). Impact of Artificial Intelligence on the Automation of Digital Health System. *International Journal of Software Engineering & Applications*, 13(6), 23–29.
- Nimmagadda, S., Gopalakrishnan, L., Avula, R., Dhar, D., Diamond-Smith, N., Fernald, L., *et al.* (2019). Effects of a mHealth intervention for community health workers on maternal and child nutrition and health service delivery in India: Protocol for a quasi-experimental mixed-methods evaluation. *BMJ Open*, 9(3), e025774.
- O'Donovan, M., Buckley, C., Benson, J., Roche, S., McGowan, M., Parkinson, L., *et al.* (2020). Telehealth for delivery of haemophilia comprehensive care during the COVID-19 pandemic. *Haemophilia*, 26(6), 984–990.
- Palacholla, R. S., Fischer, N., Coleman, A., Agboola, S., Kirley, K., Felsted, J., *et al.* (2019). Provider- and Patient-Related Barriers to and Facilitators of Digital Health Technology Adoption for Hypertension Management: Scoping Review. *JMIR Cardio*, 3(1), e11951.
- Pan American Health Organization. (2021). *8 Principles for Digital Transformation of Public Health—PAHO/WHO | Pan American Health Organization* (PAHO/EIH/IS/21-0004; Digital Transformation Toolkit; Knowledge Tools). PAHO. Retrieved 7 July 2023 from <https://iris.paho.org/handle/10665.2/54256>
- Petrazzuoli, F., Collins, C., Van Poel, E., Tatsioni, A., Streit, S., Bojaj, G., *et al.* (2023). Differences between Rural and Urban Practices in the Response to the COVID-19 Pandemic: Outcomes from the PRICOV-19 Study in 38 Countries. *International Journal of Environmental Research and Public Health*, 20(4), 3674.
- Radhakrishnan, K., Xie, B. & Jacelon, C. S. (2016). Unsustainable Home Telehealth: A Texas Qualitative Study. *The Gerontologist*, 56(5), 830–840.
- Reynolds, A., Awan, N. & Gallagher, P. (2021). Physiotherapists' perspective of telehealth during the Covid-19 pandemic. *International Journal of Medical Informatics*, 156: 1386-5056.
- Saisó, S. G., Marti, M. C., Medina, F. M., Pascha, V. M., Nelson, J., Tejerina, L., *et al.* (2022). Digital Transformation for More Equitable and Sustainable Public Health in the Age of Digital Interdependence. *American Journal of Public Health*, 112(6), S621-S624.
- Sari, Y. M., Burton, E., Lee, D.-C. A. & Hill, K. D. (2023). A Telehealth Home-Based Exercise Program for Community-Dwelling Older People with Dementia in Indonesia: A Feasibility Study. *International Journal of Environmental Research and Public Health*, 20(4), 3397.
- Shah, S. G. S., Noguerras, D., Woerden, H. C. van, & Kiparoglou, V. (2020). The COVID-19 Pandemic: A Pandemic of Lockdown Loneliness and the Role of Digital Technology. *Journal of Medical Internet Research*, 22(11), e22287.

