‘The Development of a Telemedicine Service for Core Podiatry in the Maltese Public Service’

Lisa Ann Stojmanovski Mercieca

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FACULTY/INSTITUTE/CENTRE/SCHOOL Health Sciences

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Abstract

From a technological, cultural, and social perspective, telemedicine is considered one of the significant innovations in health services. Telemedicine benefits accessibility to health care services and promotes the quality of healthcare and organizational efficiency. Nonetheless, there are significant barriers to standardizing telemedicine as well as its complete consolidation and expansion.

Although a growing number of pilot projects and viability studies have been carried out in various healthcare professions, only a few telemedicine applications have been rooted in clinical practice and consolidated into medical processes. Moreover, even these were frequently dropped once the initial phase was over due to heavy regulatory laws and resistance to change from stakeholders.

This PhD research study aimed to investigate the feasibility of the development of a podiatric telemedicine framework for low-risk patients in a primary care setting. This research evaluated the possibility of implementing telemedicine in core podiatry; analyse interactions that arise throughout the process of implementation in podiatric care and changes that occur in organizations, management models, culture, and healthcare services. It also reflects on significant features associated to prioritization, design, deployment, integration, and assessment tailored for core podiatry services. The evaluation of the developed podiatric telemedicine guideline ultimately concentrates on significant aspects in the successful development of telemedicine and generates recommendations to overcome difficulties that could arise.

This research comprised three main studies, an initial scoping study to investigate current foot and ankle telemedicine practice guidelines, the second study adopting a modified Delphi

study to develop the podiatric telemedicine guideline, followed by the last phase which included healthcare provider training and a pilot study testing the podiatric telemedicine guideline in a primary care setting. Lastly, this PhD research shed light on the challenges faced and opportunities for podiatric service expansion in a primary care setting. This study developed the first evidence-based guideline for podiatry services in a primary care setting for low-risk patients.

Key words: Telemedicine, telehealth, podiatry, primary care, implementation, complex intervention.

Dedication

To all mothers who, through daily sacrifices, continue to persevere through life's hurdles with courage and hope — this work is dedicated to you. May it stand as a tribute to your resilience and a reminder that, despite the challenges, the possibilities to pursue one's dreams are infinite.

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Dissemination of Findings through Conferences and Publications

Conferences – Oral Presentations

1. Stojmanovski Mercieca, L.A., Formosa, C., and Chockalingam, N. (2025). Podiatric Telemedicine: Turning Challenges into Opportunities. This abstract was presented as an oral presentation at the 1st Running Science International Congress and ENPODHE Congress, in Zaragoza, Spain (27th and 28th March 2025).
2. Stojmanovski Mercieca, L.A., Formosa, C., Chockalingam, N., and Cassar, V. (2024). Extending the Scope of Telemedicine to Podiatric Medicine. This abstract was presented as an oral presentation at the 23rd EFMI STC2024 Conference, in Timisoara, Romania (27th-29th November 2024).
3. Stojmanovski Mercieca, L.A., Formosa, C., and Chockalingam, N. (2024). Enhancing Wound Care Management Through the Introduction of Podiatric Telemedicine. This abstract was presented as an oral presentation at the MASC Conference 'Together Towards Tomorrow: Collaboration in Wound Healing', in St.Julian's, Malta (6-7th May 2024).
4. Stojmanovski Mercieca, L.A., Formosa, C., and Chockalingam, N. (2024). The Introduction of Podiatric Telemedicine for Wound Care Management. This abstract was presented as an oral presentation at the EWMA Conference in London, UK (1-3rd May 2024).
5. Stojmanovski Mercieca, L.A., Formosa, C., and Chockalingam, N. (2024). Advancing Podiatric Telemedicine: A Guideline for Foot and Ankle Care in a

Primary Care Setting. This abstract was presented as an oral presentation at the FIP Global Podiatry Summit in Reykjavik, Iceland (3-6th March 2024).

6. Stojmanovski Mercieca, L.A., Formosa, C., and Chockalingam, N. (2023). Considerations for a Sustainable Podiatric Telemedicine Service. This abstract was presented as an oral presentation at the EFMI Special Topic Conference 2023 – Telehealth Ecosystems in Practice in Torino, Italy (25th – 27th October 2023).
7. Stojmanovski Mercieca, L.A., Formosa, C., and Chockalingam, N. (2023). Telemedicine in Podiatry in a Primary Care Setting. This was a 20-minute oral presentation forming part of a webinar organised by the ISfTeH (International Society for Telemedicine and eHealth) part of a Flash Course Series held online (13th September 2023).
8. Stojmanovski Mercieca, L.A., Formosa, C., and Chockalingam, N. (2023). Podiatric Telemedicine Guidelines: A Scoping Review. This abstract was presented as an oral presentation at the ENPODHE Congress: Walking Together, We are Stronger in Lisbon, Portugal (29th March – 31st March 2023).
9. Stojmanovski Mercieca, L.A., and Cassar, V. (2022). Telemedicine in Podiatry: Patient and Provider Perspectives. This abstract was presented as an oral presentation at the 4th Hellenic Conference of Podiatry in Athens, Greece (21st May and 22nd May 2022).
10. Stojmanovski Mercieca, L.A., and Cassar, V. (2022). Podiatric Telemedicine: An Evidence-Based Approach. This abstract was presented as an online oral presentation at the ENPODHE Congress: Future Steps Towards a Changing Podiatry held online (31st March 2022).

Conferences – Posters

1. Stojmanovski Mercieca, L.A., Formosa, C., and Chockalingam, N. (2024). Implementing Podiatric Telemedicine within a Primary Care Setting: Progress So Far. This abstract was presented as a poster at the Being SEA-EU Conference in Valletta, Malta (10-12th June 2024).
2. Stojmanovski Mercieca, L.A., Formosa, C., and Chockalingam, N. (2024). Blending Traditional and Virtual Approaches: A Guideline for Podiatric Care within Primary Care Settings. This abstract was presented as a poster at the University of Malta Research Expo in Valletta, Malta (29th May 2024).

Roundtable Discussions

World Telemedicine Congress 2025, Torre del Mar, Malaga, Spain (22nd-23rd May 2025). Presented a presentation on 'Telemedicine in Podiatry' for a roundtable discussion which was held online.

Peer Reviewed Abstracts and Publications

1. Stojmanovski Mercieca, L.A., Formosa, C. and Chockalingam, N. (2023). A scoping review of foot and ankle telemedicine guidelines. *Health Sci Rep*. 6:e1076. doi:10.1002/hsr2.1076
2. Stojmanovski Mercieca, L.A., Formosa, C. and Chockalingam, N. (2023). Considerations for a Sustainable Podiatric Telemedicine Service. *Studies in Health Technology and Informatics.* 20:309:292-293. doi: 10.3233/SHTI230799.
3. Stojmanovski Mercieca, L. A., Formosa, C., & Chockalingam, N. (2024). Developing a podiatric telemedicine framework for service users and providers in a

primary-care setting. *Journal of the American Podiatric Medical Association, 114*(5), 24-122. https://doi.org/10.7547/24-122

4. Stojmanovski Mercieca, L. A., Formosa, C., Chockalingam, N., & Cassar, V. (2024, November 22). Extending the scope of telemedicine to podiatric medicine. *Studies in Health Technology and Informatics, 321*, 89–93. https://doi.org/10.3233/SHTI241069
5. Stojmanovski Mercieca, L. A., Formosa, C., Chockalingam, N. (2025). The Introduction of Podiatric Telemedicine for Wound Care Management – An Alternate Model of Care. *Journal of Wound Management*.

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Chapter One – Framing the Thesis

1.1 Background

The emergence of telemedicine is widely acknowledged as a transformative force in healthcare delivery, constituting a substantial leap forward with notable implications for social and cultural progress (Haleem et al., 2021). Beyond its technological strides, telemedicine signifies a consequential societal shift, promising enhanced accessibility to high-quality healthcare and heightened recipient satisfaction (Kichloo et al., 2020).

The COVID-19 pandemic has been recognised as the primary driver for the recent increase in the use of telemedicine. The main benefit was that patients and healthcare providers could communicate with each other directly without the risk of spreading a disease or infection (Haleem et al., 2021). Since the pandemic, the use of telemedicine has increased significantly worldwide (Klinge & Bleckwenn, 2021). Unfortunately, even though much research has been done on telemedicine during that time, more research is needed on telemedicine recommendations relevant to certain professions, such as podiatric medicine (Stojmanovski Mercieca et al., 2023).

This PhD research provides scientific data supporting the advantages of telemedicine interventions in primary care, specifically applicable to podiatry while acknowledging the significance of physical intervention within the podiatry profession. It is widely believed that primary care serves a pivotal function in the healthcare system, acting as the initial point of contact for patients seeking treatment and as the gatekeeper and coordinator of care (Allen & Kidd, 2025). Podiatry in a primary care environment facilitates and promotes patient-centred care, patient education, managed self-care, accountable care, and population foot health (Allen & Kidd, 2025). Rising concerns regarding sustainability and projected shortages of primary care podiatrists, along with prolonged waiting periods for podiatric care, have generated interest in investigating the feasibility of podiatric telemedicine within a primary care context for low-risk patients, thereby addressing numerous challenges confronting the podiatry profession in Malta.

Despite the increasing number of pilot initiatives and feasibility analyses for various healthcare professions, only a limited number of telemedicine applications have been successfully integrated into clinical practice and established as integral components of medical procedures (WHO, 2010). Furthermore, it has been observed that these measures were often discontinued after the initial phase, mainly due to legal and regulatory issues (Broens, 2007; Kichloo et al., 2020; WHO, 2010). Nevertheless, despite the commendable

strides made in telemedicine across diverse medical domains (Bhaskar et al., 2020), a notable dearth of studies addressing its application in podiatry exists within the current body of literature. This study was undertaken to address this literature gap, rectify this deficiency, and assess the feasibility of employing telemedicine to provide accessible podiatric care for individuals who require it. This research aims to contribute valuable insights to the existing knowledge base, shedding light on the potential integration of telemedicine into podiatric practices for low-risk patients within the public primary care setting.

1.2 Definitions

Podiatry: Podiatry is the discipline that addresses the prevention, diagnosis, treatment, and rehabilitation of medical and surgical problems affecting the feet and lower extremities (Directorate Allied Health Services, 2023).

Core Podiatry: Core podiatry includes basic procedures such as the treatment of corns, callosities, foot infections (fungal, bacterial, or viral), nail pathologies, and comprehensive examinations, including biomechanical, vascular and neurological assessments (Directorate Allied Health Services, 2023).

Low-risk patients: Patients who have no neuropathy, no limb ischaemia, no significant deformity, no previous foot ulcers and able to demonstrate self-care (NICE, 2019).

Primary Health Care:

> *Primary Health Care is essential health care made universally accessible to individuals and families in the community by means acceptable to them and at a cost that the community and country can afford. It forms an integral part both of the country's health care system, of which it is the nucleus, and of the overall social and economic development of the community. It is the first contact of individuals, family and the community with the national health care system, bringing health care as*

> *close as possible to where people live and work, and constitutes the first element of a continuing health care process. PHC addresses the main health problems of the community, providing promotive, preventive, curative, supportive and rehabilitative services accordingly. (WHO, 1978)*

Telemedicine: Telemedicine refers to the utilisation of electronic communications and information technology to deliver therapeutic treatments when participants are situated in different places (American Telemedicine Association, 2006).

Telehealth: The term frequently refers to the extensive deployment of technologies in distant education, consumer outreach, and other contexts where electronic communications and information technologies facilitate healthcare services (American Telemedicine Association, 2006).

Complex Intervention:

> *An intervention might be considered complex because of properties of the intervention itself, such as the number of components involved; the range of behaviours targeted; expertise and skills required by those delivering and receiving the intervention; the number of groups, settings, or levels targeted; or the permitted level of flexibility of the intervention or its components.* (Skivington et al., 2021)

1.3 An Overview of Telemedicine

As has been established for over 30 years by Puskin and Sanders (1995, p.1), "telemedicine is not new". Technological advancements have added to the decades-long lexical confusion between telemedicine and telehealth, leading to other similarly interchangeable concepts, such as e-health and m-health (Gajarawala & Pelkowski, 2021). Although telehealth and telemedicine are defined in greater depth in the coming chapters, telehealth can be defined

as delivering healthcare and healthcare information via information and communication technology (WHO, 2010). It includes a wide range of telehealth services designed to enhance patient care and hospital operations. The term is commonly used to describe activities not directly involved in patient care, such as educational sessions for healthcare professionals, administrative meetings, and continuous professional development (Haleem et al., 2021). Long-distance clinical healthcare, patient and professional health-related education, public health, and healthcare administration are all bolstered using electronic information and telecommunication technologies (Gajarawala & Pelkowski, 2021). Telehealth technologies include video conferencing, store-and-forward imaging, live streaming media, and wireless connectivity (WHO, 2010).

Nevertheless, telemedicine is a subset of telehealth that focuses exclusively on remote clinical healthcare services (WHO, 2010). This healthcare delivery method eliminates the need for in-person contact between the provider and patient by instead relying on computer software and digital communication networks (WHO, 2010). It is broadly applied to remote services such as follow-up appointments, chronic disease management, medication administration, and specialist consultation (Haleem et al., 2021).

In the realm of telemedicine, specifying the setting of deployment is crucial, as the applicability and effectiveness of telemedicine solutions vary across different healthcare professions and contexts (Bashshur et al., 2016). Specifically, within the domain of podiatry, understanding the nuances of telemedicine deployment is essential for optimising patient care outcomes. Podiatry, encompassing the management of foot and ankle-related conditions, extends beyond mere nail trimming and corn/callus treatment to include a spectrum of dermatological, musculoskeletal, and footwear-related interventions (Landorf & Keenan, 2001). However, while telemedicine holds promise for enhancing access to podiatric services, its efficacy in addressing the complexities of podiatric care remains subject to scrutiny. Within Malta's primary care clinics, telemedicine implementation for

core podiatric interventions requires meticulous consideration of various factors, including diagnostic accuracy, patient satisfaction, and ethical implications (Kane et al., 2017). Furthermore, a comparative analysis of podiatric telemedicine initiatives can provide valuable insights into best practices and potential challenges unique to the Maltese healthcare system. Thus, this thesis critically evaluates the implications of telemedicine for core podiatric care within the primary care clinics of Malta, shedding light on its opportunities and limitations in improving podiatric care delivery.

1.4 Podiatry Services in Malta

To date, Malta's Primary Healthcare Service includes a team of 50 podiatrists, encompassing both clinical practitioners and those in management and administrative roles (Primary Healthcare Malta, 2023). In 2024, podiatrists held approximately 180,000 core podiatry appointments, which signals the increased workload which primary care podiatrists must share. Presently, Podiatry services are available in eight Health Centres and 17 community clinics under the umbrella of the Primary Health Care Department (Primary Healthcare Malta, 2023). The official recognition of Podiatry in Malta occurred approximately 40 years ago, marking a significant milestone in the healthcare landscape (Primary Healthcare Malta, 2023). Podiatric services for primary care are accessible through both the public and private healthcare systems. Nevertheless, this research is specifically directed towards the public sector, aiming to address service gaps and enhance the overall accessibility of podiatric care within this domain.

Podiatry's initial operation was initiated in the late 1980s at St Luke's Hospital, which served as Malta's primary government hospital. It holds historical significance as the first public institution to offer podiatry services. (Primary Healthcare Malta, 2023). Over the years, the spectrum of care has expanded, incorporating specialised podiatry clinics into the existing primary care facilities, including podopaediatrics, rheumatology, vascular, diabetes and

sports, as well as other secondary facilities at Mater Dei Hospital (including the Diabetes Outpatient clinic, Tissue Viability clinic and the Diabetic Foot Ward) and other tertiary hospital including St Vincent De Paul, Karin Grech Rehabilitation Hospital, Mount Carmel Hospital, and Gozo General Hospital (Primary Healthcare Malta, 2023). Moreover, domiciliary podiatry services have expanded over the years by introducing the Active Ageing and Community Care services (Active Ageing and Community Care Malta, 2025).

An important observation is the lack of an established telemedicine service in the local field of podiatry. This research seeks to address this gap by proposing the development and implementation of Malta's first national podiatric telemedicine service. The significance of this initiative lies in its potential to revolutionise patient care, particularly within the public healthcare sector.

Between May and July 2020, the Podiatry Department within Primary Healthcare implemented a temporary solution by introducing telemedicine consultations due to the COVID-19 pandemic in response to the cancellation of hundreds of daily appointments due to public health mandates restricting clinic visits to only the most urgent cases. This directive from healthcare authorities was applied to mitigate the spread of the COVID-19 pandemic. Podiatric telemedicine, facilitated through telephone consultations, emerged as a primary solution during that time; however, this was offered without any prior training to healthcare professionals and in an ad-hoc manner. Podiatrists contacted patients whose appointments had been postponed, ensuring continuity of care and providing necessary foot care advice until further notice. However, post-pandemic, these telephone consultations have since been discontinued, and all consultations have returned to in-person within primary care clinics.

1.5 Telemedicine Services in Malta

Currently, a cohort of primary healthcare general practitioners in Malta are offering telemedicine consultations from the Telemedicine Clinic, which was set up for this purpose

(Malta Daily, 2024). General practitioners initiated this service to mitigate the spread of COVID-19 in Malta, for general practitioners to communicate continuously with patients presenting with the viral infection as a follow-up measure. From a podiatry departmental perspective at the primary care level, it was noted that the introduction of telemedicine consultations by general practitioners had been successful, and its implementation was maintained due to its efficacy in meeting the fundamental healthcare needs of individuals, extending beyond the termination of the COVID-19 pandemic (Primary Healthcare Malta, 2023). In addition, the Department of Speech and Language Pathology offers telemedicine services to conduct autism screenings for children. A telemedicine facility on the island suggests a promising prospect for integrating supplementary telemedicine services in primary healthcare (Vassallo et al., 2024). Hence, the podiatric field must seize this opportunity and engage in collaborative efforts to promote and guarantee the provision of telemedicine services as a constituent component of its multifaceted service offerings.

1.6 The Literature Gap

Upon looking at the current literature on podiatric telemedicine in a primary care context, from an international perspective, a significant amount of the research has focused chiefly on orthopaedics (Eble et al., 2020; Manz et al., 2021; Sharma et al., 2022), musculoskeletal (Palmer et al., 2021), and wound management services (Chen et al., 2020; Bondini et al., 2020). Extensive studies have explored the use of telemedicine for managing wound care in high-risk populations with multiple co-morbidities and orthopaedic consultations. From an epidemiological survey carried out during the pandemic, physicians have also considered telemedicine for pre-operative and post-operative foot and ankle surgical interventions, follow-up consultations, and triaging (Neville et al., 2021). This great research uptake driven by the pandemic provided valuable information on how telemedicine can be implemented in other healthcare areas, such as podiatry. Nevertheless, there is a distinct paucity of research

in the field of podiatric telemedicine when it comes to managing foot and ankle conditions, especially in primary care settings where most patients usually can be categorised as low risk. This gap is important because while podiatry is generally seen as a profession that involves physical intervention, there are situations, such as for dermatological and musculoskeletal-related follow-ups, where patients do not need to visit the clinic physically and can be monitored remotely with appropriate professional guidance, especially if they are considered low risk. Addressing this gap could create the possibility of remote podiatric consultations, thereby expanding the existing podiatric services provided in primary care settings. This could free up clinical appointments for patients who require immediate hands-on intervention or other patients who might be considered as having higher-risk foot health status. Therefore, telemedicine eliminates the need for patients to travel unnecessarily and serves as a guideline for other professions to explore remote consultations in their respective fields.

Additionally, it could inform policy decisions, open avenues for further research in podiatry, and offer opportunities for other healthcare professions to explore remote consultations. This thesis addresses this gap in podiatric telemedicine in a primary healthcare context for low-risk patients. Doing so will contribute to a more comprehensive understanding of podiatric telemedicine and its dynamics within an already established podiatry clinical setting.

1.7 Justification of Study

In response to the global COVID-19 pandemic, healthcare strategies worldwide have embraced telemedicine and remote healthcare delivery (Bhaskar et al., 2020). However, the effectiveness of these strategies is intricately tied to the structures of healthcare systems, regulatory frameworks, and the impact of local culture on the provision of healthcare services on a global scale (Anawade et al., 2024). It has been reported that adopting telemedicine could introduce challenges for healthcare providers and patients alike,

stemming from differences in technology access among patients, patient educational levels, policy considerations, and ethical implications (Nittari et al., 2020). Therefore, evaluating all considerations before providing such a service is crucial, especially with this research study's chosen cohort of low-risk patients. Studies indicated that low-risk patients may rapidly experience foot issues without effective glycaemic management and self-care methods that enable the timely detection of sensory abnormalities (Calle-Pascual et al., 2002). Moreover, it is essential to acknowledge that most patients with foot issues were previously classified as low risk at some stage. Furthermore, a UK study indicated that low-risk patients demonstrated a diminished comprehension of the risks associated with foot injury, decreased wound healing, and the necessity for regular foot hygiene compared to high-risk patients (Pollock et al., 2004). Consequently, the development and implementation of such services in primary healthcare settings facilitate the avoidance of foot ailments from worsening through quick intervention.

Before the pandemic, the use of telemedicine in the healthcare system of Malta was limited to almost non-existent. During the pandemic, the only healthcare professionals who offered this service were general practitioners and speech and language pathologists. However, due to the pandemic's impact, non-essential appointments had to be cancelled across the healthcare system both locally and worldwide, leading to the need for telemedicine services to make up for the lack of in-person consultations even in other health scenarios. However, this service was ad hoc, had no structure, and depended on health professionals.

The pandemic has elicited reflections on telemedicine practices in Malta, particularly concerning why such practices were only considered during such a critical period rather than prior. Since telemedicine is known to reduce travel distances and time effectively, this is not the case for Malta since the Maltese healthcare system is highly accessible with several clinics all over the island, thus eliminating the geographical barriers that telemedicine is known to eliminate. Implementing remote podiatric practice in Malta may be challenging,

as healthcare services have traditionally been clinic-based and could be seen as disrupting established conventions for patients and healthcare practitioners. Furthermore, healthcare professionals and patients must recognise that remote podiatric care consultations do not constitute an inferior method of providing podiatric treatment, a misconception that this study aims to highlight and address.

The pandemic has prompted a re-evaluation and integration of telemedicine into healthcare practices (Omboni et al., 2021), which was also considered for podiatry (Stojmanovski Mercieca et al., 2024). This shift from clinical to remote practice transcends previous barriers, requiring a comprehensive exploration of the associated challenges and opportunities that remote podiatric consultations can offer to the Maltese public primary health care setting (Stojmanovski Mercieca et al., 2024). By looking into the challenges and opportunities, one can recognise the human impact of these changes, as these are changes that are driven and need to be accepted by all involved stakeholders, whereby it becomes even more imperative the need for a thoughtful and patient-centred evidence-based approach to the evolving landscape of healthcare delivery (Ezeamii et al., 2024).

While the researcher acknowledges that podiatry is primarily a hands-on profession requiring physical intervention, this thesis sought to investigate the range of podiatry conditions that could be seen via telemedicine, encompassing consultations, diagnosis, treatment recommendations, and follow-up care, whereby no physical intervention is required. Through a modified Delphi study with major stakeholders (service users, service providers and policymakers) and post-telemedicine consultation surveys with service users in a primary healthcare setting, the study aims to elucidate stakeholder perspectives, experiences, and challenges in utilising telemedicine for podiatric care.

Therefore, podiatric telemedicine is being explored to decrease the public primary care waiting list by shifting non-hands-on clinical podiatry appointments to remote consultations.

Additionally, it is also being explored to assist patients who have difficulties accessing podiatric care due to challenges such as the lack of convenient appointment times, a lack of reliable transportation, or the need to care for young children or older relatives, as well as to alleviate the current shortage of podiatrists in primary health care by making the most of the limited resources available. This service enables rapid interventions and convenience for patients who can benefit from remote podiatric care, as a hands-on approach is not always necessary. It also presents an opportunity to extend podiatry services beyond clinical environments and lays the groundwork for additional educational and outreach programmes to educate the broader community that podiatry encompasses more than just hands-on intervention. Recognising the constraints and difficulties presented by technological progress is essential to guarantee the service's sustainability and accessibility for everyone. Consequently, this initiative acknowledges healthcare inequities to enhance existing and forthcoming services.

During a research study that was undertaken by the researcher whilst pursuing a master's degree, this research sought to investigate the perceptions and the viewpoints of major stakeholders (patients, podiatrists, and senior managers) in relation to the potential introduction of telemedicine in the field of podiatry. This study identified that more data is required on podiatric telemedicine in terms of utilisation, modality of how such service is provided (through telephone or video calls), and standard framework and guidelines to target healthcare professionals and patients. Stakeholders voiced their positive thoughts in relation to a potential podiatric telemedicine service. However, they also noted that the podiatry profession is a hands-on profession and that since not all consultations can be carried out remotely, it is important that patients and healthcare providers are aware and knowledgeable enough about what telemedicine entails and how it can work out in podiatry (Stojmanovski Mercieca, 2021). These results have elicited the idea to progress this research further as it was evident that a gap in the literature and at the clinical level existed. This was further

backed up by the idea that since only the Telemedicine Centre at the primary care level was providing telemedicine by general practitioners, it was an opportunity to explore and introduce further such services for podiatric care. The Telemedicine Centre is still running and operated by several general practitioners who have expanded their service beyond the COVID-19 pandemic. This was further highlighted by a local study that established that telemedicine's success delivered by general practitioners locally (Vassallo et al., 2024) provided an opportunity for broader deployment into other professions, including podiatry, as is being proposed.

To maintain consistency and focus, this research was delimited to a primary health care setting for follow-up consultations only referred by podiatrists practising in a primary health care setting. It was decided that only primary care podiatry, specifically low-risk patients, would be included in the pilot evaluation of this new service to ensure patient safety. This focus was imperative since, if this service proved beneficial to low-risk podiatry patients, this could eventually be extended to a high-risk population. A defined set of podiatric conditions commonly managed by podiatrists in a primary health care setting, specific telemedicine platforms (video and telephone consultations), and software commonly used in primary health care are also considered.

Through this comprehensive research, this thesis aims to contribute valuable insights into the development, implementation, and impact of telemedicine in podiatry within primary health care, as well as inform healthcare policies, evidence-based practices, and future research directions in this evolving field.

1.8 Overarching Research

This thesis contained an overarching research framework that included a principal research question and overarching aims and objectives that aided in completing this research project.

1.8.1 Research Question

The overarching research question of this project is, ‘How feasible is it to develop and successfully implement podiatric telemedicine in a primary care setting?’

1.8.2 Research Aim and Objectives

The overarching aim of this study is to create an evidence-based telemedicine guideline for podiatry and implement podiatric telemedicine for low-risk patients in a primary care context.

To achieve this aim, the following objectives must be met. These objectives are:

1. To develop a podiatric telemedicine guideline suitable for primary health care
2. To provide training for providers and create outreach and educational initiatives targeting service users
3. To implement and assess the feasibility of the developed podiatric telemedicine guideline for core podiatry in a primary health care setting
4. To evaluate key stakeholders’ perceptions and satisfaction following the implementation of telemedicine in core podiatry targeting the low-risk category of patients

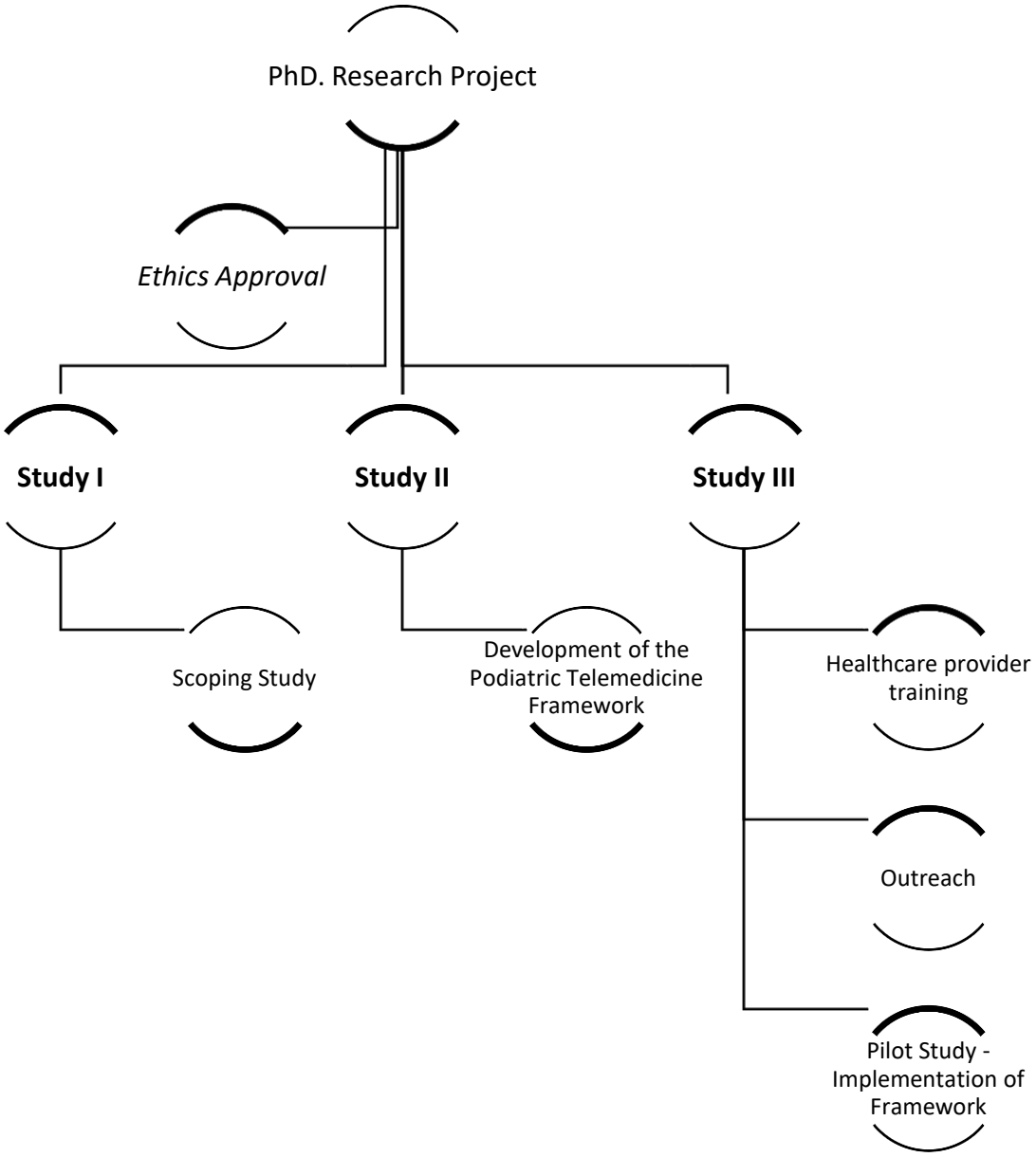
This research project adheres to the Medical Research Council’s (MRC) Framework for Complex Interventions (Skivington et al., 2021), which serves as the overarching research framework and is discussed in more detail in Chapter 2.

1.9 The structure of the PhD investigation

This research adopted a mixed-methodology approach, using interpretivism and pragmatism as philosophical frameworks, which is reflected in the overall investigation. The primary audiences’ targets were service users, healthcare providers (podiatrists) working within a

primary care setting, and senior management involved in policy writing. In addition, the project sought to provide insights into the intricate process of integrating telemedicine into an established healthcare system. This PhD research project was conducted in three phases (see Figure 1), each with its aims and objectives. The reader can also view the GANTT chart [Appendix 1], which was produced to illustrate the timeline for this PhD project.

Figure 1: *Flow chart summarising the stages undertaken for this PhD research project*.



***Study I* – A Scoping Review of Foot and Ankle Telemedicine Guidelines** – This study in the original proposal was meant to be a systematic review; however, due to a lack of research literature available related to the subject matter, a scoping review was undertaken to broaden the literature search related to foot and ankle telemedicine practice guidelines. Nevertheless, it was observed that there needed to be more standardised interventions and outcomes pertaining to telemedicine in podiatry. Consequently, it was necessary to expand the scope of the review to encompass telemedicine practice guidelines related to the foot and ankle. Due to the limited availability of articles, a scoping review was deemed the optimal approach for conducting and exploring this study area. This scoping review adhered to the PRISMA-ScR15 guidelines for scoping reviews (Tricco et al., 2018). This study provided insight into telemedicine practice guidelines for foot and ankle management. This scoping review proved essential for this research as it provided insight into the existing gaps in research related to podiatry and telemedicine. It highlighted that no specific guidelines for podiatry exist and pointed out the need for more methodological rigour in the studies related to foot and ankle telemedicine practice guidelines, highlighting the need for profession-specific telemedicine guidelines. A detailed description of this study can be found in Chapter 5 of this dissertation.

Study II - **Developing a Podiatric Telemedicine Framework for Service Users and Providers in a Primary-Care Setting** - The results obtained from Study I were used to facilitate the design and execution of Study II, which centred on developing a framework for Podiatric Telemedicine in a primary health care setting for low-risk patients. The present investigation employed a modified Delphi methodology, consisting of three rounds of Delphi, to examine the viewpoints of service users, providers, and policymakers. The objective was to establish and achieve consensus on a Podiatric Telemedicine Framework that can be piloted locally with present primary care podiatry services. A detailed description of this study can be found in Chapter 6 of this dissertation.

Study III **- The Piloting of a Telemedicine Service for Core Podiatry in the Maltese Public Service** - This study was the final study proposed to incorporate simultaneous training, outreach, and educational initiatives together with the launch of a pilot study to evaluate the developed podiatric telemedicine framework. Study III determined whether the ideas and findings established in Study II can be shaped to be relevant and sustainable for podiatric telemedicine in a primary care setting with close consideration of the Maltese healthcare system in mind. Chapters 7 and 8 of this dissertation describe this robust study split into three stages.

1.10 Presentation of the thesis

This dissertation is composed of 9 Chapters.

Chapter 1 (Framing the Thesis) is an introductory chapter that provides information on the podiatric profession and telemedicine in general, where they were merged to focus on introducing podiatric telemedicine. This chapter provides an overview of the local background in the Podiatrist profession and telemedicine, as well as highlights the literature gap that led to the conceptualisation of this project. It additionally informs the reader about the overarching research question, aims, and objectives of this PhD research project.

Chapter 2 (The Literature Review) provides an in-depth exploration of the existing literature on podiatry and telemedicine in both global and local contexts, which assisted in identifying the research gap and justification of this study. Furthermore, it also examines various theories, models, and frameworks related to telemedicine. The chapter focuses on podiatric telemedicine in the Maltese public primary care system, particularly for low-risk patients, and discusses key factors that informed the research design.

Chapter 3 (The Position Statement of the Researcher) provides the reader with a narrative of the researcher discussing her personal perspectives and the approach taken to address this

research project. This chapter presents the researcher's personal reflections and emotions that were encountered during the execution of this investigation.

Chapter 4 (Identifying the Philosophical Approach of the Research) outlines the overarching philosophical approach used for this study and how it influenced and motivated the conducted research.

Chapter 5 (The Scoping Study) presents a scoping study that was carried out as part of the initial phase of this research project. This scoping study intended to provide insights into telemedicine practice guidelines for foot and ankle management in a primary care setting for low-risk patients, which included studies from other professional backgrounds that overlapped the podiatry profession. This study has been published in Health Science Reports [Appendix 2].

Chapter 6 (The Development for a Podiatric Telemedicine Framework in a Primary Care Setting) presents how a modified Delphi technique was used to develop a podiatric telemedicine framework for a primary care setting. This study has been published in the Journal of American Podiatric Medical Association [Appendix 3].

Chapter 7 (Healthcare Provider Training) explores the development and implementation of training designed specifically for podiatrists to conduct podiatric telemedicine in a primary care setting effectively. This chapter details the process of creating a comprehensive training programme, highlighting the key components to preparing podiatrists for podiatric telemedicine consultations, which mainly was informed from the results generated in the previous study from the preceding chapter, Chapter 6. It also describes the structure and content of the delivered training sessions, focusing on the methods used to train podiatrists in the necessary skills and technologies for providing quality care via telemedicine platforms. Additionally, this chapter discusses the challenges faced during the training

process and the strategies employed to overcome them, ensuring that podiatrists are well-equipped to use telemedicine in their practice.

Chapter 8 (The Implementation Phase – Pilot Study) demonstrates the practical implementation of a podiatric telemedicine service delivery in a primary care setting. This also encompasses a quantitative metric for evaluating patient satisfaction in relation to the provided services. Furthermore, this chapter critically evaluates the challenges encountered throughout this pilot project, aiming to review the established podiatric telemedicine framework and examine these challenges to suggest potential solutions.

Chapter 9 (Discussion and Conclusion) provides an in-depth review derived from this PhD dissertation. This chapter also emphasises and explains the limitations encountered throughout this research endeavour and provides suggestions for future research, clinical practice, and societal influence. It concludes by providing a comprehensive summary of the key conclusions derived from the entirety of the PhD research dissertation.

Chapter Two – The Literature Review

2.1 Introduction

This literature review focuses on essential components in the practical advancement of podiatric telemedicine. It highlights the literature gap that shaped this study's methodology. It also produces recommendations to address potential challenges faced throughout this PhD research.

This chapter presents a comprehensive review of existing telemedicine literature, specifically focusing on telemedicine in the context of foot and ankle care. It also examines the importance of patient-centred care, terminology distinguishing between telemedicine, telehealth, and other similar terminologies, and the advantages and challenges of telemedicine. Furthermore, this thesis considers a range of models, theories, and frameworks pertaining to telemedicine research, as they offer valuable guidance and insight. The literature review critically analyses past telemedicine research on foot and ankle care. It aims to identify gaps in the research subject and previous studies, guiding the complete research study. Moreover, this chapter provides the framework for the main study, which constitutes the central focus of the research outlined in this thesis. Examining prior research facilitated the identification of essential data-gathering requirements for the forthcoming studies. It contributed to the formulation of the study design. The acknowledgement of prior work also contributed to guiding and contextualising this thesis. This critical literature review of previous publications identified significant biases that must be addressed in the research design process.

2.2 Research Strategy

An extensive literature search was performed using electronic databases, textbooks, and journal articles.

Electronic Databases:

The key databases used for this research project were Hy-Di, PubMed, SAGE Publications, Science Direct, EBSCO and Google Scholar.

Journal Searches:

The journals consulted during this literature search are listed below and include:

BMJ Open, European Journal of Public Health, Foot and Ankle International, Foot and Ankle Orthopaedics, Foot and Ankle Specialist, Frontiers in Digital Health, Frontiers in Public Health, Health Informatics Journal, Health Science Reports, International Journal of Telemedicine and Applications, Journal of American Podiatric Medical Association, Journal of Family Medicine and Primary Care, Journal of Foot and Ankle Research, Journal of Foot and Ankle Surgery, Journal of Primary Care and Community Health, Journal of Telemedicine and Telecare, Medical Informatics and Decision Making, Telemedicine and e-Health, The Foot.

Textbooks and Dissertations:

The University of Malta's Faculty of Health Sciences Library granted access to textbooks and dissertations focused on digital health. Additionally, textbooks on statistical and research methods were consulted to carry out this research.

Keywords:

The keywords used during this literature search are listed below and include:

"Telemedicine," "foot health," "guidelines," "podiatry," "primary care," "telehealth," "digital health," "foot and ankle," "allied health professional," "remote consultation," "podiatrist," and "primary healthcare."

The literature was carefully chosen to evaluate the existing literature thoroughly. Preference was given to research articles written in English, specifically those published from the COVID-19 period up to the present. However, pre-coronavirus pandemic articles were only consulted when necessary to provide historical context or when recent evidence was inaccessible. The decision was primarily motivated by the significant technological advancements in recent years. As the adoption of telemedicine gained momentum during the COVID-19 pandemic, the researcher found it necessary to examine articles published during this period.

2.3 Telemedicine and other Relatable Terminology

Technological advancements have added to the decades-long lexical confusion between telemedicine and telehealth, leading to other similarly interchangeable concepts, such as eHealth and mHealth (Colucci et al., 2017). Telemedicine is commonly defined as the use of telecommunications technology to diagnose and treat patients from a distance (Sood et al., 2007). On the other hand, telehealth is a more comprehensive term encompassing various remote healthcare services, including live conferencing, remote patient monitoring, and personal health apps (Suresh & Nath, 2021). Although telemedicine and telehealth are both broad terminologies, telemedicine is generally considered the more precise term for remote consultation (Haleem et al., 2021). The inclusion of terms such as remote monitoring, mHealth and eHealth, along with the utilisation of different technologies (such as video

consultations, audio-only consultations, email, and text-based communication) and communication methods (synchronous or asynchronous) in telemedicine, adds complexity to the comprehension of what telemedicine encompasses (Roy et al., 2021). Table 2 below highlights the difference in terminology between telemedicine, telehealth, and remote monitoring to compare the three and provide a clear description of each term.