- Singh, N. S., Scott, K., George, A., LeFevre, A. E. & Ved, R. (2021). A tale of 'politics and stars aligning': Analysing the sustainability of scaled-up digital tools for front-line health workers in India. *BMJ Global Health*, 6(5), e005041.
- Singh, P. K., & Landry, M. (2019). Harnessing the potential of digital health in the WHO South-East Asia Region: Sustaining what works, accelerating scale-up and innovating frontier technologies. *WHO South-East Asia Journal of Public Health*, 8(2), 67–70.
- Smith, E. M., Toro Hernandez, M. L., Ebuenyi, I. D., Syurina, E. V., Barbareschi, G., Best, K. L., et al. (2020). Assistive Technology Use and Provision During COVID-19: Results From a Rapid Global Survey. *International Journal of Health Policy and Management*, 11(6), 1.
- Snowell, C. L., Taylor, M. L. & Caffery, L. J. (2019). The breakeven point for implementing telehealth. *Journal of Telemedicine and Telecare*, 25(9), 530–536.
- Țăran, A.-M., Mustea, L., Vătavu, S., Lobonț, O.-R., & Luca, M.-M. (2022). Challenges and Drawbacks of the EU Medical System Generated by the COVID-19 Pandemic in the Field of Health Systems' Digitalization. *International Journal of Environmental Research and Public Health*, 19(9), 4950.
- The Health Service Executive (2015). *Knowledge & Information Strategy*. Retrieved 18 July 2023 from https://www.ehealthireland.ie/knowledge-information-plan/hse_knowledge_information_plan-pdf.pdf
- The United States Agency for International Development (2023). *A Vision for Action in Digital Health*. Retrieved 8 July 2023 from <https://www.usaid.gov/policy/digital-health-vision>
- Tsekoura, M., Fousekis, K., Lampropoulou, S., Xergia, S., Bania, T., Tsepis, E., et al. (2022). Physiotherapists' Perceptions and Willingness to Use Telerehabilitation in Greece: A Cross-Sectional Study. *Cureus*, 14(12), e32317.
- Tully, L., Case, L., Arthurs, N., Sorensen, J., Marcin, J. P. & O'Malley, G. (2021). Barriers and Facilitators for Implementing Paediatric Telemedicine: Rapid Review of User Perspectives. *Frontiers in Pediatrics*, 9:630365.
- Wang, J. & Xu, Y. (2023). Digitalization, income inequality, and public health: Evidence from developing countries. *Technology in Society*, 73: 102210.
- Wannheden, C., von Thiele Schwarz, U., Östenson, C. G., Pukk Härenstam, K., & Stenfors, T. (2021). What's the Name of the Game? The Impact of eHealth on Productive Interactions in Chronic Care Management. *Sustainability, MDPI AG*, 13(9), 5221. MDPI AG.
- Wong, B. L. H., Maaß, L., Vodden, A., van Kessel, R., Sorbello, S., Buttigieg, S., et al. (2022). The dawn of digital public health in Europe: Implications for public health policy and practice. *The Lancet Regional Health - Europe*, 14: 100316.

Zhang, J., Zhao, W., Cheng, B., Li, A., Wang, Y., Yang, N., et al. (2022). The Impact of Digital Economy on the Economic Growth and the Development Strategies in the post-COVID-19 Era: Evidence from Countries Along the "Belt and Road". *Frontiers in Public Health*, 10(1), 856142.

9. APPENDIX:

Appendix 1: Questionnaire

As we continue to deliver health services in the presence of COVID 19 are we using telehealth to support practice? An Analysis of sustainability of telehealth solutions among Physiotherapists in Ireland	
1. Gender	a) Female b) Male c) Prefer not to say
2. Professional Role	a) Staff Grade Physiotherapist
	b) Senior Physiotherapist
	c) Clinical Specialist
	d) Physiotherapy Manager
3. Location of work:	Acute Hospital
	Primary Care
	Nursing/ Residential units
	Rehabilitation centres
	Private Care
	Disability
	Charity & Others
4. What age range are you in	25-44 years
	45-64 years
	65 years and over
	Prefer not to say
5. Please rate your IT literacy	Excellent
	Good
	Average
6. Telehealth usage: I used telehealth between March 2020 - March 2022 as part of my service delivery	Yes
	No (If not please skip to question 8)
7. If yes, what kind of telehealth did you use?	a) Video consultation
	b) Telephone
	c) Remote monitoring through wearable sensors
	d) Others please specify:

8. I currently use telehealth as part of assessment, treatment, and follow-ups	Yes
	No (If no please proceed to question 11)
<p>9. What percentage of your current care involves telehealth as your service delivery method (F2F - Face to Face Contact?)</p> <ul style="list-style-type: none"> • 100% (Full telehealth use – No F2F) • 75% (e.g.: 7-8 out of 10 sessions are through telehealth and rest by F2F) • 50% (ego: Equal numbers of F2F and telehealth contacts) • 25% or less (e.g.: 1-3 out of 10 sessions are through telehealth and rest by F2F) 	
10. What kind of telehealth you currently use?	a) Video consultation
	b) Telephone
	c) Remote monitoring through wearable sensors
	d) Others please specify:
<p>11. Enablers: In your view, what do you think are enablers for use of telehealth in service provision? Choose your best three answers.</p> <ul style="list-style-type: none"> a. The government / eHealth has made adequate investments in telehealth programs. b. Cost effectiveness for both patients and clinicians c. I got enough manpower and support to handle the telehealth technologies. d. Quick delivery of services through telehealth solutions e. There is growing familiarity and acceptance of telehealth solutions by public. f. Improved access to patients and reduced travel times g. Great job satisfaction 	
<p>12. Barriers: In your view, what are the current barriers to using telehealth solutions? Choose any three answers. Choose your best three answers.</p> <ul style="list-style-type: none"> a. Inadequate funding for purchase of telehealth solutions/ devices. b. My patients prefer face-to-face solutions. c. The organization is unsupportive. d. I am comfortable with traditional approaches. e. Poor infrastructure and insufficient facilities including network connection challenges. f. Telehealth is not practical or appropriate for some/all aspects of my intervention or treatment. 	

Appendix 2: Pilot Study (May 2023)

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Draft - An Analysis of sustainability of telehealth solutions among Physiotherapists in Irela...	Active	12	Survey	Me	30 May 2023	16 May 2023	...
An Analysis of sustainability of telehealth solutions among Physiotherapists in Ireland - C...	Active	133	Survey	Me	16 Jul 2023	30 May 2023	...

< 1 of 1 >

Appendix 3: Ethical Approval

SAVONIAResearch Ethics Statement
28.4.2023**Ethical Statement for a Thesis plan**

ref: Vivek Bhaskaran thesis for Masters Program in Digital Healthcare in Savonia University of Applied Sciences: An Analysis of sustainability of telehealth solutions among Physiotherapists in Ireland

The Research Ethics Committee of Savonia University of Applied Sciences have been asked for a assessment for the research work referred above. The application for the statement dated March 27th, 2023 included The thesis plan, the questionnaire and the consent form. The assessment was asked due to the practices of the institution, where questionnaire will be used.

The actual assessments was carried out according to the guidelines by The Finnish National Board on Research Integrity TENK publication 3/2019: *Guidelines for ethical review in human sciences*.

According to the evaluation made by The Research Ethics Committee of Savonia University of Applied Sciences, good research ethics was followed throughout the research plan, and the referred study is according to these TENK Guidelines.

On behalf of the Research Ethics Committee,

Kuopio 28.4.2023



Mikko Vuoristo, Vice President
Chariman of Reserch Ethics Committee



Appendix 4: Participant's Information Leaflet

SAVONIA

University of Applied Sciences

Information for Participants in Research

Study Title: "An Analysis of sustainability of telehealth solutions among Physiotherapists in Ireland"

Principal investigator's name: **Vivek Bhaskaran**

Principal investigator's title: Senior Physiotherapist,
CORU PT027226 -
Vivek.kumar@hse.ie

Telephone number of principal investigator: 01-7044491

Co-investigator's name: **Liisa Klemola**

Co-investigator's title: Lecturer – Savonia University

Telephone number of co-investigator: 00 358 44 785 6203

Email: Liisa.Klemola@savonia.fi

Gate Keeper: **Joanne Finn**

Gate Keeper title: Physiotherapy Manager –
HSE- CHO 9

Telephone number of the gate Keeper 01 8605827

Email: Joanne.Finn2@hse.ie

Data Controller's Identity: Vivek Bhaskaran

Data Controller's Contact Details: 01-7044491

Dear Participant,

My name is Vivek Bhaskaran, working as a Physiotherapist in Claremont services. As part of my Master's dissertation, I am carrying out a survey questionnaire to analyse the sustainability of telehealth solutions among Physiotherapists in Ireland during COVID 19 and post COVID restrictions lifted. I would like to ask you to participate in my study.