Table 1*: A comparison between telemedicine, telehealth and remote monitoring.*

Aspect	Telemedicine	Telehealth	Remote Monitoring	References
Definition	Remote delivery of clinical healthcare services via telecommunications	Broad use of digital health, including non-clinical services like health education & administration	Use of connected devices for continuous patient monitoring outside clinical settings	Bashshur et al. (2020); Dorsey & Topol (2020)
Primary Focus	Clinical diagnosis & treatment	Comprehensive healthcare support	Real-time health tracking & proactive care	Mehrotra et al. (2021); Snoswell et al. (2021)
Interaction Type	Real-time (synchronous)	Synchronous & asynchronous	Asynchronous (continuous monitoring)	Greenhalgh et al. (2020); Totten et al. (2016)
Best Suited For	Acute & chronic disease management, virtual consultations	Health education, system efficiency, admin work	Chronic disease patients, post-surgical monitoring, elderly care	Smith et al. (2020); Sperrin et al. (2021)
Key Benefits	Improves access to specialists; reduces travel & wait times	Enhances system efficiency; improves health literacy & preventive care	Reduces hospital readmissions; enables early disease detection	Krikorian et al. (2021); Pires et al. (2022)
Biggest Challenge	Licensing & reimbursement barriers	Interoperability & security risks	Device accuracy & patient compliance	Ramsetty & Adams (2020); Lal et al. (2021)
Future Potential	AI-driven remote diagnostics	Global telehealth integration & standardisation	AI-powered predictive analytics for personalised medicine	Kruse et al. (2021); Nguyen et al. (2022)

Although telemedicine and telehealth are used interchangeably most of the time, there is still a distinction between the two, and for the purpose of this research the term telemedicine will be adopted. The WHO (2010) defined telemedicine as: "The provision of healthcare services at a distance with communication between healthcare providers seeking clinical guidance and support from other healthcare providers (provider-to-provider telemedicine) or between

remote healthcare users seeking health services and healthcare providers (client-to-provider telemedicine)" (WHO, 2021, p.2).

In this research project, the researcher uses the above definition of telemedicine. This research also aims to define '***podiatric telemedicine',*** which has been established in the second study (Chapter 6) of this research, as there has been no definition so far. Existing definitions were mostly predominantly related to orthopaedic domains. Therefore, as recent research suggests, when an intervention lacks widely recognised indications, consensus on its operationalisation in healthcare environments diminishes (Skivington et al., 2021). Hence, it is imperative that before a proposed framework is used within an already established healthcare facility, such as primary healthcare, there needs to be strong agreement on what its components are and how to define this intervention (Skivington et al., 2021) in this case, telemedicine in common podiatry practice.

2.5 A Local Overview of Telemedicine and Podiatry

From technological, cultural, and social perspectives, telemedicine is considered a significant innovation in health services (Haleem et al., 2021). Telemedicine has been shown to enhance access to healthcare services while improving medical care and organisational efficiency (Ezeamii et al., 2024). In addition, telemedicine plays a significant role in addressing the challenges arising from socioeconomic disparities in healthcare systems in the current era (Haleem et al., 2021). These challenges include heightened demands on healthcare, ageing populations, greater mobility of citizens, the need to manage vast amounts of information, global competitiveness, and enhanced healthcare delivery, all within the confines of limited budgets and expenditure constraints (PAHO, 2016).

Significant obstacles exist to achieving standardisation in telemedicine, which impede its complete integration and growth (Bali, 2019). Despite the increasing number of pilot

initiatives and feasibility analyses for various healthcare professions, only a limited number of telemedicine applications have been successfully integrated into clinical practice and established as integral components of medical procedures worldwide (WHO, 2021). Furthermore, it has been observed that these measures were often discontinued after the initial phase, mainly due to legal and regulatory issues (Broens, 2007; Kichloo et al., 2020; WHO, 2010).

During the COVID-19 pandemic, telemedicine services at the national level were initially provided solely by general practitioners in primary care, then followed by speech and language pathologists who, to date, still perform autism screenings via video consultations (Vassallo et al., 2024). The initial play of telemedicine in the podiatry field was initiated in response to ad-hoc measures necessitated by health authorities' mitigation strategies, resulting in the cancellation of non-critical appointments (Stojmanovski Mercieca, 2021). Podiatrists were directed to conduct telephone consultations with all patients whose appointments were cancelled as they were not considered high-risk patients. Therefore, to facilitate remote care and offer essential guidance to low-risk patients, podiatrists were instructed to shift to remote modalities to ensure patients could self-manage and not neglect their foot health during this critical period.

Podiatry is considered a relatively recent profession in the Maltese Islands. It was introduced in 1986 and has since evolved into a well-established healthcare field, with numerous patients depending on podiatrists for lower limb issues. Today, podiatry at a national level features an extensive network of healthcare and community clinics across both islands, aiming to provide accessible treatment by bringing services closer to the community (Primary Health Care Malta, 2023). Despite the presence of physical healthcare facilities that do not necessitate extensive travel, telemedicine presents opportunities to augment healthcare accessibility on the island, including enhanced service delivery, reduced time

spent in transit and parking, improved patient outcomes, and increased operational efficiency.

This research aims to enhance comprehension of the overarching context, current challenges, and opportunities related to developing and implementing guidelines for podiatric telemedicine in a primary care setting for low-risk patients.

2.5.1 Different Modes of Telemedicine: Benefits and Challenges

Telemedicine services have altered healthcare delivery by leveraging technology to offer health services from a distance (Colucci et al., 2017). There are three main categories of telemedicine services, including synchronous, asynchronous, and remote monitoring, each providing distinct methods for connecting patients with healthcare providers (Wang et al., 2019).

Synchronous Telemedicine - involves immediate and interactive communication between a patient and a healthcare professional (Shih & Portnoy, 2018). This form of telemedicine can be described as a virtual encounter, where both participants are present simultaneously (American Telemedicine Association, 2020; Khosla, 2020), usually using video conferencing technologies (ensuring recognised HIPPAA-compliant platforms), telephone calls, or live chat platforms (American Telemedicine Association, 2020). Such consultations work well for consultations, follow-ups, and urgent care needs that require rapid engagement and intervention. For example, a podiatrist assesses a patient's recent ankle sprain injury, which can provide a diagnosis and advise a treatment plan during the consultation until the patient is seen at the clinic in person. Synchronous telemedicine enables instant feedback, dynamic discourse, and individualised attention (Haleem et al., 2021). It replicates the conventional face-to-face consultation, offering patients a feeling of timeliness, prompt intervention and direct interaction with the healthcare provider (Lindenfeld et al., 2022). However, on the other hand, this modality might encounter challenges in terms of real-time

availability of both the patient and the provider, as, at times, this might be difficult due to factors including time zone disparities, inconsistent schedules, and technological obstacles such as internet access problems (Haleem et al., 2021).

Asynchronous telemedicine – this is often referred to as store-and-forward telemedicine and entails transmitting medical data, such as photographs, test results, or patient histories, to a healthcare provider who will examine the material at a later point in time (Abbasi-Feinberg, 2020). This telemedicine modality does not necessitate the simultaneous presence of both the patient and the physician (Culmer et al., 2023). This can be beneficial for podiatrists when encountering dermatological foot conditions. A patient can upload photographs of a skin issue to a protected platform or by sending them via email as advised by a podiatrist, who can subsequently examine and diagnose. Asynchronous telemedicine enables flexibility, as the patient can transmit information at any given moment, and the provider can examine it at their convenience (Leighton et al., 2024). This is especially advantageous for situations that do not necessitate urgent attention, facilitating efficient allocation of time and resources (Culmer et al., 2023). However, the absence of immediate intervention in live communication might cause a delay in providing the necessary medical attention, particularly if the issue is urgent. Lastly, the level of care provided may be contingent upon the thoroughness and precision of the information that is exchanged by the patient (Haleem et al., 2021).

Remote patient monitoring (RPM) - This entails the ongoing collection and transmission of patient health information remotely (Vudathaneni et al., 2024). Wearable devices, sensors, or mobile applications are commonly employed to gather this data, which is subsequently relayed to healthcare professionals for ongoing assessment (Anikwe et al., 2022). This method is frequently utilised to manage chronic conditions such as diabetes, cardiovascular disease, or hypertension (Peyroteo et al., 2021). Consequently, RPM permits continuous surveillance of a patient's health status, promoting the early detection of potential issues and

the proactive management of chronic diseases (Vijayan et al., 2021). It can reduce the need for regular in-person appointments and improve patient outcomes through rapid interventions (Tan et al., 2024; Vijayan et al., 2021). Nonetheless, RPM is significantly reliant on patient compliance and the precise functioning of monitoring devices. Obstacles may emerge from device malfunctions, apprehensions regarding data security, and the imperative to instruct patients on using the technology (Thomas et al., 2021).

The asynchronous, synchronous, and RPM strategies collectively enhance access to medical treatment, increase patient engagement, and improve health outcomes, especially for individuals in remote or underprivileged areas. Nonetheless, the efficacy of these services depends on the technological infrastructure, user acceptance, and the ability to maintain superior care standards on digital platforms (Thomas et al., 2021).

2.5.2 Telemedicine Infrastructure

The telemedicine infrastructure is fundamental to the distant delivery of healthcare services, utilising advanced technology to connect patients and clinicians (Ezeamii et al., 2024). Essential elements include safe digital platforms for real-time video consultations, asynchronous messaging, and electronic patient records (ePR) integration to optimise patient data accessibility and storage (Ezeamii et al., 2024). Advanced diagnostic instruments, including wearable technologies and AI-driven applications, enhance remote monitoring and individualised care (Chaturvedi et al., 2025). Moreover, cybersecurity mechanisms, including encryption and two-factor authentication, protect patient confidentiality and data integrity, ensuring adherence to regulatory standards (Maleki et al., 2024). An effective telemedicine infrastructure improves patient outcomes, optimises resource allocation, diminishes healthcare inequities, and strengthens the health system's resilience (Ezeamii et al., 2024).

2.6 Telemedicine for Podiatry Practice

As this research is focused on low-risk core podiatry care, it implies that the patient's clinical profiles suggest a small probability of experiencing complications or unfavourable outcomes related to their health conditions. Such patients generally display low or effectively controlled symptoms, do not possess severe comorbidities like diabetes or cardiovascular disease, and uphold an overall positive health status (American Academy of Family Physicians, 2019). Hence, the importance of this research, focusing on low-risk patients, is fundamental as it not only helps healthcare institutions to manage healthcare resources better, reduce unnecessary clinical appointments, and focus efforts on individuals with elevated risk profiles but also facilitates the early identification of any foot related ailments that could eventually become detrimental to the patient's health.

This research recognises that telemedicine may benefit certain core podiatry situations but is not universally applicable. Such situations include follow-ups for musculoskeletal conditions such as plantar fasciitis, metatarsalgia, lesser toe deformities, and hallux deformities, as well as in cases for dermatology foot and ankle follow-up such as in cases of trauma to the nails, follow-up for pathological nails and skin pathologies. Despite the apparent limitations of telemedicine in a hands-on speciality like podiatry, it should not discourage podiatrists from reevaluating traditional care delivery methods (Morrow, 2020). Telemedicine can enhance the quality of care in podiatric practices by improving patients' comprehension of elements that affect their overall well-being from the perspective of podiatrists (Morrow, 2020). Furthermore, telemedicine can establish a 'new normal', becoming another available podiatry service in primary care that benefits healthcare practitioners, service users, and healthcare services (Bowen et al., 2021).

Before the COVID-19 pandemic, the utilisation of telemedicine was gradually increasing (Kumar et al., 2022; Schroeder, 2018). A prior study employing qualitative inquiry, and an

interpretative description methodology established the necessary elements to implement telemedicine in diabetic foot care successfully (Kolltveit et al., 2017). The study identified four essential conditions: user-friendly technology and training, a telemedicine champion in the workplace, effective communication across all organisational levels, and leadership support that aligned with the four principal factors outlined in Venkatesh et al.'s (2003) Unified Theory of Acceptance and Use of Technology (Kolltveit et al., 2017). A previous study employing an interpretative description methodology revealed that telemedicine services enabled podiatrists to engage with patients presenting with diabetic foot ulcers with increased knowledge, augmented confidence, and refined wound evaluation capabilities (Kolltveit et al., 2017).

During the initial phase of the COVID-19 pandemic, the utilisation of telemedicine in podiatric clinical practice surged (Terry, 2020). A recent epidemiological study indicated that telemedicine has proven beneficial for evaluating various pathologies, including foot and ankle musculoskeletal conditions or tendonitis, dermatological conditions, infections, postoperative care, trauma, and preoperative consultations (Neville et al., 2021). The study reported that telemedicine was most effective for dermatological conditions and medication prescriptions. At the same time, it was least effective for foot trauma. Additionally, another study indicated that telemedicine could serve as a screening instrument for detecting and monitoring patients with diabetic foot complications, as well as establishing a triage system to assist in determining hospitalisations (Hazenberg et al., 2020). Consequently, it is evident that telemedicine has been explored primarily for high-risk patients with foot and ankle pathologies rather than for low-risk individuals. This underscores the necessity of this research, as the efficacy demonstrated for high-risk patients implies that similar benefits could extend to low-risk patients, who are likely to engage in more effective self-care and self-management of their foot-related health issues with reduced risk of complications.

Despite the beneficial impact of telemedicine on podiatry, some practitioners swiftly adapted to its complexities and integrated it into their practices to ensure continuity of patient care. In contrast, others steadfastly maintained that podiatry is fundamentally a hands-on speciality (Haspel, 2020). Considering the available literature, it is essential to note that most studies were conducted in the United States, where podiatric practice is more open and advanced than in Malta, regarding prescription rights and surgical management of foot and ankle complications. In Malta, podiatrists can only perform nail surgeries and cannot order any prescription medications. The future utilisation of telemedicine in clinical practice will depend on changes in state health policy (Qian et al., 2022). Despite the limitations and constraints associated with telemedicine technology, it is evident that more individuals have encountered its offerings compared to the period preceding the COVID-19 pandemic (Drake et al., 2022).

Additionally, thorough guidelines and training programs related to podiatric telemedicine are essential for the effective deployment and long-term sustainability of remote core podiatry services in a post-pandemic context. Looking at it from a global perspective and initiative, not only podiatry-related, one of the United Nations Sustainable Development Goals (SDG) (2023) is directly concerned with guaranteeing healthy lives and fostering well-being for all age groups by 2030. The United Nations' Sustainable Development Goals (2023) effort indicated that the COVID-19 pandemic posed a significant danger to decades of global health advancements and disrupted key health services in 92% of countries since late 2021. Therefore, this can be considered an opportunity for the growth and development of podiatric services, ensuring that they are patient-centred, meeting the needs as required by the United Nations' Sustainable Development Goals, which can lead to new innovative services for better accessible podiatric care.

2.7 Patient-Centred Care

Throughout the COVID-19 pandemic, telemedicine became important, facilitating safe physical separation between patients and healthcare professionals (Kaplan, 2020). Significant efforts and money have been dedicated to advancing information technology in healthcare (Kim & Choi, 2019). The proliferation of telemedicine has altered the dynamics between healthcare providers and patients as service users. Technology mediates provider-patient interactions in telemedicine, leading to issues for healthcare providers who are regarded by patients as lacking social cues, being less attentive, and appearing impersonal (Judson et al., 2013; Seargeant & Togg, 2014). Patients anticipate that healthcare professionals will fulfil their expectations and are apprehensive about the potential loss of human interaction. It is imperative to start recognising and facilitating patient-centred care, particularly in telemedicine, which is essential (Baker, 2001).

Person-centred care entails treating patients as unique individuals and equal collaborators in treating and managing the patient process; it is tailored, coordinated, and empowering (Health Foundation, 2014). It is not a medical model and should be considered multidisciplinary, acknowledging that an individual may require assistance from multiple professionals (Taberna et al., 2020). Engaging in this manner entails acknowledging individuals' capacities and ability to oversee and enhance their own health rather than perceiving them only as victims of illness or passive consumers of care (Coulter & Oldham, 2016). Hence, considering the dynamics of telemedicine, it can provide timely interventions and an easier referral pathway system whereby patients can be referred to other healthcare professionals without needing to physically attend a clinic when possible. The authors Coulter and Oldham (2016) have explored the dimensions of partnership between three different working levels: consultation, service, and system.

Furthermore, some authors mentioned that the healthcare system should be designed to enable individuals to acquire the knowledge, skills, and confidence required for self-

improvement (Mulley et al., 2012). Hence, telemedicine and telehealth practice can initiate and encourage outreach and knowledge dissemination, potentially assisting patients in acquiring more confidence in practising self-care and preventative measures. Additionally, healthcare professionals should not allow the effect of bias to undervalue the degree to which patients can assume responsibility for their health. Hence, by acknowledging, supporting, and enhancing patient abilities rather than disregarding and diminishing them, many patients would be inclined and enthusiastic to engage in various forms of care and treatment (Coulter & Oldham, 2016). Families, carers, and professional supports must be thoroughly involved in the care planning process for individuals with limited or no mental ability to assume increased responsibility for their care to ensure more sustainable treatment, management, and service delivery outcomes (Coulter & Oldham, 2016).

Patients' objectives in controlling their health may diverge from those of healthcare providers, yet both are significant (Coulter et al., 2013). Person-centred care promotes patients articulating their objectives and collaborating with the healthcare provider to ascertain the assistance required to attain these goals (Coulter & Oldham, 2016). Both participants in the dialogue must possess a comprehensive awareness of one another's priorities. Before discussing symptoms, numerous patients prefer that healthcare providers ask what information they should know about the patient before addressing the management of the condition. Research indicates that this collaborative approach can enhance physical and psychological well-being while bolstering patients' confidence and ability to manage their health (Coulter et al., 2015). An instance in the podiatric context may pertain to several treatment techniques for many foot and ankle conditions, necessitating the patient's absence from work or significant social engagements, hence hindering their presence. Therefore, the patient should be enquired about the feasibility of specific treatment modalities given the circumstances and maybe defer or adopt an alternative treatment plan.

Engaging patients through a person-centred approach imposes additional requirements on healthcare providers. It necessitates exceptional listening, communication, bargaining abilities, and the capacity to adapt responsively to individuals' specific requirements (Godfrey et al., 2018). Patients fundamentally depend on effective evidence-based medicine, and technical protocols cannot simplify person-centred treatment. While guidelines and standards are important, they should not overshadow the essential human attributes of care and empathy, which patients greatly appreciate (Coultren & Oldham, 2016). Therefore, while healthcare practitioners must adhere to established standard operating procedures mandated by healthcare authorities, this does not imply that the patient should be overlooked or treated as anything less than an individual. Our professional practice and environment must regard patients as not just numbers but individuals with distinct requirements and needs.

The incorporation of remote practices in this research study must not overlook person-centred care. Literature indicates that healthcare practitioners' responses to patient needs in telemedicine were considered inadequate, contradicting the patient-centred care approach (Alpert et al., 2017; Miller et al., 2016). Patients must perceive that their healthcare provider recognises them as individuals rather than merely patients to establish an effective patient-provider relationship (Portnoy et al., 2020). Furthermore, previous studies on telemedicine primarily focused on discrepancies in the length and type of provider-patient interactions, content, quality of care, accessibility, consent, and privacy issues (Boffa et al., 2015; El Kefi & Asan, 2021; Kaplan, 2020; Kim & Choi, 2019).

A literature review by Kaplan (2020) that aimed to investigate analysing and identifying gaps in the literature related to telemedicine and telehealth practice prior to the COVID-19 pandemic found that through their synthesis matrix, most of the literature mainly focused on

the quality of care provided, access to such care, patient consent and privacy. In the research by Kaplan (2020), it was acknowledged that other factors have surfaced but have not been given much weight. These included usability of such remote services, tailoring services according to the patients, which would provide a more person-centred approach in care delivery, curriculum and training to be provided to healthcare providers, and implementation processes that should take into consideration the interoperability of the service, data management, cybersecurity concerns and informatics infrastructure, particularly since technology is constantly evolving (Kaplan, 2020). Hence, this literature review confirms the need for robust infrastructure with updated guidelines on the ethical use of such remote practices so that decision-makers can arrive at an informed, evidence-based decision in telemedicine and telehealth practice (Kaplan, 2020). The results of such research are broad and not specific to one profession; instead, they involve telemedicine and telehealth practices in general. Therefore, for this PhD research, such results further highlight the need to look deeper into such practices for specific professions since no one profession is like another. Therefore, such guidelines should not only be tailored broadly for the general practice of telemedicine and telehealth but also profession-specific, as was highlighted by Leone et al. (2021).

Optimised telemedicine utilisation that could enhance clinical outcomes requires alignment with patient communication expectations, promoting patient engagement, self-management, and medication adherence, which strengthens the therapeutic alliance between provider and patient, ultimately decreasing future healthcare costs (El Kefi & Asan, 2021; Novara et al., 2020). To overcome existing barriers to patient-centred care via telemedicine, it is essential to understand patient expectations for communication with healthcare providers in this manner (Alpert et al., 2017). Research into patient expectations and the customisation of telemedicine to align with these expectations is limited (Kaplan, 2020; Robinson et al., 2016;

Seargeant & Togg, 2014). As telemedicine becomes prevalent in healthcare, it is essential to address obstacles to delivering patient-centred care through this medium (Paige et al., 2021; Talal et al., 2020). Prior research has urged the expansion of current knowledge by evaluating patient expectations of healthcare professionals in telemedicine (Alpert et al., 2017; Amin et al., 2020; Kaplan, 2020; Paige et al., 2021; Seargeant & Togg, 2014).

Moreover, a recent experimental design conducted by Gabay et al. (2022) revealed that patients' expectations of healthcare providers are influenced more by their cognitive processes than by demographic factors such as gender or age. The prediction tool used in their study allows clinicians to ascertain each patient's affiliation with a mentality segment and fulfil expectations in telemedicine care delivery. Comprehending the communication expectations of each mentality may aid providers in refining their communication strategies and improving the quality of care. To improve patient-centred care through telemedicine, healthcare providers must align with patient expectations based on mindset-belonging by acknowledging the preferences and sensitivities of each mentality segment (Gabay et al., 2022).

2.8 Theories, Models and Frameworks in Telemedicine Research

Numerous theories, models, and frameworks have been developed to facilitate telemedicine research and implementation (van Dyk, 2014; Wade et al., 2016). The theories, models, and frameworks to be addressed have informed the theoretical framework employed in this research, guiding it from inception to completion.

2.8.1 Theories in Telemedicine Research

Positivism

Positivism is aligned with the hypothetico-deductive research approach (Park et al., 2020). It involves formulating a hypothesis and evaluating its statistical significance. This method's logic is supposed to be self-evident, and no underlying theory is explained explicitly (McDowell et al., 2015). The positivist approach challenges the researcher as an independent objective observer who understands empirical evidence in contrast to the nature of reality (Garcia, 2021). Positivist approaches focus on statistical and logical approaches concerning research evaluation (Garcia, 2021). These approaches comprise establishing the cause-and-effect relationships and estimating anomalies based on theory (Orlikowski & Baroudi, 1991). Nevertheless, some researchers reject the belief that all viewpoints of reality can be seen without seeing how human perceptions shape our interpretations of reality (Garcia, 2021).

Diffusion of Innovation Theory

Research on the spread of new technologies in healthcare frequently draws on the Diffusion of Innovation (DOI) theory (Rogers, 1995). According to Attewell (1992), diffusion is the process through which potential users learn about newly available technology and are persuaded to adopt it through dialogue with current or former users. The theory of the diffusion of innovations proposes the factors that lead to the widespread dissemination of new ideas. It elucidates the why, how, and speed with which new ideas propagate (Garcia-Avilés, 2020). Five elements make up the innovation adoption process: information, persuasion, decision, action, and verification. Studies show that this theory is the most frequently cited in telemedicine research and has dominated knowledge translation in the adoption of healthcare ICT (Estabrooks et al., 2018; Whitten et al., 2007). However, this approach lacks clarity, emphasising internal matters rather than external ones (Oliveira & Martins, 2011).

Normalisation Process Theory

Normalisation Process Theory (NPT) was developed after many failures in adopting advances in complex healthcare settings (May et al., 2009). It is a socio-behavioural paradigm that makes work practises part of daily life and maintains them in their social contexts. Four components define the action or work and offer a sophisticated intervention that will become routine. Coherence, cognitive participation, collective action, and reflexive monitoring should be considered (McEvoy et al., 2014). It focuses on the work individuals and communities must do to embed and sustain modern technology or practice. It also discusses the process evaluation of the complicated intervention to determine what environmental elements influence new practices (May et al., 2018). It emphasises service users' distinct perspectives. This theory addresses implementation, post-implementation, and how practices can be incorporated into ordinary practice and social environment (Murray et al., 2010). Though NPT was officially established in the telehealth sector, it does not include a more considerable societal influence. It only describes how new practices are adopted and embedded into normal ones. Some authors argued that developing each component within the complexity of existing organisational practice is difficult (Bouramrane et al., 2011; Morrison, 2014).

Systems and Complexity Theories

The systems and complexity theory umbrella was established to highlight the functioning of complex, adaptive, nonlinear systems where it is not always possible to identify direct causation (Gare, 2000). When Plsek and Greenhalgh (2001) applied these principles to healthcare, they found that improvements fared best when introduced gradually, were driven by locally self-organised groups, and allowed the most effective solution to emerge from competing options. Health care is becoming increasingly complex, necessitating the use of nonlinear models, the acceptance of uncertainties, the respect for (and utilisation of) individual autonomy and creativity, and the readiness to adapt quickly to new opportunities

(Plsek & Greenhalgh, 2001). Podiatric telemedicine is considered a complex intervention that should be introduced into an already complex system at the primary care level, where podiatric telemedicine could lead to changing referral pathways, professional responsibilities, and workflow. Therefore, systems and complexity theories can help explain the challenges of podiatric telemedicine adoption.

Sociotechnical theories

Sociotechnical theories are involved in understanding the interactions between people and technology. These theories are concerned with how humans interact with the tools and computers in their immediate environment. According to research based on sociotechnical theories, in-person instruction and a dedicated support team are also critical for a smooth rollout (Greenhalgh et al., 2014).

Process Theories

Process theories focus on the interplay of several factors that decide whether a new technology is widely adopted (Cloutier & Langley, 2020). These notions share the common ground that interactions between various agents influence the adoption process. This clarifies why some tasks are easily adaptable to existing telehealth practices while others are more difficult to incorporate (Kairy et al., 2014). The structuration theory is widely used because it explains how established practises within an organisation emerge within a social system, leading researchers to conclude that successful telehealth application deployment must be suited to the established practises of the organisation (Canary, 2017). Activity theory and agency theory are two more process theories. Using activity theory, researchers can find the most critical factors affecting the long-term success of new healthcare services (Lin & Hsieh, 2014). The adoption of telehealth applications into economic interactions can be understood through the lens of agency theory (Leukel et al., 2012).

Organisational Change Management Theories

Theories of change management focus on the question of "how": how the change itself can be organised for maximum efficiency and how the intended users can be persuaded to adopt the change (Rufo, 2012). Kurt Lewin's (1951) field theory of organisational transformation is predicated on the existence of both the current and the ideal state (Burnes & Bargal, 2017). Lewin's model of unfreezing, restructuring, and refreezing serves as the foundation for this theory. Although the theory was developed with organisational transformation in mind, its principles can be applied to modify behaviour (Burnes & Bargal, 2017). This idea provided the basis for all subsequent "stage of change" theories because of its clarity (Prochaska & Velicer, 1997). The theory posits that individuals and communities go through several phases of motivation and openness to change and that different interventions are required at each phase (Broens et al., 2007; Hendy et al., 2012).

Behavioural Theories

When it comes to managing change, cognitive theories favour methodical deliberation. According to these theories, training and education could introduce new workplace operation methods. The constructivist view of learning, which describes it as "what people do when they construct meaning from experiences," is congruent with this method (Slotnick & Shershneva, 2002, p. 198). Behavioural theories examine how people's internal drives and choices might generate socially beneficial behavioural changes (Davis et al., 2015). Some healthcare providers are more inclined to embrace telehealth than others. This discrepancy can be explained by factors related to the theories of planned behaviour, interpersonal behaviour, self-efficacy, and adult learning (Gagnon et al., 2003; Graham et al., 2014; Kelders et al., 2012). These frameworks are increasingly being used to develop telehealth interventions that assist patients in improving their lifestyles and dealing with chronic conditions (Riley et al., 2015; Suter et al., 2011).

Considering behavioural theories, the service user perspective is also imperative. A recent study investigated the telemedicine adoption habits of Generation Y and Generation Z by categorising them into two distinct groups (Parahyanti et al., 2024). Study Group 1 included individuals familiar with current technologies but lacking experience in telemedicine utilisation. Simultaneously, Study Group 2 included individuals who had utilised telemedicine services (Parahyanti et al., 2024). Structural equation modelling analysis examined the extent of influence various determinants have on an individual's propensity to utilise telemedicine, revealing that younger generations possess favourable attitudes towards telemedicine, which significantly affects their willingness to adopt it (Parahyanti et al., 2024). The readiness for change is a critical component influencing the extent of affective, continuance, and normative commitment to change. Consequently, this study suggested that it is essential to cultivate a favourable and pragmatic perception of telemedicine among the younger generation (Parahyanti et al., 2024). This has been proposed to be accomplished by promoting telemedicine services and fully embracing the transition to telemedicine. Therefore, it is imperative to prioritise cultivating a favourable perception of telemedicine, delivering exceptional service experiences, and encouraging social adaptability to attract a substantial user base, particularly among the younger population (Parahyanti et al., 2024). Thus, regarding this PhD research, given that the younger demographic is more adept at technological advancements and acknowledging that today's youth will transition into tomorrow's elderly, educating the younger generation about innovative podiatric care delivery methods can catalyse improved acceptance of telemedicine in the future.

From a comparative analysis of the theories mentioned above, as shown in Table 3, it can be deduced that the theories most relevant to this PhD research all emphasise that telemedicine practice, when proposed as new services, constitutes complex interventions. It has also been noted that most theories emphasise that for an intervention to take place, it should be widely recognised by stakeholders, from patients to policymakers, to ensure swift and positive

behavioural transition and implementation of such service, particularly if the service involved implies technological components.

Table 2: *A comparative analysis of various telemedicine-related theories*.

Dimension	DOI (Rogers, 2003)	NPT (May et al., 2009)	Organisational Change Management (Hiatt, 2006; Lewin, 1951)	Behavioural Theories (Ajzen, 1991; Bandura, 1986)	Systems & Complexity (Checkland, 1999; Stacey, 2001)	Process Theories (Van de Ven & Poole, 1995)
Focus	Innovation adoption	Normalisation of new practices	Organisational transition	Individual and social behaviour change	System dynamics and complexity	Processual dynamic of change
Key Constructs	Adopters' categories, innovation attributes	Coherence, participation, action, monitoring	Leadership, communication, resistance management	Attitudes, norms and self-efficacy	Feedback loops, adaptation, emergent properties	Change sequence, mechanisms
Contextual Application	Technology, public health, social systems	Healthcare, work practices	Business, healthcare, corporate change	Individual and group behaviour	Healthcare, business, and policy systems	Organisational and social change
Strengths	Explains the spread of innovations	Highlights embedding and sustainability	Provides structured change approaches	Predicts and influences behaviour	Accounts for complexity and adaptability	Captures dynamism of change
Limitations	Assumes rational decision-making	Less focus on early adoption	Often linear and prescriptive	Limited systemic view	Difficult to control and predict	Can be abstract and hard to operationalise

The above theoretical frameworks provide a unique lens for understanding change and innovation. The role of these frameworks is being considered for podiatric telemedicine, where the DOI and NPT focus on adoption and sustainability. At the same time, OCM offers structured approaches to managing transitions. Thus, such theories are highly relevant because podiatric telemedicine is a new, innovative concept for podiatry. Telemedicine practices within the public primary health setting have only gained momentum in recent years due to the pandemic. Transitioning from traditional clinical practice to incorporating remote podiatric care can be challenging as it deviates from the norm that patients and healthcare providers are used to. This change not only brings about a new service but requires service users and providers to embrace technological advancements if they wish to use such a service. Hence, behavioural theories play an important role in explaining individual decision-making, whereas systems and complexity theories capture change's

unpredictability. Lastly, process theories highlight the unfolding nature of transformation. Hence, it is very difficult to lean onto one theory for such a complex intervention as combining these perspectives can offer a comprehensive approach to change management in complex environments and can better narrate the narrative of this planned doctoral research initiative.

2.8.2 Models in Telemedicine Research

Technology Acceptance Model

Users' attitudes toward new technologies can be better understood with the help of the technology acceptance model (Davis, 1989). The theory of reasoned action served as the inspiration for its creation (Davis, 1989). There are two primary ideas on which it rests: ease of use and perceived usefulness (King & Jun, 2006). Furthermore, it considers individuals' intentions as a direct determinant of behaviour, while attitudes and social norms are predictors of intentions (Davis, 1989). Effortlessness of use and the belief that the service will benefit one's health have both been shown to predict future telehealth participation (Kowitlawakul, 2011; Orruño et al., 2011). This model has been criticised for its applicability to healthcare settings due to its failure to account for user engagement and external factors that affect technology adoption (Ammenwerth et al., 2006; Yarbrough & Smith, 2007).

Unified Theory of Acceptance and Use of Technology (UTAUT) Model

A unified theory of acceptance and use of technology (UTAUT) model was developed to fill in the gaps left by the lack of standardisation in the Technology Acceptance Model and make it applicable to healthcare settings (Holden & Karsh, 2010). As a relatively new and promising model in the field of information systems, the UTAUT model is currently being used by only a select number of research projects. Some have argued that this method is inadequate because it does not formulate the level between the individual and the macro (Holden & Karsh, 2010; Venkatesh et al., 2016). In addition, while UTAUT is a thorough

instrument for gauging technology acceptance and use, it does not shed light on why people act the way they do, considering factors like culture and technology readiness in different contexts (Marikyan & Papagiannidis, 2003).

Models Relating to Health Economics

The primary aim of health economics research is the most productive use of limited resources (Wade et al., 2017). Cost analysis, cost-effectiveness analysis, cost-benefit analysis, and cost-utility analysis are all forms of cost-effectiveness modelling with a common goal of bringing the system into equilibrium (Gammon et al., 2008). Health outcomes are used to determine the value of healthcare's physical and human resources. Cost savings and more efficient use of resources are two significant benefits of utilising this method in telehealth research (Bergmo, 2009; Jódar-Sánchez et al., 2013). Several large-scale economic analyses of telehealth programmes have been conducted in the United Kingdom and the United States of America (Darkins et al., 2015; Henderson et al., 2013). Each of these studies examines the costs and outcomes (or both) using statistical or economic modelling and one of four different forms of analysis (cost analysis, cost-effectiveness analysis, cost-benefit analysis, and cost-utility analysis).

The Model for Assessment of Telemedicine (MAST)

To aid policymakers in selecting the most productive and economical telemedicine solutions, the European Commission created the Model for Assessment of Telemedicine (MAST) (Kidholm et al., 2012). The paradigm was developed with input from European telehealth users and stakeholders. Clinical efficacy, health problem description (application to be utilised), economics, patient perception, organisational (workflow, workflows between providers), safety (data safety and network difficulties), and ethical (legal requirements) are the seven key factors that the model covers (Kidholm et al., 2012). However, the model's limitations include its inapplicability outside of Europe and its failure to account for healthcare workers' likelihood of technology uptake (Kidholm et al., 2012).

Comparing the above models, as shown in Table 4, it has been identified that each is useful for different things when looking at healthcare technology. Therefore, while TAM and UTAUT emphasise technology adoption and usage behaviours, MAST provides a structured evaluation framework specifically for telemedicine. Meanwhile, although this domain does not fall within the scope of this dissertation, health economics models assess financial sustainability and cost-effectiveness, which could lead to potential new research in the field. So, for a complete technology assessment in healthcare, combining information from several models might be necessary to ensure the technology can be adopted and is viable.

Table 3: *A comparative analysis of various telemedicine-related models.*

Feature	TAM (Davis, 1989)	UTAUT (Holden & Karsh, 2010; Venkatesh et al., 2003;)	MAST (Kidholm et al., 2012)	Health Economics Models (Drummond et al., 2015)
Focus	Technology acceptance	Technology adoption and use	Telemedicine evaluation	Economic impact of healthcare technologies
Key Factors	Attitude, Intention	Performance & Effort Expectancy, Social Influence, Facilitating Conditions	Clinical, economic, and patient-centered factors	Cost-effectiveness, utility, and benefit analyses
Applicability	General technology adoption	Organisational and user adoption	Telemedicine applications	Healthcare policy and economic assessments
Assessment Scope	Behavioural intention and use	Adoption and sustained use	Multi-dimensional, including safety and legal aspects	Financial and resource allocation decisions
Strengths	Simple, strong empirical support, useful for early-stage evaluation	Incorporates multiple factors, widely applicable, accounts for demographics	Comprehensive, evaluates clinical & ethical aspects	Supports policy decisions, quantifies health impact, assesses sustainability
Limitations	Limited contextual considerations	Complexity and model adaptation challenges	Requires comprehensive data collection	Often lacks user behaviour considerations

It is essential to emphasise that these models recognise that developing and implementing such new interventions is complex, with numerous aspects playing a crucial role in successfully executing these services. Therefore, it would be unwise to separate these models; instead, they should be integrated to establish service expectations based on optimal evidence-based practice.

2.8.3 Frameworks in Telemedicine Research

A framework supports a research study's theoretical base and explains the research problem (Swanson, 2013), whereby these can be discipline-specific and context-specific, depending on the users, organisation, and area (Swanson, 2013). Several frameworks that can be translated into telemedicine research include:

The Technology Organisation and Environment Framework (TOE)

Tornatzky and Fleischer (1990) developed the Technology Organization and Environment Framework (TOE). A generic set of factors explains and predicts technological adoption and innovation. This framework describes the post-adoption factors of digital innovation technology (Zhu & Kraemer, 2005). According to the TOE framework, the main factors influencing an organisation's adoption of digital technology innovation are technology, organisational context, and environmental context. The technology context explains the organisation's internal and external technology availability. The company's technologies and the market are included (Baker, 2011). The organisational context describes the scope, size, structure, and organisational complexity of the organisation. Finally, the environmental context includes the business environment, suppliers, competitors, and government politics and regulations. This framework has been used in many empirical studies on various information system domains to understand digital technology innovation adoption (Zhu & Kraemer, 2005). TOE was not designed with the healthcare industry in mind, but it has become widely used to assess an organisation's readiness to adopt new technological

innovations. Following adoption, telehealth service implementation must go beyond the readiness and implementation phases (Pumplun et al., 2021).

NASSS (Nonadoption, Abandonment, Scale-up, Spread and Sustainability) Framework

Many promising technical advances in social and health care are abandoned by people or fail to spread locally, globally, or sustainably at the system or organisation level (Greenhalgh et al., 2017). Greenhalgh et al. (2017) established the methodology to assess obstacles, non-adoption, and abandonment of health and care technology spread, sustainability, and scale-up. They found that many health and social care innovations were abandoned, not adopted, or failed to scale up, disseminate, or become sustainable at the system and organisational levels. Thus, the authors used secondary research and empirical case studies to construct a framework to forecast and evaluate technological breakthroughs in health and social care (Greenhalgh et al., 2017). The NASSS framework includes seven domains: the value proposition, the ailment or illness, the adopter system, the organisation, the technology, the broader setting, and their interaction and mutual adaptation through time.

From the comparative analysis, as shown in Table 5, it can be deduced that both frameworks offer similar perspectives on technology adoption and implementation; however, they offer varying degrees of scope, complexity and applicability.

Table 4: *A comparative analysis of different frameworks implemented in telemedicine.*

Feature	TOE Framework (Tornatzky & Fleischer, 1990)	NASSS Framework (Greenhalgh et al., 2017)
Scope	Technology adoption within organisations	Adoption, scale-up, spread, and sustainability of health/social care innovations
Focus	Organisational readiness and external pressures	Challenges in adoption, sustainability, and long-term impact
Application	Business, IT, and healthcare	Healthcare and social care systems
Complexity Consideration	Linear (three factors: technology, organisation, environment)	Nonlinear (seven interrelated domains)
Timeframe	Adoption-focused	Covers adoption, scale-up, spread, and sustainability
Decision Factors	Technology, organisation, and environment	Condition, technology, value, adopters, organisation, system, sustainability
Emphasis on Sustainability	Limited; mainly concerned with adoption and diffusion	Strong focus on long-term impact and barriers to sustainability
Strengths	Simple and widely applicable across industries and provides a structured approach to technology adoption, that recognises both internal and external factors influencing adoption	Addresses real-world complexities in healthcare innovation and covers the full lifecycle of technology from adoption to sustainability. This highlights key barriers to scaling and sustaining innovations

Limitations	Lacks depth on long-term sustainability and assumes a relatively linear adoption process that does not fully account for social or political complexities	Requires extensive data and contextual understanding. It is complex and less structured than TOE and primarily suited for healthcare and social care, limiting cross-industry application

In view of the above comparative analysis of frameworks, this research initiative sheds light on complex, long-term health implementations, such as podiatric telemedicine. Hence, it can be deduced that, in this case, the NASSS framework provides a better understanding of sustainability challenges to implementing a new service. As acknowledged earlier with the theories and models, the same applies to these frameworks where it can be noted that no framework is superior to another, but ideally, a blend of these theories, models and frameworks can offer a tailormade approach as required for the service in question for better evidence-based practice. Therefore, this would foster a more balanced approach for technological implementation in complex environments, which can translate to this research's initiative in developing and implementing podiatric telemedicine in primary healthcare.

Hence, through these comparative deductions, an overarching framework has been identified and concluded to be considered for this PhD research, whereby it considers encompassing and considering the above factors under one framework. Therefore, the Medical Research Council Framework for Complex Interventions was deemed the most appropriate as the overarching framework for this research study.

2.8.4 Medical Research Council Framework for Complex Interventions

In 2000, the UK Medical Research Council (MRC) published a framework for researchers and research funders to develop and assess complex interventions, which was later revised in 2006 (Campbell et al., 2000; Craig et al., 2008). Complex interventions refer to an intervention at either the healthcare or social level, which includes a number of components that are required to be involved for a service to be improved or rolled out, a range of behaviours that are required for an intervention to take place, the type of skill and expertise

required for the intervention to take place, as well as human resources available and internal politics of the organisation or institution involved (Skivington et al., 2021).