1. Description of the study:

Given the continued existence of COVID-19 in Ireland, its unprecedented scale and unknown endpoint, the study aims to analyse the sustainability of telehealth in Ireland since March 2020. The study aims to answer the following questions:

- A. What telehealth solutions were adopted in response to Covid-19?
- B. How Physiotherapists in Ireland were dependent on telehealth solutions during COVID19 and how dependent are they after the ease of COVID-19 restrictions.
3. What are the current enablers and barriers associated with telehealth sustainability?

2. Rationale:

It is hypothesized that telehealth solutions implemented in Ireland during COVID 19 have the potential to support public health and these newly adapted healthcare delivery methods should be sustained by the Irish government and the Irish healthcare systems. Recent Irish studies have shown that the majority of healthcare professionals including Physiotherapists have considered telehealth as a sustainable alternative method of service delivery and would like to continue to offer telehealth consultations as routine patient care. Another Irish study has shown patient's acceptance of telehealth services during COVID 19. It is evident that healthcare professionals and patients are willing to adopt telehealth solutions as part of their care and current usage and sustainability of telehealth among the Physiotherapists may be better understood. Findings may inform the wider HSE, eHealth, the Department of Health and service providers to support future sustainable telehealth solutions and for long-term service delivery for reasons other than COVID-19.

3. Why have I been invited?

I have approached you because you are a Physiotherapist and your views and insights would be useful for my research. Participating in this study is completely voluntary and you can refuse to participate in this study.

4. What will I be asked to do if I take part?

If you decide to take part in this study, the following steps will be involved:

You will see a link to a survey questionnaire in this email

Please click on the link to the survey if you agree to proceed.

You give your consent for the survey if you wish to proceed and this will bring you to the survey questionnaire.

Complete the online survey that will less than 5 minutes.

Click the submit button and your participation in the research will be complete.

Ethical approval for this research has been given by the Savonia University of Applied Sciences, Finland

5. What are the advantages from taking part?

Taking part will contribute to the understanding of current usage of tele-health and its sustainability in Irish healthcare systems and gathering insights into long-term service delivery for reasons other than COVID-19.

6. What are the risks?

We anticipate that there will be no risks associated with your participation in this study

7. Voluntary participation:

Participating in this study is completely voluntary. You can refuse to participate or withdraw your participation up until you click the submit button. Once the questionnaire is submitted you will be unable to withdraw. You do not have to tell me why you do not want to participate. If you have any questions about your rights, please contact the

Researcher Vivek Bhaskaran or his supervisor Ms Liisa Klemola

8. Will my data be identifiable?

No personal data is collected in this survey and all data collected will be anonymised (i.e. you will not be identifiable). **Respondents' IP address, location data and contact info will not be collected.** All data will be stored electronically under strict data protection guidelines and in conjunction with HSE data protection policies and the guidelines of **Savonia University of Applied Sciences, Finland.**

9. Where will my data be stored and archived and will it be kept confidential?

Your data will be stored on password-protected computers, the HSE physiotherapy service computer servers and Savonia University Server. No-one other than me and the aforementioned lecturers will have access.

11. Research results:

I will use the data you have shared, to generate discussions and findings and the content of this study will be released in scientific publications to share new information. This research topic will also be discussed in presentations and during lectures.

12. If you have a question or concern:

You can ask me or my supervisor anything about this study before, during or after the survey. You have the right to access any data you have given me and have it rectified. In addition, you can tell me if you do not want your data to be processed. You will be asked to give consent before the survey. You will see the consent questionnaire at the beginning of the questionnaire. If you select YES, this will bring you into the survey questionnaire and you can start answering the survey questions. If you select No, it will bring you to the end of the page and you can opt out from the survey.

Thank you for considering your participation in this project.

Appendix 5: Thematic Analysis of Survey questionnaire