This framework continues to be utilised to date and is now accompanied by comprehensive instruction on specific aspects of the research process and notable conceptual, methodological, and theoretical developments since 2006. In 2021, an update of this framework was developed, and these developments have been included in a new framework commissioned by the National Institute for Health Research (NIHR) and the Medical Research Council (MRC) (Skivintgton et al., 2021). The framework aimed to aid researchers in engaging with numerous stakeholders to identify essential questions concerning complex interventions beyond asking solely what works. Instead, it questions the how, why, and when of such interventions. Moreover, it considers the intervention's design and how it can be translated into research, including varied perspectives and appropriate approaches (Skivington et al., 2021).

Complex interventions are often utilised in health and social care services, public health initiatives, and various social and economic policy areas that influence health outcomes (Skivington et al., 2021). Interventions are executed and evaluated across multiple levels, from the individual to the societal level (Skivintgon et al., 2021). The development and implementation of podiatric telemedicine is a complex intervention for this research. This is due to dynamic interactions that must take place. Various behaviours come from stakeholders delivering and receiving telemedicine, whereby internal politics and dynamics also play a role. A variety of outcomes can emerge from this service. Furthermore, the service's flexibility in meeting needs is considered, including the profession's needs, patients' needs, and organisational growth (Skivington et al., 2021).

Complex intervention research surpasses conventional efficiency evaluations by comprehensively examining impacts, resource allocation, contextual mechanisms, and interactions (Skivington et al., 2021). This method enables an assessment of systemic changes that transcend immediate outcomes, thereby encapsulating the complex nature of treatments in everyday environments (Paparini et al., 2021). Researchers employ diverse approaches to assess the interaction of interventions with varying contexts, thereby guiding evidence-based decision-making. These assessments evaluate both the efficacy of an intervention and its sustainability and scalability, fostering a comprehensive framework that assists professionals and leaders in making informed decisions that elucidate the quantitative and qualitative dimensions of public health and social interventions (Skivington et al., 2021).

Research on complex interventions can be classified into phases that are not necessarily sequential. The process encompasses designing or identifying an intervention, examining its feasibility and assessment framework, evaluating the intervention, and its effective implementation (Skivington et al., 2021). As a result, this framework was chosen as the overarching framework to guide this study's endeavour. Throughout this process, as mentioned in the research by Skivington et al. (2021), the subsequent questions were kept in mind to address this research to evaluate six fundamental elements that include:

1. How this intervention engages with the context
2. The foundational theory that assisted with developing this research and its execution
3. How research could integrate different stakeholder perspectives into practice and research
4. The main challenges and uncertainties for this complex intervention
5. How this intervention can be enhanced and further supported
6. The relative resources and outcome implications that this intervention can have on podiatry as a whole and for primary care

The responses to these enquiries guide the final discussion of this research. They will determine whether to proceed to the next phase, one study at a time. If necessary, the process may revert to a previous phase for amendments or clarification. A phase may also be repeated to ensure the development phase is clear enough for implementation. If deemed necessary, the process may be terminated.

This PhD research builds on an existing telemedicine service that general practitioners provide in a primary care environment in Malta. The establishment of this service during the COVID-19 pandemic allowed the podiatry profession to explore it further and consider its adaptability to the profession. As a result, this adaptation of an established strategy has the potential to target different patient populations while also improving access to podiatric care. This type of intervention adaptation of current interventions was also noted in the literature, and it could consist of adapting to a new demographic, a different environment, or targeting additional outcomes (Skivington et al., 2021). A well-thought-out programme theory can help figure out what parts of the previous intervention(s) need to be changed for different purposes and what basic mechanisms should stay the same even if they are used in different ways (Escoffery et al., 2018; Evans et al., 2021).

Moreover, as Skivington et al. (2021) highlighted, policy or practice-led interventions are fundamental to evaluation research. A strong theoretical foundation of an intervention is imperative to recognising important reservations and deciding on how to go about the intervention and its evaluation. The evaluation phase is essential even if a service is already up and running, as it supports the identification of what needs to be modified, significant contextual influences, and pertinent outcome measures.

Following the development phase, as outlined in the framework (Skivington et al., 2021), feasibility is the next key domain to be explored. As defined in the framework, this should be designed to evaluate pre-established principles related to the evaluation phase, including

prospects related to recruitment, data collection, retention, outcomes and data analysis. Furthermore, the feasibility phase could also relate to the intervention itself, ranging from optimal content and delivery of service, acceptability, engagement and adherence, the prospect of cost-effectiveness, or the capacity of healthcare providers to deliver the intervention (Skivington et al., 2021).

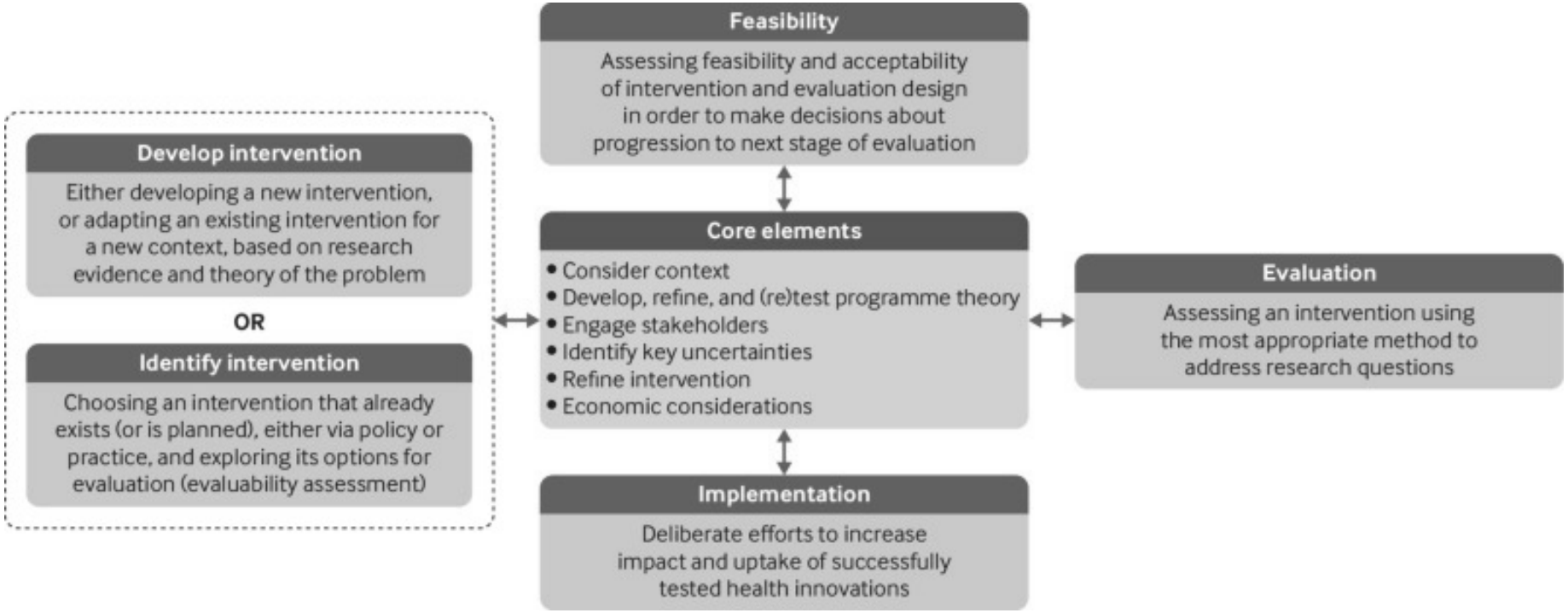
Consequently, as emphasised in the framework, evaluation is essential. It must extend beyond merely assessing the efficacy of an intervention to encompass a wider array of questions, including determining its additional impacts, theorising its mechanisms, considering its interactions with the implementation context, evaluating its contribution to systemic change, and utilising the evidence to inform real-world decision-making (Ogilvie et al., 2011). This indicates a transition from a singular emphasis on acquiring impartial effectiveness estimates to focusing on the utility of information for decision-making by choosing the appropriate research perspective and prioritising responsive research inquiries (Ogilvie et al., 2011).

Therefore, as outlined in this framework by Skivington et al. (2021), early deliberation of implementation enhances the likelihood of creating an intervention that may be broadly adopted and sustained in practical environments. Hence, implementation enquiries are best anticipated within the intervention theoretical framework and addressed throughout the stages of intervention development, feasibility, process evaluation, and outcome evaluation (Skivington et al., 2021). In addition to implementation outcomes, it is essential to consider the components of the implementation strategy and the contextual elements that facilitate or obstruct the attainment of impacts. Moreover, this framework suggests that intervention implementation flexibility may facilitate interventions' transferability across various contexts (Skivington et al., 2021), which is crucial for long-term implementation (Andersen et al., 2007) if the service's essential functions are preserved. The modifications are properly

comprehended (Greenhalgh & Papoutsi, 2018). As a result, in the final phase, this PhD research also includes the implementation through a pilot study. This can also be described as a natural experiment study, as the implementation evaluation occurs during and after the implementation of the intervention. The flow diagram in Figure 2 outlines the various phases that are taken into consideration as outlined in the Medical Research Council Framework for Complex Interventions.

In view of all the other models/theories mentioned previously in this chapter, these models/theories had a lacking factor in providing a comprehensive and systematic approach to developing, implementing, and evaluating complex interventions within real-world settings. Therefore, the MRC framework, has been considered as the overarching framework for this research study as it offers a structured process that aligns well with the study's objectives, allowing for iterative development, stakeholder involvement, and evidence-based evaluation of outcomes.

Figure 2: *Flow diagram outlining the different phases of the Medical Research Council Framework for Complex Interventions (Skivington et al., 2021).*



2.9 Research Related to Telemedicine in Podiatry

Since the onset of the COVID-19 pandemic, there has been an increase in research pertaining to telemedicine; however, this has not particularly addressed general podiatry for low-risk patients. A study conducted by Corcoran et al. (2003) was one of the first studies looking into telepodiatry services, yielding encouraging results. Despite not being in a primary care setting but in elderly home residential facility, telepodiatry offered a satisfactory means of administering podiatric care for diagnosing and treating foot disorders via videoconferencing in regions with restricted service availability due to considerable staffing deficits. However, the study emphasised that onsite clinical visits were still required for some patients to reach a definitive diagnosis but also highlighted that it was a great triaging exercise leading to more timely interventions (Corcoran et al., 2003). Therefore, it is important to consider that the context and setting of this research typically translate into patients with higher foot complications and at higher risk of limb loss primarily. This is due to an increased number of comorbidities, which could pose the patients with a greater risk of ulceration and amputation. Thus, timely intervention is considered imperative to diminish as much as possible from such complications from arising.

Other studies have focused on remote evaluation and management of diabetic foot conditions (Graham et al., 2023; Hazenberg et al., 2020; Yammine & Estephan, 2022), predominantly considered a high-risk domain rather than low risk. This underscores the gap in the literature, as most of the research focuses on high-risk patients instead of low-risk patients. This presents an opportunity for additional research on the subject, as high-risk individuals now were once classified as low risk at a point in time in their lives. Consequently, it is essential to target the low-risk population to prevent subsequent high-risk complications.

A qualitative study by Inniss (2024) examined podiatrists' thoughts on utilising telemedicine for delivering podiatric care. It explored the podiatrist's personal experience with

telemedicine, the problems encountered post-implementation, and the prospects that emerged for future service enhancements. This study suggested that the findings indicate a favourable social change aimed at enhancing and facilitating more accessible podiatric care, which may subsequently reduce the load on the healthcare system, patients, and healthcare providers (Inniss, 2024). These findings align with the results of the researcher's master's work and further underscore the necessity for an in-depth exploration of this specific area of podiatric telemedicine.

This PhD research, as highlighted, originated from the author's master's-level research, which examined the perspectives of key stakeholders concerning the implementation of a potential podiatric telemedicine service in primary care, whereby the same research has been published in a peer-reviewed journal, 'Studies in Health Technology and Informatics,' with the complete paper entitled 'Extending the Scope of Telemedicine to Podiatric Medicine', in Appendix 4. This approach has enabled the exploration and examination of pertinent study topics throughout this thesis.

2.10 Patient Public Involvement

Patient and public involvement must not be disregarded in guaranteeing that telemedicine practices embody person-centred care. Researchers often regard patient and public involvement as an ethical imperative (Carr & Patel, 2016; Rolfe et al., 2018), with obligatory policies implemented across diverse sectors, including healthcare design and delivery (Mockford et al., 2012), research (Brett et al., 2014; Locock et al., 2017; Shippee et al., 2014), regulation (Lalani et al., 2019), education (Dijk et al., 2020), and, most recently, digital health innovation. Despite the absence of unanimity over the term PPI (Baines & Regan de Bere, 2018), its potential advantages are widely acknowledged. These advantages encompass improved relevance, quality, and authenticity (Jagosh et al., 2012; Locock et al.,

2019; Locock & Boaz, 2019); the creation of alternative and innovative concepts (Pizzo et al., 2015; Staniszewska et al., 2007); stakeholder empowerment (Gillard et al., 2012; MacDonald, 2012); emancipation (Reason & Bradbury, 2005; Tangvald-Pedersen & Bongaardt 2017); and democratisation. Nonetheless, the COVID-19 pandemic seemingly precipitated an unparalleled surge in innovation and the adoption of digital health technologies (Budd et al., 2020; Crawford & Serhal, 2020). This frequently occurred at the cost of significant engagement (Murphy et al., 2020; Richards & Scowcroft, 2020), with patient and public involvement predominantly regarded as a supplementary rather than a vital component (Richards & Scowcroft, 2020). Moreover, as noted in the literature (Birnbaum et al., 2015), evidence-based guidance is deficient for implementing effective patient and public involvement in the swiftly advancing digital health domain, underscoring a gap in current comprehension and expertise.

A recent systematic review by Baines et al. (2022) identified a gap in the literature by examining the extent of patient and public involvement in digital health innovation and the principal barriers and facilitators influencing meaningful engagement in the innovation, implementation, and evaluation processes. This review's key findings indicate a growing number of articles focused on patient involvement across various digital health innovations, encompassing themes such as mental health, dementia, and cancer over the last decade (Baines et al., 2022). Nonetheless, despite the numerous reported advantages and robust policy discourse, patients have rarely engaged since the inception of digital health innovations, with opportunities for involvement typically restricted to the later phases of usability testing, where the capacity to effectuate change is significantly constrained (Baines et al., 2022). Limited research has documented the preliminary engagement of patients and the public in digital technologies' earliest design or conceptualisation phases. Fears about data privacy and security, limited time and money, and an unfair distribution of power can make it hard for patients and the public to be involved in digital health innovations. These

problems are made worse by traditional, often hierarchical ways of working, where patient ideas and suggestions are often seen as less important during the innovation and implementation stages (Baines et al., 2022).

Although patient and public involvement is widely considered important and essential, its application in the design, implementation, and assessment of digital health advances is infrequent (Baines et al., 2022). To the researcher's knowledge, this PhD research study is the first to include public and patient input in developing a podiatric telemedicine guideline in a primary care context.

2.11 Research Gap and Justification of Study

This research initiative aimed to establish a podiatric telemedicine service through virtual practices corresponding to a worldwide determination to integrate telehealth solutions into conventional healthcare frameworks. The thought and execution of Malta's first podiatric telemedicine service addresses a distinct requirement within the national healthcare framework and substantially enriches the overarching dialogue on primary healthcare innovation and the podiatry profession. This service offers an alternative avenue to fulfil patient needs, potentially alleviating the waiting list for core podiatry appointments in a primary care context. The potential effect of this service on reducing podiatry appointment waiting times also offers reassurance to patients needing quick intervention by delivering care in a timely manner. This service extends beyond the podiatric domain as a model for other professions to explore telemedicine services across various specialised healthcare domains. This research seeks to ameliorate podiatric care in Malta by introducing an innovative approach/service to improve the quality and accessibility of podiatric healthcare services both locally and internationally. The drive for such a service is not focused solely

on overcoming geographical barriers but on the urgency to enable timely interventions to lessen situations that delay access to podiatric care and lessen extended waiting times to consult with a podiatrist.

Telemedicine is no longer considered merely a convenience but may be an underexplored necessity in today's dynamic world of healthcare and the ever-growing technology landscape (Haleem et al., 2021). With an ever-growing ageing population, increasing chronic diseases, and global health crises which have been shown to create chaos and overwhelm healthcare institutions, traditional healthcare systems face the struggle to meet the growing demand for timely and accessible care (World Health Organisation, 2022) and this could also be observed within the podiatry profession throughout the pandemic. Although telemedicine has been known to bridge the gap by breaking down geographical barriers (Anawade et al., 2024; Gajarawala & Pelkowski, 2020), for us locally in Malta, with the increasing number of primary healthcare clinics across the island (Primary HealthCare Malta, 2023), geographical barriers do not pose much of a treat to the nationwide community. However, overpopulation does, which puts tremendous pressure on Malta's healthcare system. According to recent statistical data on population density, Malta ranks eighth globally with 1713 inhabitants per square kilometre (Statista, 2024). Thus, reducing healthcare costs and ensuring that patients receive expert consultations without unnecessary delays in relation to diagnosis, monitoring, and treatment are crucial. Such timely interventions can offer patients seeking podiatric care peace of mind. Therefore, embedding podiatric telemedicine as an additional service within primary care can enhance efficiency in podiatric healthcare delivery by optimising scheduling and reducing clinical appointments as necessary. Therefore, podiatry is not solely confined to clinical spaces, which can provide a greener approach towards podiatric care. Such an initiative also proposes fostering more interdisciplinary collaboration amongst professionals in primary care to eliminate unnecessary lengthy processes that could prolong patient care. Moreover, podiatric

telemedicine can further continuous patient engagement, improve foot-related health outcomes, and empower individuals to take charge of better self-care and preventative measures. Hence, podiatric telemedicine should align with current podiatry practices as a complementary service and not be seen as a replacement for face-to-face consultations. Thus, it is imperative to acknowledge that we live in an era where digital transformation is revolutionising every industry (Stoumpos et al., 2023). Accepting telemedicine as a new practice within our already established primary healthcare services is essential for creating a more resilient, inclusive, and patient and person-centred healthcare system. Likewise, it is imperative also to accept that different professions practise in different ways, which is why telemedicine should be customised according to the profession's needs and capacities (Leone et al., 2023).

Thus, as research indicates, creating universal telemedicine practice guidelines for all professions is impractical due to the varying requirements of the different professions (Leone et al., 2023). Therefore, profession-specific telemedicine guidelines are necessary. Telemedicine has been widely utilised across multiple disciplines, including general practice (Nguyen et al., 2024; Vassallo et al., 2024), dermatology (Sud & Anjankar, 2022; Trettel et al., 2018), and psychiatry (Brunt & Gale-Grant, 2023). Comprehensive telemedicine standards for podiatric specialists are necessary, encompassing a broad spectrum of potential foot and ankle ailments. Prior research has examined the application of telemedicine in the management of diabetic foot (Hazenberg et al., 2020), wound care (Khan et al., 2022), and musculoskeletal injuries and complications (Labib et al., 2021). Further research is required to investigate the implementation of telemedicine in podiatry consultations for low-risk patients within primary care environments.

Global public health initiatives to curb the transmission of the COVID-19 pandemic have encompassed telemedicine and remote healthcare delivery (Bhaskar et al., 2020). Nonetheless, the configuration of healthcare systems, the legal framework, and the influence

of local culture significantly affect the administration and operation of healthcare services globally (Alderwick et al., 2021). Telemedicine presents challenges for healthcare practitioners and patients owing to disparities in technology, education, policy, and ethics (Nittari et al., 2020; Solimini et al., 2021). These deficiencies are also evident in the current Maltese research landscape. Before the outbreak, the Maltese public primary care system paid minimal attention to telemedicine, as there were no concerns regarding considerable travel distances to reach a health centre or community clinic. Consequently, the necessity to cancel non-essential appointments in reaction to the pandemic elevated the prominence of telemedicine services.

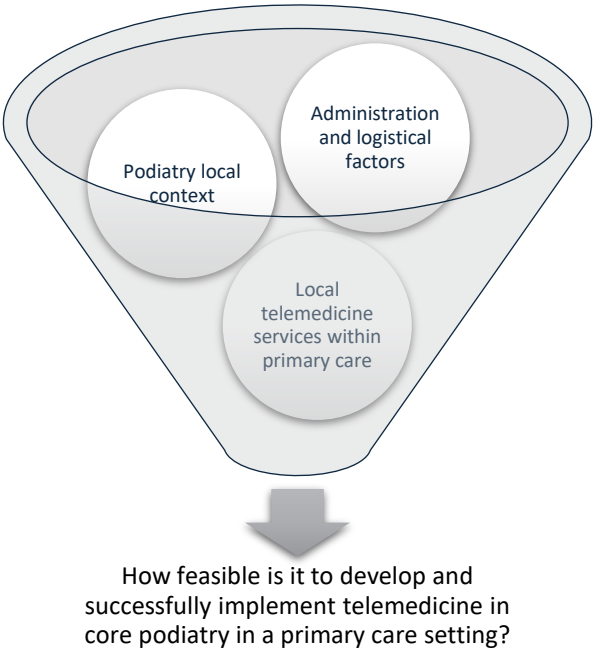
Establishing a podiatric telemedicine service could assist patients facing difficulty accessing podiatric care due to inconvenient appointment schedules, unreliable transportation, or childcare/elderly responsibilities. It may mitigate the existing deficit of podiatrists in primary care by optimising the limited resources at hand. The aim is to include podiatric telemedicine within the existing podiatric services without interfering with patient care. Furthermore, standardising frameworks and developing and evaluating telemedicine procedures require advancement in certain domains, including core podiatry services. Moreover, this research seeks to evaluate podiatric telemedicine to alleviate the burden on the physical infrastructure of the podiatric system beyond emergencies.

In conclusion, the objective of this literature review was to reach an informed conclusion about the formulation and execution of a telemedicine guideline for essential podiatric care within the local primary care setting to ensure effective and safe treatment. Subsequently, this is intended to lead to developing a podiatric telemedicine framework and its implementation in a pilot study within the local context.

2.12 Development of the Research Question

This PhD research question was developed after doing an extensive literature review and previous research at the master's level related to the perceptions of major stakeholders in the potential implementation of podiatric telemedicine in a primary care setting. This study emphasised key elements, as highlighted in Figure 3, such as familiarity with the local context of telemedicine services in primary care, technological advancements in healthcare primarily brought about by the COVID-19 pandemic, the evolution of the podiatry profession away from traditional methods, and prevailing global health conditions as its core focus. This information aided in the development of the theoretical foundation for this PhD.

Figure 3: *Key concepts that shaped this PhD's research question.*



The literature review demonstrated a lack of studies about telemedicine in podiatry within a primary care setting for low-risk patients. Consequently, the literature review concentrated on the local context and advancements due to the COVID-19 pandemic. The theories, models, and frameworks highlighted in the literature review served as the foundation for the theoretical framework of this research, with the Medical Research Council's Framework for

Complex Interventions being accepted as the primary overarching framework. The literature review delineates that complex intervention research is defined by a four-phase approach: development, feasibility, assessment, and implementation, which this research will adhere to.

This project aims to develop a telemedicine framework for podiatry based on the best evidence available, fostering the sustainable future of essential podiatric care for low-risk patients within a primary care setting. Therefore, to accomplish this goal, several objectives must be fulfilled, including the establishment of a podiatric telemedicine framework appropriate for a primary care environment aimed at low-risk patients, the provision of training, the creation of outreach and educational initiatives for service users, and finally, the implementation and evaluation of the feasibility of the developed podiatric telemedicine service via a pilot initiative. Upon conclusion of the pilot service research, the perceptions and satisfaction of key stakeholders will be assessed.

2.13 Conclusion

This review highlighted that telemedicine has evolved as a successful means for treating, monitoring, and managing patients necessitating foot and ankle care, especially for patients with a higher risk profile, including diabetic foot problems and other abnormalities, including musculoskeletal and dermatological follow-ups. Prior research in podiatry examined the preliminary experiences of podiatrists in the deployment of telemedicine services for individuals with foot ulcers, articulated the experiences of podiatrists overseeing diverse cases of diabetic foot via telemedicine, and investigated essential conditions for the successful implementation of telemedicine in diabetic foot care (Kavitha et al., 2020; Kolltveit et al., 2017). Previous studies demonstrated that telemedicine improved patient-physician interactions by facilitating a more comprehensive approach to patient care and its effectiveness in managing diabetic foot conditions (Kavitha et al., 2020). Despite

technological obstacles and criticism, telemedicine, with its myriad benefits, has been adopted across varying podiatry specialities, improving the overall patient experience (Haleem et al., 2021); however, it lacks its foundation with low-risk patients.

There is a scarcity of research examining the experiences of podiatrists and service users in utilising telemedicine to provide/receive podiatric care services. The literature is deficient regarding podiatrists' acceptance of telemedicine as a tool for delivering podiatric care services in their clinical practice. Hence, through this research, the scope is to examine the insufficient understanding of podiatrists as healthcare providers and patients as service users regarding comprehensive experiences in providing and receiving podiatric care services via telemedicine.

The following chapters highlight the researcher's journey throughout this PhD research, the philosophical inspirations that framed this research and the individual studies, which constituted a mixed methodology and collected comprehensive insights from literature and key stakeholders, including service users, healthcare providers, and leaders. This includes their perceptions and experiences with telemedicine and its impact on their competence in communicating with and caring for patients with diverse podiatric ailments. The forthcoming chapter delineates my role as a researcher and the factors that have captivated me to undertake this study project.

Chapter Three – The Position Statement of the Researcher

3.1 Introduction

As a researcher, my interest and role were to investigate and understand the existing state of podiatric telemedicine practices in primary care, both locally and globally. I was particularly interested in introducing podiatric telemedicine for patients classified as having a low-risk foot health status. This research comprises a series of studies that have resulted in the establishment of a telemedicine framework for podiatry in a primary care setting. Additionally, a pilot study was conducted to test the framework in a local context. This pilot study involved the development of a new service within primary healthcare that complements the existing podiatry services currently available.

3.2 Introducing the Researcher

I am a state-registered podiatrist interested in enhancing foot and ankle healthcare by exploring innovative practice methods, specifically through podiatric telemedicine. Currently, I am the lead clinician for podiatric telemedicine at the Podiatry Centre of Excellence, located in a local health centre. My responsibilities mainly involve overseeing the recently established Podiatric Telemedicine service in terms of training, outreach, and service implementation. In 2011, I embarked on my professional path by completing a four-year undergraduate degree with the University of Malta, Faculty of Health Sciences in Podiatry. In 2015, I obtained my degree in Podiatry and subsequently secured a position with the Ministry of Health. During the initial three years of my employment in the Podiatry

department, I primarily worked in core clinics and served as a reliever in core clinics located in other health centres.

As a student, I was always interested in the human body, especially the feet, which tend to be mostly neglected and not appreciated for the role they hold for everyone. Additionally, I was keenly interested in technology's potential role in advancing healthcare delivery. Specifically, I was curious about how these advancements could impact the field of podiatry in the future. Moreover, I strongly disagree with the misconception that podiatry is limited to toenail trimming and corn removal. I firmly believe that embracing technology is the key to dispelling this notion and educating both healthcare professionals and the general public about the diverse scope of the podiatry profession.

As a Podiatrist employed by the Ministry for Health, I have gained experience in treating patients from diverse backgrounds, including both low and high-risk individuals, on a regular basis. Consequently, this experience gave me valuable knowledge of the patients who may benefit from remote podiatric consultations. While completing a master's degree in management with the University of Malta, Faculty of Economics, Management and Accountancy, in 2021, I conducted a study on podiatric telemedicine. The purpose of the study was to examine the viewpoints of various stakeholders regarding the possible integration of a podiatric telemedicine service in a primary care setting. This research was conducted throughout the pandemic, which provided the perfect opportunity to investigate this field of research. This study examined stakeholders' perspectives about the potential implementation of a telemedicine service in a primary care setting. This work has recently been published as a full paper entitled '*Extending the Scope of Telemedicine to Podiatric Medicine'* in Studies in Health Technology and Informatics, and it has been included as a book chapter from a conference proceeding. [Appendix 4]

Amidst the coronavirus pandemic, my role as a podiatrist primarily involved administrative duties within the Podiatry Department, specifically managing the procurement requirements for primary care clinics in Malta. Additionally, I participated in managing the roster and day-to-day scheduling of podiatry lists. This experience heightened my awareness of the significant waiting times patients face when booking appointments. It emphasised the urgency of implementing various podiatric care techniques to address this issue. During the pandemic, there were occasions when podiatry clinics had to cease operations entirely. In such cases, podiatrists resorted to telephonic communication with patients to guarantee that their foot care was monitored. Witnessing these situations made me realise that neither podiatrists nor patients were adequately prepared for such circumstances. Telephone consultations proved crucial in certain cases, as they allowed for the immediate recognition of high-risk patients who could then be scheduled for in-person appointments. However, some patients did not value or comprehend this mode of communication, which occasionally caused distress for podiatrists who had to handle complaints related to this issue.

As I neared the end of my two-year master's program, I realised that I should not abandon this work. Instead, I decided to delve deeper into the emerging field of podiatric telemedicine. In 2022, I took the opportunity to pursue a PhD and focus on a research project aimed at developing a telemedicine service that could be implemented in primary care. My thoughts were to develop a service that could be considered for implementation in a primary care setting for podiatry. Having podiatry as a profession at heart, I felt the need to explore something new that could benefit not only podiatry by broadening its wide spectrum of services but also benefitting the community by developing a service that could be more easily accessible if the need is required and ensuring that this service is evidence-based.

3.3 The Research Project

According to the Greek philosopher Heraclitus, whereby he is known for his theory related to the Doctrine of Flux and Unity of opposites, Heraclitus explains that the only constant in life is change (Graham, 2021). This philosophical thinking has further motivated me to continue this research since it was clear that healthcare was transitioning into a new era that required the incorporation of technological modalities more than ever before. The COVID-19 pandemic, along with insights gained during that period about remote consultations, clearly indicated that a transformation in healthcare practices was necessary. During that period, telemedicine was presented as an alternative and, at times, the sole feasible means of consultation. The advantages of change, especially when it is thrust upon us, demonstrate that such transformation is necessary for human beings. This prompted a re-evaluation of healthcare modalities during a crisis, leading to the realisation that innovative care delivery methods are viable, advantageous, and should be sustained beyond such crucial periods. In challenging periods, it is often contemplated how we may enhance our actions, identify areas for improvement, and determine what is necessary to adapt to the ever-evolving circumstances we face.

Despite the widespread representation of telemedicine as a significant advancement in the ever-evolving healthcare sector, transforming the provision of medical services and improving people's access to healthcare, Malta has faced difficulties in implementing telemedicine practices. This conflict was observed consistently among service users, providers, and policymakers. Therefore, my curiosity to comprehend the present state of telemedicine locally prompted me to embark on a new study endeavour. I recognised that telemedicine is unique to each profession and varies across different countries. Initially, it was somewhat challenging to comprehend this subject's nascent nature and the little research

that has been conducted thus far. Nevertheless, I believe this presented a favourable occasion to delve further into this area of research and launch a series of further studies in the field.

At first, I had mixed feelings about how podiatrists and service users would perceive this service, as it deviates from the usual practices in the local setting, whereby patients are always met and seen in a clinical setting. From a cultural standpoint, patients typically consider visiting a clinic as the only way to consult with a podiatrist when a foot pathology arises, mainly due to the profession itself being a mostly hands-on profession which requires hands on intervention to treating patients. However, we often overlook the fact that even receiving a private message from a patient or having a telephone conversation with a patient discussing a particular concern could provide an alternate method to offer advice to patients.

However, to ascertain that podiatric telemedicine is delivered in an evidence-based manner, time and expert evaluation are required. Without the involvement of stakeholders, beginning with patients at the grassroots level and extending to healthcare professionals and policymakers, such a service cannot be sustainable. Stakeholder opinion is essential and critical, particularly from the start of the service until its delivery and beyond. Ultimately, it is the stakeholders who utilise or supply the service; thus, their input is essential to ensure engagement and to establish initial expectations regarding the service's functionality, its benefits, and its limitations. While it is customary for patients and podiatrists to communicate remotely through text messages by sending videos and photos at times to a podiatrist within private practice, it is not the same in the public sector. Consequently, I recognised the necessity to investigate an alternative approach for a more evidence-based and robust implementation of remote consultations in primary care setting.

I initially was interested into looking and discussing telemedicine practices which were employed by general practitioners and evaluated their application to podiatry, utilising existing platforms to facilitate a seamless development and implementation strategy within

the podiatry department at the primary care level for low-risk patients. The objective was to enhance the accessibility of podiatric care through timely telemedicine practices, whereby diminishing waiting time could in turn assist with availing clinical appointments to patients who require hands-on intervention. However, I also recognised that no universally agreed upon "objective reality" exists and thus, immediately realised that if such as service had to start for podiatric practice it required a specific and unique framework tailored for podiatry. Consequently, my thought process aligned closely with the interpretivist and pragmatic perspectives, which I ultimately applied to this research.

This study is motivated by the increasing demand for foot and ankle treatments, both locally and even at international level, and thus, the possibility of introducing telemedicine to connect patients and podiatrists remotely when an in-person consultation is not feasible or necessary. Telemedicine can thus offer patients faster and more convenient foot care, when appropriate, in a primary care setting. Bringing about change in this context does not include removing something that already exists but rather creating something that can enhance and supplement existing services. A service that allows users to participate or withdraw voluntarily from podiatric telemedicine, giving patients the freedom to choose which mode of consultation they prefer if a telemedicine consultation is deemed fit, without any coercion. Although it is recognised that this service might not be suitable for all podiatric cases, it can effectively handle specific low- risk situations including follow-ups for dermatological skin and nail conditions (including fungal skin and nail pathologies and other dermal pathologies that can be assessed by sending photos of the lesion in question), follow-ups for musculoskeletal conditions (such as in the case of plantar fasciitis treatments, metatarsalgia treatments, lesser toe deformity advise, and in cases of recent trauma causing acute gait abnormalities), and also to provide footwear and footcare advise.

Reducing the workload in clinical practice can be advantageous by allowing clinical appointments to be made available for patients requiring in-person consultations.

Podiatric telemedicine could provide professional accurate information to patients and other healthcare professionals regarding specific aspects and components of podiatry. This service aims to explore podiatry by utilising technological methods to explore innovative ways of delivering podiatric care services, hence creating opportunities to diminish waiting times for podiatry appointments, offering prompt podiatric advice and guidance, establishing new pathways for podiatric care and, for further research in the field of podiatric telemedicine.

It is necessary to recognise that this shift in podiatric practice may not be universally applicable and acceptable by both patients and healthcare professionals, but the purpose is to implement telemedicine for individuals who are capable and willing to embrace alternative methods of obtaining podiatric care. Consequently, both the interpretivist approach, which emphasises understanding the subjective realities of individuals and discerning the social significance of this service, and the pragmatist philosophical approach, which prioritises practical outcomes and adaptive strategies, are appropriate. This is because, while change over time is unavoidable, innovative methods of providing podiatric care can be developed organically, largely influenced by cultural and societal factors. Thus, to commence this new service, it was imperative as a researcher to gain a comprehensive understanding of the current state of podiatric telemedicine, both nationally and internationally, to ascertain its foundation in other nations. To investigate this matter, a scoping study was conducted to examine the current guidelines for telemedicine in the field of podiatry. The initial search aimed to concentrate exclusively on podiatry. However, upon investigating research papers, it became apparent that there were no specific guidelines for podiatric telemedicine. Consequently, the review had to be expanded to encompass foot and ankle practice guidelines, which included a range of other healthcare professionals. These professions were examined as they intersected with the field of podiatry in some manner. This scoping study presents strong evidence that there is a significant lack of literature and clinical recommendations for podiatric telemedicine.

Furthermore, it highlights that this kind of practice is still relatively new in Malta and across Europe. These findings raised my interest in developing a framework for podiatric telemedicine. I aim to contribute both clinically and academically to the field of podiatric telemedicine.

During this journey, I have engaged in multiple talks with my supervisor and co-supervisor, offering valuable insights and diverse perspectives on the intersection of podiatry and telemedicine's potential influence on clinical practice and research opportunities. Initially the plan was to launch the service as a triage channel for patients contacting the podiatry department. The second pathway would involve patients referred directly to the designated podiatric telemedicine team for remote consultation. After thorough deliberation and internal consultations with both the research team and primary care collaborators, it was determined that the pilot should commence exclusively through a referral system from podiatrists. The triaging notion was disregarded due to logistical constraints that made it impractical at the current moment.

The most significant obstacle I encountered while carrying out this research was during the execution stage of the pilot study. I recall having concerns over the recruiting process, as podiatrists were not referring a significant number of patients to the podiatric telemedicine team. Despite multiple efforts to inform and engage podiatrists in this process, the desired outcome was not achieved. In addition, there was a lack of patient willingness to use podiatric telemedicine processes, primarily which can be attributed to cultural reluctance.

Throughout my research, I continuously questioned why telemedicine practices in our culture had not been adopted by local stakeholders prior to the COVID-19 pandemic, even though some countries have prioritised growing primary care consultations via telemedicine. As a podiatrist who works in both the public and private sectors, I found myself offering telemedicine consultations throughout the pandemic more regularly in my private practice.

This made me wonder whether other podiatrists offer this service too, hence offering telemedicine without acknowledging and realising it. After experiencing the COVID-19 crisis in which our local healthcare delivery system had to convert to remote consultations for a while, I was surprised as to why these practices were discontinued post-pandemic. Podiatric telemedicine presents a valuable opportunity to equip healthcare staff, including podiatrists, with the necessary skills and equipment to conduct remote consultations in daily practice in primary health care settings where it can eventually be integrated as common practice as one of the established services the local podiatry department has to offer.

Since the initiation of this PhD research project, its effect on my development—both as a researcher and as a podiatrist—has been insightful and multifaceted. Beyond the achievement of technical competencies and domain-specific knowledge, this journey has demanded, and in turn raised, the enhancement of critical personal and professional qualities needed to succeed in complex, dynamic environments such as primary care.

The two-fold challenge of conducting full-time research while concurrently caring for a young child presented a unique set of constraints that imposed particular discipline, innovation, and adaptability. Command of time management evolved not only as a theoretical exercise but as a day-to-day need—each day requiring precise prioritization of tasks, sustained focus, and efficient shifts linking intellectual demands and caregiving responsibilities. Similarly, the development and implementation of service management strategies became a formative characteristic of my skillset, as I engaged in systems thinking, collaborated with competing stakeholder interests, and translated conceptual frameworks into practical, actionable plans within the podiatry department in a primary care context.

Equally meaningful has been the personal growth rooted within this process. As previously described, this two-fold process has cultivated a deeper sense of resilience, emotional intelligence, and reflective practice. These experiences enhanced my ability to navigate

uncertainty particularly when the process was not smooth running and involved several alterations and process modifications, manage cognitive and emotional load, and remain attuned to the ethical and human dimensions of research and clinical work.

Over time, this project has shaped my identity not only as a scholar-practitioner but also as a leader in the field of podiatric telemedicine, capable of integrating strategic vision with empathetic engagement. It has required me to stretch beyond conventional boundaries, to re-imagine efficiency through a lens of sustainability, and to adopt a more nuanced interpretation of what it means to lead, contribute, and grow within a dynamic and often unpredictable professional setting.

Overall, the trajectory of this research has been transformative equipping me with advanced skills in podiatric telemedicine service development and project management, while concomitantly strengthening my capability for reflection, adaptability, and relational competence. These developments will without doubt continue to inform and improve my future contributions to research, clinical practice, and leadership within the domain of podiatric telemedicine.

Throughout this process I have continuously prioritised the interests and needs of patients and podiatrists and consistently strived to offer the best evidence-based advice and professional podiatric care. This research opportunity has also allowed me to travel and present my work at podiatry and telemedicine-related conferences, where I engaged in discussions on podiatric telemedicine with peers worldwide. This endeavour has contributed to raising awareness among podiatrists abroad about the ongoing work and the potential relevance of podiatric telemedicine within their professional practice. It is anticipated that this research may support local podiatrists by introducing new perspectives on service delivery. This PhD journey has been both challenging and motivating. I hope it will

fundamentally change how low-risk patients in primary care settings can obtain timely and specialised podiatric care.

To conclude, working on my PhD has genuinely helped me grow, pushing me to think more critically and engage more deeply with the evidence that shapes podiatric practice. Throughout this research, I gained a clearer understanding of how technology can be used in real clinical settings, especially when working closely with other professionals and patients. This journey has not only strengthened my research skills but also helped me recognise how my role is evolving in supporting more accessible and forward-thinking podiatric care.

Chapter Four – Identifying the Philosophical Approach of the Research

4.1 Introduction

During the process of conducting research, it is customary for researchers to formulate several assumptions (Leed and Ormrod, 2005). This chapter delves into the process of developing telemedicine services in podiatry within a primary care context, exploring it from ontological, epistemological, axiological, and methodological standpoints. The chapter aims to provide a comprehensive understanding of various research approaches that are rooted in these philosophical domains. Differences in research procedures arise from the underlying philosophical and theoretical perspectives that guide research. It is important to distinguish between the terms 'methodology' and 'method', which are often mistakenly used interchangeably. 'Methodology' refers to the overarching philosophical framework and intellectual process behind research, while 'method' pertains to the specific techniques used to collect data. Consequently, the choice of methodology precedes and informs the selection of research methods (Aguiar, 2024).

In accordance with these definitions, this chapter provides a comprehensive overview of the research methodology utilised in this PhD study. The underlying philosophy guiding the research approach is observed, emphasizing the researcher's interpretivist and pragmatist perspectives, which ultimately informed the decision to adopt a mixed-methods approach. Additionally, the chapter explores the rationale behind the chosen research design.

4.2 Philosophy

A research philosophy encompasses a fundamental set of principles that direct the design and implementation of research, providing unique perspectives on and methods for conducting scientific inquiry (Kazdin, 2016). According to Saunders et al. (2009), research philosophy is a broad notion encompassing knowledge acquisition and nature. Throughout the course of history, spanning several philosophical schools of thought, humanity has consistently endeavoured to comprehend the nature of reality, the purpose of existence, and the methods by which we might attain and grasp knowledge. These ongoing enquiries continue to influence the many viewpoints and approaches employed in today's studies (Chandra & Sharma, 2006).

4.2.1 Knowledge, truth and reality as interpreted in this PhD study for Telemedicine Practice

When researchers discuss knowledge, they refer to the ability to understand the world as it is; a skill that can propel societal progress and development (Laustsen et al., 2021). Collaboration between practitioners, managers, decision-makers, policymakers, service users and researchers can be crucial in closing the gap between research and practical application, thereby enhancing the healthcare system (Theobald et al., 2018). While involving professionals in telemedicine research can yield valuable and practical insights, such partnerships are often complex and challenging to manage effectively.

The application of study findings in practice often requires a significant amount of time (Balas and Boren, 2000). Despite published research, study findings may lack practical relevance, which might hinder their implementation and reduce their usefulness for patients and healthcare practitioners (Ioannidis, 2016). The divergence may occur due to the different priorities and perspectives of researchers and professionals, leading to differences in their

evaluation of the significance of study areas and outcomes (Chalmers, & Glasziou, 2009). The perception of research and practice as separate domains with distinct principles can hinder good collaboration (Schot et al., 2019). However, some contend that research and practice are not conflicting entities but rather mutually beneficial (Van de Ven, & Johnson, 2006). Both disciplines provide valuable insights and are crucial for solving the problems faced by today's technologically advanced healthcare sector.

Professionals possess valuable knowledge that can significantly enhance research efforts (Glegg & Hoens, 2016; Bullock et al., 2012). Their active participation in research can lead to the generation of practical insights, as they help ensure that investigations address relevant issues and consider the context in which findings will be applied (Bullock et al., 2012; Pentland et al., 2011). Due to their firsthand experience, professionals hold a deep understanding of specific contexts, allowing them to discern patterns that may be inaccessible to external observers. In this way, professionals act as key interpreters of context-specific knowledge (Laustsen et al., 2021). On the other hand, researchers typically bring a broader, theoretical understanding, offering explanations of processes and concepts at a more abstract level. When professionals collaborate in research, they are not merely subjects but active partners in the process (Kylberg et al., 2018). This collaboration fosters a reciprocal exchange of knowledge, where the practical, context-based insights of professionals and the scientific expertise of researchers complement and enrich each other. In this scenario, the researcher plays a dual role, functioning both as an investigator and as a healthcare professional in the field of podiatry within a primary care setting.

The categorization of different forms of knowledge, such as scientific and practical, may be traced back to Aristotle around 300 BC (Ross, 1999). Scientific knowledge, or episteme, is defined as a comprehensive and theoretical understanding that is applicable worldwide rather than specific to any individual or context. Conversely, practical wisdom (phronesis) pertains to a form of expertise that is based on personal experience and a profound comprehension

of circumstances (Ross, 1999). Although there is a general understanding of the importance of many types of information, there are instances where the worth of these distinct forms of knowledge is not fully recognised. Disagreements about what qualifies as actual knowledge can lead to a disconnect between research and practical application.

Nevertheless, it is important to recognise that no individual viewpoint is adequate in addressing intricate issues independently, underscoring the necessity for a unified and diverse approach (Van de Ven & Johnson, 2006). By actively incorporating experts and patients in research, this can effectively bridge the gap between scientific knowledge and practical applications. This not only enhances professionals' comprehension of their own work but also promotes the development of shared knowledge (Worum et al., 2019). Within research domains like telemedicine, the active participation of experts and patients facilitates the sharing of unspoken, situation-dependent knowledge, leading to advantages for both the healthcare system and society (Roy et al., 2022).

Knowledge is often closely tied to the notion of truth, implying that it should be grounded in evidence for something to be considered knowledge. When a statement is false, it is generally not seen as knowledge. However, in daily life, not all knowledge fits neatly into categories of true or false. Some forms of knowledge are devoid of such classification but remain essential for navigating life effectively (Laustsen et al., 2021).

This complexity becomes especially relevant when we try to apply the concepts of knowledge, truth, and reality to practical scenarios—such as the field of telemedicine, particularly in the development of a new service. While healthcare professionals and patients are increasingly comfortable with technology, it cannot be assumed that this proficiency extends to everyone. Although the COVID-19 pandemic accelerated the adoption of telemedicine in healthcare, it is still not a widespread practice in many local contexts, including in podiatry across Europe. Therefore, even though technological advancements

are progressing rapidly, the actual implementation and integration of remote consultations in primary care settings, especially in podiatry, lags behind this technological progress.

The word “research” originates from the components “re” and “search,” suggesting a systematic investigation intended to reveal new knowledge grounded in existing evidence (Yadav, 2020). Research is fundamentally the scientific endeavor to understand established facts and produce new insights for the benefit of humanity (Yadav, 2020). Wernher von Braun, a notable German philosopher, succinctly articulated, “Research is what I’m doing when I don’t know what I’m doing,” emphasizing that research constitutes a pursuit of truth and knowledge. The importance of research extends beyond personal advancement to encompass national development, yielding commercial, social, and educational advantages. Albert Szent-Györgyi, the Nobel Prize-winning Hungarian biochemist, emphasised this by stating, “Research is to see what everybody else has seen and think what nobody has thought.”

The absence of substantial evidence-based research in the emerging domain of podiatric telemedicine poses distinct obstacles. As this domain remains nascent, generating new knowledge or extracting information from allied disciplines, including foot and ankle musculoskeletal specialists, physiotherapists, and dermatologists, is necessary. This PhD research relied on philosophy, which provides essential concepts for theory development, method selection, and interpretation of findings. This dissertation categorised philosophical investigation into five principal domains: axiology, epistemology, ontology, logic, and metaphysics (Moon & Blackman, 2014). Each domain has unique assumptions about reality, knowledge, and values, influencing the researcher’s strategy in research and assessment.

4.2.2 Reflection on Philosophical Domains

During the process of conducting research, it is customary for researchers to formulate several assumptions, frequently without conscious awareness (Leed & Ormrod, 2005).

These concepts can be classified into three overarching domains: ontological, epistemological, and axiological.

- The ontological assumptions pertain to the underlying nature of reality, exerting a substantial influence on an individual's perspective and approach when investigating study subjects (Thomas & Hardy, 2011).
- Epistemological assumptions pertain to the fundamental beliefs and concepts that serve as the basis for human comprehension. These assumptions establish the parameters for evaluating knowledge's trustworthiness, accuracy, and legitimacy, as well as the approaches for efficiently communicating it to others (Saunders et al., 2009).
- The axiological assumptions revolve around the researcher's acknowledgment of values and ethical issues throughout the study process, highlighting how these values generate dependable and trustworthy findings (Saunders et al., 2009).

  Therefore, before commencing this research project, many philosophical domains and elements were looked into to address the central research issue regarding the feasibility of establishing a podiatric telemedicine service for low-risk patients in a primary care setting. The research onion framework, illustrated by Saunders, Lewis and Thornhill (2009), in Figure 4, was employed to elucidate the numerous components of the research that must be analyzed and organised to develop a robust research design.

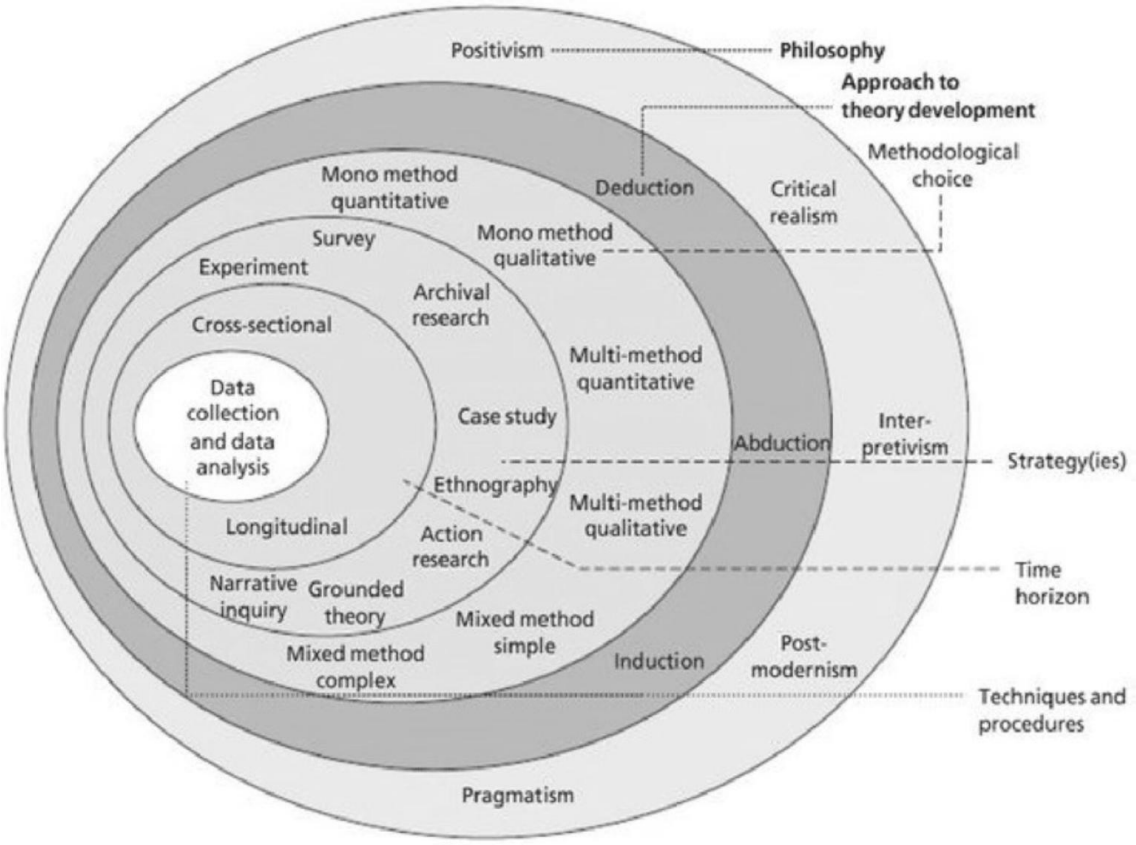


Figure 4: The research onion model. Source: Adapted from Mark Saunders, Philip Lewis, and Adrian Thornhill, 2009.

Acknowledging and critically examining these assumptions at every stage of the research process is crucial. Participating in this practice enhances the resilience and coherence of the research being conducted, mitigating potential biases or constraints stemming from underlying assumptions. Therefore, a comprehensive understanding of ontological, epistemological, and axiological principles facilitates enhanced participation in more informed and rigorous queries. Thus, the study aimed to establish a comprehensive podiatric telemedicine framework that may be effectively implemented within a primary care context. This undertaking was also incorporated in the assumptions mentioned earlier, which encompass the following:

Ontology

The research ontology for developing a podiatric telemedicine service encompasses various dynamic aspects. Firstly, it involves studying the existing literature to know what is already

available and considering its methodological rigor. It also involves understanding the concept of telemedicine, including definitions, principles, benefits, and limitations. This ontological process is intended to help identify gaps and discover new challenges in current foot and ankle telemedicine practices, which is the first initial study of this research project (Study I – The Scoping Study). Secondly, Study I is intended to help inform and drive this research focus onto Study II, which aimed to explore further strategic, organizational, public policy, and developmental domains which include technological aspects, exploring different telecommunication tools, platforms, and software solutions available for remote patient consultations, data management, and security. Throughout these processes in Study I and Study II, these investigations essentially assisted in integrating podiatric telemedicine with existing healthcare systems and electronic patient records (ePR) for seamless information exchange.

Moreover, for this research, the research ontology was also intended to emphasise using user-centric approaches, examining the perspectives of healthcare providers, patients, and policymakers to understand their needs, expectations, and concerns regarding telemedicine services that will be carried out in Study II. Lastly, the final stage of this research, Study III, evaluated the effectiveness, efficiency, and overall impact of podiatric telemedicine services through empirical studies, which is a crucial component of the research ontology. These evaluations consider patient satisfaction and clinical outcomes to enable continuous improvement and refinement of podiatric telemedicine practices.

Therefore, given that the ontological process primarily pertains to the theory of reality, this research was conducted with an open mind, remaining objective and constructive, to guarantee that it can ultimately result in an effective service for low-risk podiatry patients in the public sector, which may also indirectly benefit high-risk patients through timely interventions. It is essential to recognise that this service may not be suitable for everyone owing to several constraints, including expertise, technology infrastructure, and cultural

opposition. Nonetheless, creating a service accessible to eligible customers is highly advantageous since it provides the option for both clinical and remote consultations.

Epistemology

Looking into epistemology, which revolves around the theory of knowledge, the scope is establishing a telemedicine service for podiatry, which entails a comprehensive approach to understanding the diverse aspects of this dynamic domain of foot and ankle care. The evaluation commenced with an extensive review of scholarly literature, which subsequently informed the design and implementation of the first study, Study I, which examined the current state of knowledge in the field of podiatry. As highlighted in the literature review, theories and frameworks on telemedicine were described and discussed to ensure that the knowledge put forward is critically appraised. This was done to ensure a robust methodology for this research since podiatric telemedicine is still in its infancy, which included its technological underpinnings, ethical deliberations, and legal ramifications. Empirical research holds significant importance within this epistemological framework, incorporating qualitative and quantitative methodologies. These methodologies are carefully considered and applied in Study II, the modified Delphi method, to formulate the podiatric telemedicine framework. This research employed qualitative methods, specifically online focus groups, to engage participants who are service users, podiatrists, and policymakers with a solid connection to the fields of podiatry, telemedicine, and primary care.

In contrast, quantitative measures were employed to systematically gather and analyze data to assess the degree of agreement and achieve a consensus regarding the statements presented during the focus group sessions. Additionally, Study III incorporated training and outreach initiatives, as well as quantitative methodologies, specifically concentrating on acquiring and examining data to assess the efficacy, productivity, and results of podiatric telemedicine interventions. This research epistemology acknowledges the significance of interdisciplinary collaboration among experts from diverse yet interconnected fields. It is

believed that this approach best integrates theoretical knowledge, empirical evidence, and interdisciplinary perspectives to advance our comprehension of telemedicine and provide guidance for creating efficient and ethically appropriate podiatric telemedicine services.

Axiology

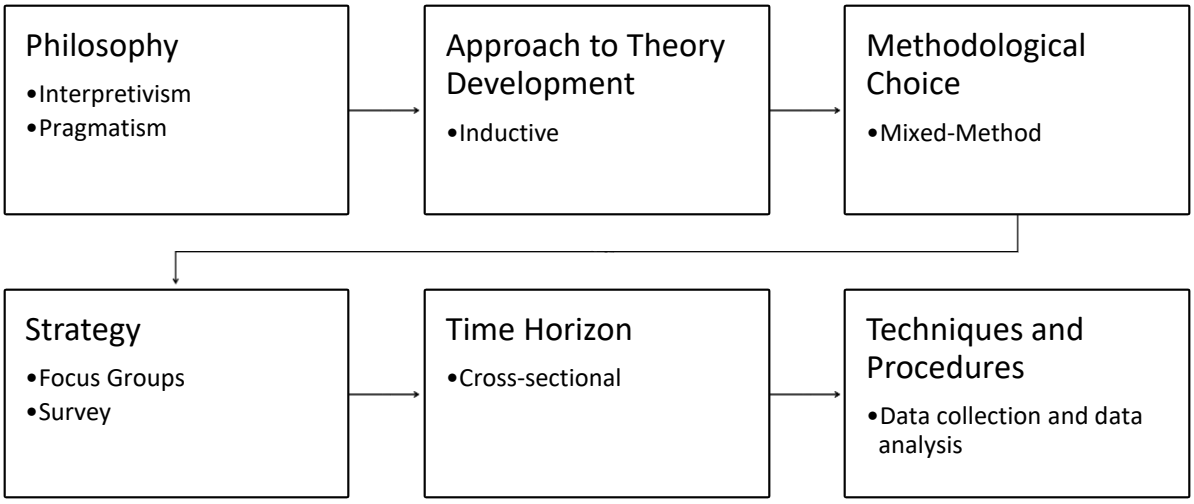
Axiology primarily investigates the concept of value, and this research endeavour seeks to highlight the challenges related to providing remote podiatric care. Consequently, an inquiry emerges regarding the supplementary benefit that podiatric telemedicine offers at both local and departmental levels. Ensuring the protection and prioritization of patients' privacy and confidentiality is crucial on telemedicine platforms while upholding data security. The primary objective of this study was to promote the establishment of podiatric telemedicine to achieve sustainable service development. This research placed significant emphasis on ensuring equal access to healthcare services, addressing potential discrepancies in technology availability and healthcare provision, and striving to contribute to attaining the United Nations' Sustainable Development Goals by 2030 (United Nations, 2023). Furthermore, the axiological component focused on evaluating the effectiveness and efficiency of telemedicine interventions, which aimed to investigate the effectiveness of virtual consultations to improve patient outcomes and decrease healthcare expenses.

Furthermore, the assessment of patient experience, satisfaction, and acceptability of telemedicine was conducted to enhance and optimise the provision of healthcare services delivered to service users at a primary care level. Finally, the research axiology promotes the ongoing advancement and innovation of telemedicine technology and practices, intending to improve the processes of diagnosis, therapy, and healthcare decision-making. Through thorough evidence-based research, this research aimed to foster the development of telemedicine as a reliable and effective healthcare solution that could supplement existing podiatry services in primary care settings.

4.3 Delineating the philosophical paradigm of the PhD research

Based on the principles of ontology, epistemology, and axiology, as shown in Figure 5, this study utilised a cross-sectional research design and employed an inductive approach to theory building. The research adopted a mixed-methodology approach, using interpretivism and pragmatism as philosophical frameworks.

Figure 5*: A flow diagram representing the delineation of the philosophical paradigm of this PhD research.*



This research project was influenced by the philosophical ideas of Heraclitus, an ancient Greek philosopher who proposed the concept of 'The Doctrine of Flux and the Unity of Opposites'. According to Heraclitus, this theory asserts that entities undergo perpetual transformation and that opposing elements coexist harmoniously (Graham, 2021). This research drew significant inspiration from this theory, whose overarching objective is to effect transformative advancements in podiatric care.

The proposed transition being championed diverges from the established methodologies used within this domain, characterised by in-person consultations conducted in a clinical environment. Thus, the amalgamation of conventional clinical experiential practices with

technologically facilitated virtual modalities of healthcare provision represents a plausible strategy predicated on acknowledging that such modifications are imperative in light of the ever-evolving nature of the profession (Stojmanovski Mercieca, Formosa, Chockalingam and Cassar, 2024). This underscores the necessity for guidelines tailored specifically to the podiatry profession, as telemedicine cannot be universally applied across all fields (Leone et al., 2023); instead, its efficacy is contingent upon the nature of the professional practice in question. It is noteworthy that specific professions may exhibit converging methodologies of evaluation, as exemplified by the practices of podiatrists and dermatologists when addressing conditions that pertain to foot dermatology (Stojmanovski Mercieca, 2021). While dermatologists and podiatrists diagnose conditions affecting the skin and nails of feet, it is essential to recognise that the treatment modalities available to each profession differ significantly, necessitating careful consideration of these distinctions.

While it is acknowledged that specific professions can conduct virtual assessments, the spectrum of treatment options may differ significantly. This underscores the necessity of establishing not only remote consultations but also a comprehensive system that promotes multidisciplinary collaboration. Such a framework would ensure that should patients require medications; the process can be efficiently managed through prompt referrals to other healthcare practitioners, thereby enhancing the overall efficacy of care delivery. Consequently, the incorporation of virtual methodologies into established clinical practices necessitates a seamless integration of these innovative approaches. It is evident that transformation engenders a plethora of uncertainties and opposition, thus necessitating the careful consideration of these challenges. In consequence, considering Heraclitus' assertion that change is the sole constant in existence (Graham, 2021), it becomes imperative to embrace and accept any transformations that occur. Failure to do so may obstruct the processes of development and progress, potentially exerting an adverse influence on pre-existing services and the overall work environment.

This study adopted an interpretivist philosophical framework, as the researcher acknowledged the intricate nature of reality in this context. The researcher recognised that reality is socially constructed through cultural and semantic influences and can be subject to diverse interpretations and understandings among various societal groups and stakeholders. Multiple theories about telemedicine structures exist that are not always characterised by simplicity and straightforwardness. Nevertheless, it is reasonable to assert that this study can effectively assess and quantify the practicality of the proposed podiatric telemedicine service in real-time. This is because the research is based on subjective perceptions and interpretations, necessitating the development of novel insights and perspectives that align with the interpretivist philosophical framework.

Furthermore, this study aligns with the axiology of the interpretivist philosophical paradigm, as the researcher is an integral component of the research subject matter. The researcher's interpretation and personal experiences are crucial in contributing to the overall findings of this study. The inclusion of reflexive practices and the involvement of human subjects, particularly patients and the public, are crucial aspects in measuring the effectiveness of the podiatric telemedicine service. To the best of the researchers' knowledge, this study is the only one that incorporates both patient and public involvement, alongside healthcare professionals and policymakers, in this service's decision-making and development processes.

In addition to the interpretivist philosophical perspective, this study also examined the pragmatist philosophical approach, which is strongly associated with mixed-method research. The research ontology of this study aligned with the pragmatism framework, which recognises the complexity of research and the importance of considering the repercussions of ideas. It encompassed various processes, experiences, and practises that must be consistent with those already established. Furthermore, this study is in accordance with the epistemological framework of the philosophical approach being employed. It holds practical

significance within the foot and ankle care domain, explicitly addressing the various issues that patients may face in this context. The research also examined the practices implemented within the primary care podiatry department and evaluated the significance of the proposed service. Therefore, from a philosophical perspective, this study aimed to stimulate problem-solving and enhance future practice in the field of podiatry by expanding and making significant contributions. This study recognised and appreciated the pragmatic philosophical approach, which involves research driven by the researcher's doubts and beliefs. The research was initiated and continued during the COVID-19 pandemic, a global crisis that compelled healthcare systems and professionals to adopt alternative methods for ensuring and preserving patient care. Amid this upheaval, the primary objective was to tackle issues effectively and securely, constituting a crucial aspect of this research. Ultimately, this study aimed to develop a framework based on empirical evidence that could be utilised at a primary care level and in future crisis scenarios.

4.4 Behavioural Change Theory for Telemedicine Practice Implementation

Telemedicine enhances access to healthcare services by facilitating remote diagnosis and treatment of patients (Ezeamii et al., 2024). Nonetheless, the deployment of telemedicine services frequently encounters challenges due to insufficient focus on change management (Kho, Gillepsie & Martin-Khan, 2020). Healthcare professionals and researchers concur that effective telemedicine services necessitate substantial organizational and procedural modifications (Kho, Gillepsie & Martin-Khan, 2020). Despite acknowledging the significance of the human aspect of implementation, research regarding optimal change management strategies for telemedicine remains disjointed, providing a minimal coherent understanding of the specific practices integral to the change process (Kho, Gillepsie & Martin-Khan, 2020). Hence, cognitive theories favor methodical deliberation when it comes

to managing change. According to these theories, new workplace operation methods could be introduced through training and education (Slotnick & Shershneva, 2002).

Change management is frequently acknowledged as essential for telemedicine deployment (Jarvis-Selinger et al., 2008; Jensen et al., 2015); thus far, it is typically conducted in an ad-hoc, occasional, and reactive manner, commonly documented as "lessons learnt" during retrospective evaluations of service implementation (Faife, 2008; Adler et al., 2014; Sanabria & Orta, 2012). Change management employs a systematic methodology grounded in "an enabling framework for managing the human aspect of change" (Hiatt & Creasey, 2003), encompassing a series of procedures, practices, and intentional activities designed to assist and direct an organization in transitioning from its current state to a preferred future state (Stouten, Rousseau & DeCremer, 2018). Therefore, the constructivist view of learning, which describes it as "what people do when they construct meaning from experiences," is congruent with behavioral theories (Slotnick & Shershneva, 2002).

A recent systematic scoping study examined what and how change management practices have been applied to telemedicine service implementation, spanning a variety of healthcare professions and countries (Kho, Gillepsie, & Martin-Khan, 2020). This review identified that the first step is preparing for the change through strategic practices, which include establishing plans, gaining leadership and management approval, support, and commitment, identifying champions to initiate and promote telemedicine services, engaging partners and stakeholders from the very start, and ensuring that the mission and vision of the service are well articulated (Kho, Gillepsie, & Martin-Khan, 2020). Since behavioral theories examine how people's internal drives and choices might bring about socially beneficial behavioral changes, as highlighted by Kho, Gillepsie and Martin-Khan (2020), continuous engagement of stakeholders with continuous effective communication in promoting new interventions is necessary. Some healthcare providers are more inclined to embrace telehealth than others,

and this discrepancy can be explained by factors related to the theories of planned behavior, interpersonal behavior, self-efficacy, and adult learning (Gagnon et al., 2003; Graham et al., 2014; Kelders et al., 2012). It is essential to acknowledge the influence of bias on the development of the proposed service, notwithstanding the numerous elements associated with behavioral change. Consequently, the subsequent section examines potential biases that could be identified in this research and proposes strategies to avoid these biases for the study's completion.

4.5 Potential Biases and Mitigation Measures

Mitigating bias is an essential professional obligation of healthcare and public health practitioners responsible for population health and well-being (Mateo & Williams, 2020). Bias is the positive or negative appraisal of something or someone, whereas implicit or explicit bias occurs when the person is unaware of their evaluation (Blair et al., 2011). Negative implicit bias is particularly concerning in healthcare. Conversely, explicit bias implies awareness of the evaluation process.

The potential biases in relation to this research project are mainly thought to revolve around self-affirmation bias, confirmation bias, and anchoring bias.

4.5.1 Self-Affirmation Bias

Self-affirmation bias denotes the inclination of humans to prefer, pursue, or interpret information that validates their pre-existing views, values, or self-perceptions (Sherman & Cohen, 2002). It is intricately linked to cognitive biases such as confirmation bias (Zhou & Shen, 2024). Nonetheless, self-affirmation bias frequently accentuates self-identity or personal validation (Epton et al., 2015). In this research scenario, the healthcare provider's setting may influence the affirmation bias in this research endeavor. Since podiatrists in

Malta only work in clinical settings and have not had much experience with remote consultations, the podiatrist who treats patients in a clinical setting may unintentionally support their preferred setting for diagnostic and treatment methods. This can be manifested by only noticing patient outcomes that support their hypothesis. Therefore, if the podiatrist overlooks the possibility of conducting specific follow-up consultations remotely, they will inevitably prefer in-person patient appointments at the clinic.

While self-affirmation bias can enhance self-esteem and confidence among healthcare professionals and contribute to a unified sense of identity, it may adversely affect decision-making in healthcare environments, impede personal growth and learning among providers, and diminish receptiveness to constructive criticism (Cohen & Sherman, 2014). Therefore, the researcher aimed to alleviate this bias through self-reflection, actively probing the assumptions and beliefs that arise during this process. As a researcher and podiatrist, I assert that pursuing varied perspectives is essential to engaging with persons or sources that can contest my viewpoint, thereby facilitating more rigorous and successful research and evidence-based practice. Consequently, the data produced by this research emphasises objective evidence rather than subjective judgments that may arise from my nine years of experience in this primary care context. Ultimately, as a researcher and podiatrist aiming to enhance the overall podiatry service, I believe it is deemed essential to promote feedback, foster an environment conducive to constructive criticism, and establish a safe space for podiatrists to discuss and propose suggestions for service improvement.

4.5.2 Confirmation Bias

Confirmation bias is an additional bias examined and considered in the present research. This is a cognitive bias in which individuals preferentially seek, understand, and recall information that corroborates their pre-existing ideas or assumptions while disproportionately neglecting other perspectives. This bias can influence decision-making,

problem-solving, and the assessment of evidence (Elston, 2019). From the researcher's perspective, this research scrutinised confirmation bias by avoiding selective attention and reviewing all available literature and resources, not just those that align with the research goal. Furthermore, during this process, the researcher guaranteed that the dissemination of information occurred not only at pro-digital health events focused on advancing digital health and exploring new research and development but also at podiatry-related and general events such as conferences and webinars. This approach aimed to present the research and its potential, allowing conferences and webinars to engage professionals from various fields to enquire and offer feedback regarding this research and service for enhanced improvement.

Unfortunately, confirmation bias makes it easier to understand information that fits with what you already believe, which means choosing studies that support the researcher's beliefs and ignoring studies that might show challenges (Kaanders et al., 2022). Furthermore, while this research effort represents a novel initiative, it is natural for the researcher to seek clarity and evade cognitive dissonance. To mitigate bias, the researcher maintained an open mind and remained receptive to all interpretations and feedback, minimizing emotional attachment to the research, which evolved from a master's degree into a PhD study. Therefore, it is essential to seek contradictory facts that can challenge certain assumptions along the way, as well as analyze alternative perspectives to evaluate the robustness of this study goal. As a researcher, the aim was to identify and question my own biases in decision-making while staying receptive to evidence-based processes and critical peer review, which are deemed effective methods to limit personal impact in this research.

4.5.3 Anchoring Bias

Lastly, anchoring bias has been considered as another cognitive bias, for this research. This refers to the human inclination to excessively depend on the initial information encountered

(the “anchor”) while making judgments. This anchor can significantly affect subsequent judgments and decisions, regardless of its relevance or relation to the context (Cho et al., 2017). This research project suggests that healthcare professionals may exhibit anchoring bias in medical diagnosis, where a podiatrist may excessively concentrate on an initial sign, symptom, or test result. In telemedicine, podiatrists may interpret images that highlight one sign while potentially neglecting other critical information that contradicts their initial assessment. As a result, disengagement may occur when podiatrists believe that podiatric telemedicine will not provide the best podiatric care the patient requires, and they refuse to use the service for fear of making mistakes and pushback because the patient may still need to attend the clinic.

Anchoring bias has significant ramifications that can lead to suboptimal decision-making in different circumstances, including healthcare practices (Ly et al., 2023). Consequently, efforts to prevent such bias encompass awareness and training to ensure recognition of biases while stakeholders receive professional education to minimise their impact. This method not only mitigates anchoring bias but also prevents hasty judgments; all information pertaining to patient history and clinical decision-making must be considered carefully, as early actions are essential (Thompson et al., 2023). Finally, getting different points of view on the service is important to ensure that the patient is cared for not only from a podiatric point of view but also from a holistic one. This way, the service can be seen as an addition to other services rather than a hindrance. Therefore, adhering to evidence-based norms and recommendations helps mitigate the impact of subjective elements.

Apart from the previously mentioned biases, the inherent characteristics of the proposed technology-based service may lead to the emergence of additional biases. Telemedicine has become a crucial component of contemporary healthcare, enhancing access to medical services, particularly in underdeveloped regions (Haimi, 2023). Nonetheless, biases in

telemedicine practices can compromise its efficacy and sustain disparities in healthcare. These biases may come from systemic challenges, technological limitations, or human conduct (Koehle, Kronk, & Lee, 2022).

Regarding technological bias, certain minorities continue to face challenges in accessing technology and achieving digital literacy. Some patients may lack essential gadgets, reliable internet connectivity, or digital proficiency to use telemedicine services effectively (Haimi, 2023). It should not be presumed that the constraint is just attributable to technology; but it must also be acknowledged that the potential existence of a language barrier, given that the remote consultation platforms such as Microsoft Teams predominantly operate in English, with no Maltese version or any other language and that healthcare professionals practicing in Malta mainly speak in Maltese and English, were no other substandard translations are available in day to day practice. The misconception that older individuals lack proficiency or literacy in using digital platforms should be avoided. It is imperative to look at the broader picture as at times patients might be proficient in using digital technology by the language barrier might hinder its use, since some patients might only be able to communicate in their mother language which might not be Maltese or English, given the increase in foreign nationals working on the island. Hence, aside from remote consultations, the language barrier is a predominant barrier across healthcare in general. Also, the age factor is not a definitive determinant of the acceptance of telemedicine consultations, as younger patients may prefer traditional clinical appointments for various reasons, including a lack of necessary connections, devices, or the capability to engage in remote consultations (Anawade et al., 2024).

It is essential to acknowledge the biases of both service providers and users. Regrettably, healthcare providers may inadvertently manifest their implicit biases related to a patient's race, ethnicity, gender, socioeconomic status, or attractiveness, thereby influencing the

quality of care provided. Moreover, if the patient is eligible for remote podiatric telemedicine services, the patient's age should not affect the provision of a telemedicine consultation. It is imperative to also refrain from misinterpreting visual signals. Healthcare professionals must not misinterpret a patient's condition owing to restricted visual and non-verbal signals in telemedicine environments, which may result in misdiagnosis or underappreciation of symptoms. Consequently, healthcare practitioners must evaluate all possible constraints. Scheduling a telemedicine session for a patient does not ensure its efficacy or negate the necessity for in-person therapeutic appointments. By means of this research, the researcher proposes podiatric telemedicine as an innovative solution to enhance podiatric care.

Patients' prejudices should not be overlooked as that may affect the adoption and participation in podiatric telemedicine. Patients must be educated about this planned service, as they may perceive telemedicine as a less effective consultation approach than in-person consultations. This is especially vital for our local community since Maltese individuals familiar with clinical podiatric care environments may not understand how these remote methods might address their healthcare requirements. Moreover, exercising caution regarding trust is crucial, as patients may possess scepticism towards telemedicine platforms or providers, particularly if they have experienced discrimination or view the technology as impersonal (Offermann et al., 2023). To mitigate this bias, departments must collaborate to provide a cohesive service that prioritises the patient's welfare and health. To ensure this approach, as a researcher this endeavour seeks to maintain a constantly patient-centered service, enabling patients to engage in their care delivery processes actively. Consequently, legal frameworks and processes are essential to guarantee the consistent operation of services, ensuring uniformity and the protection of data privacy concerns, thereby alleviating patient apprehension regarding the use of remote modalities.

This research examined the development and the implementation of podiatric telemedicine and took into consideration its feasibility as much as possible by avoiding biases in the process. The objective was to create a service that assists already existing podiatry services for low-risk patients in terms of waiting list reduction and providing an alternative pathway for podiatric care whereby providing more accessible and timely interventions to patients requiring such service. Moreover, throughout the process the objective was to reach out to stakeholders and inform about the challenges and opportunities such service provides to the Maltese community at large and at a national healthcare level. Conscious that podiatrists encounter a varied demographic population with the majority predominantly consisting of geriatric patients, it is optimal to uphold open podiatric telemedicine communication channels, whether telephone or video-based, to cater to these varied groups not on an age-related basis but rather on whether these patients can use such devices and technologies when required as appropriate. Therefore, providing a hybrid care podiatry service whereby patients can opt to use telemedicine or not, if necessary, could resolve challenges related to language barriers, accessibility, and user-friendly strategies to provide fair and efficient care for all demographics (Stojmanovski Mercieca, 2021), as advocated by the United Nations' Sustainable Development Goals framework (United Nations, 2023).

4.6 Conclusion

The insights gained from personal ad-hoc clinical experience during the COVID-19 pandemic, together with an extensive literature review, informed the development of the theoretical framework for this PhD dissertation. This study followed upon the Heraclitean Theory which emphasises constant changes around us (Graham, 2021), and employed an interpretivist and pragmatist inductive strategy, with each phase sequentially leading to the next. The selection of the theory was determined not only by its relevance to this research but also by the straightforward nature of its application and implementation, in addition to

its explanatory usefulness. Additionally, behavioural change theories and potential biases that could be present throughout this research were highlighted. This dissertation will now elaborate on the three investigations carried out, each with distinct methodologies and objectives, as outlined in each separate chapter.

Chapter Five – Study I: A Scoping Review of Foot and Ankle Telemedicine Guidelines

5.1 Introduction

This initial scoping review evaluated the literature related to telemedicine approaches for managing foot and ankle pathologies by reviewing the current guidelines recommended by reputable research groups or institutions since it was found that telemedicine approaches specifically for podiatry were not in place. Given the time this study started, towards the 'end' of the COVID-19 pandemic, it presented a chance to identify any policies accessible locally and at an international level for clinicians since telemedicine was utilised during the lockdown period. Therefore, such circumstances made it possible to look into prior guidelines that had been made available.

5.1.1 Rationale

The rationale behind this initial phase of this research is significant as it supports a broader investigation aimed at developing telemedicine practice guidelines for podiatrists providing essential podiatry services in a primary care context. This scoping review signifies a crucial milestone in the comprehensive examination of the existing literature about telemedicine practice guidelines for foot and ankle management since such guidelines for podiatry to date do not exist. This study was initially designed as a systematic review, but due to the lack of available literature in the subject area, it had to adopt a scoping review approach.

The research question for this first study is as follows: *What are the current practice guidelines related to foot and ankle telemedicine in a primary care setting for low-risk patients?*

5.2 Scoping Study

A scoping study is concerned with contextualizing knowledge in terms of identifying the current state of understanding, identifying what we know and do not know, and then setting this within policy and practice contexts (Anderson et al., 2008). Hence, this study investigated any existing foot and ankle-related telemedicine practice guidelines that could be used as a reference guide when formulating podiatric telemedicine guidelines.

5.3 Aims and Objectives

The purpose of this research was to identify the most recent telemedicine practice recommendations for foot and ankle pathologies, with a particular emphasis on guidelines that apply to primary care situations, and to compare any existing guidelines for their suitability and level of rigour.

The following objectives were set to meet the aim of this study:

1. To identify different telemedicine foot and ankle practice guidelines for low-risk patients in primary care settings
2. To identify methods employed in developing and validating such practice guidelines

5.4 Methodology

The review adhered to the PRISMA-ScR principles and met the established reporting standards for scoping reviews (Tricco et al., 2018). Scoping reviews, a form of knowledge synthesis, employ a systematic methodology to delineate evidence on a subject and ascertain major concepts, hypotheses, sources, and knowledge deficiencies. The PRISMA-ScR checklist was created by a panel of 24 experts and 2 research leaders in accordance with established guidelines from the EQUATOR (Enhancing the QUAlity and Transparency Of

health Research) Network. The final checklist [Appendix 5] has 20 mandatory reporting items and 2 discretionary ones (Tricco et al., 2018).

This research defined explicit inclusion and exclusion criteria, formulated a search strategy, and executed data extraction and synthesis. A literature search was performed using the terms ‘telemedicine’, ‘foot health’, and ‘guidelines’ across multiple search engines.

5.5 Eligibility Criteria

The database-identified articles were selected following specific inclusion and exclusion criteria.

Inclusion Criteria for Articles

1. Articles exploring the use of telemedicine for foot and ankle-related patient consultations within a primary care setting
2. Guidelines, practical guidance, consensus statements, expert opinions, case studies, editorials and narratives, and systematic reviews published in peer-reviewed journals related to telemedicine for foot and ankle-related patient consultations within a primary care setting

Exclusion Criteria for Articles

1. Any articles exploring the use of telemedicine for purposes other than patient consultations, or which do not require direct interaction between patients and clinicians (such as in remote monitoring, training, health applications, and other forms of asynchronous communication)
2. Articles exploring the use of telemedicine for lower limb wound management
3. Articles where healthcare and medical students utilised telemedicine
4. Articles that did not fall under a primary care setting

5. Letters to the editor, patient education leaflets, and reviews that lack clear instructions on telemedicine for patient consultations

Inclusion Criteria for Institutional Guidelines

1. Telemedicine practice guidelines produced by international professional bodies and relevant to the podiatry profession

Exclusion Criteria for Institutional Guidelines

1. Telemedicine practice guidelines that fall beyond the scope of foot and ankle care management
2. Guidelines produced by third parties that are not considered professional bodies

All articles and guidelines included in this study were required to be available in full text and in English.

5.5.1 Data Sources and Search Strategy

For this study, a combination of grey literature searches and database searches was utilised. This document includes two types of publications: (1) publications derived from databases and referred to as articles, and (2) guidelines related to the foot and ankle, which are derived from international professional groups or their websites and are used as guiding principles. The guidelines that were released by worldwide professional organizations pertaining to foot health or that were accessible on their websites were the only ones that were considered for the grey literature search.

Articles were identified by a systematic literature search of PubMed, MEDLINE, Cochrane Central Register of Controlled Trials, and CINAHL databases. Multiple subject headings and free-text terms for the keywords ‘telemedicine’, ‘foot health’, and ‘guidelines’, together with suitable Boolean operators, were employed to search these databases from 2012 to 2022. The search strategy is explained in Appendix 6.

A search on Google and Google Scholar was performed, and the screening for suitable publications and guidelines concluded on page 5, adhering to a methodology similar to that employed by Godin et al. (2015). Appendix 6 delineates the search approach. The database search results were imported into the citation management system RefWorks (ProQuest LLC, USA). This software enabled the eradication of all duplicates. The lead researcher independently evaluated the suitability of the records (titles and abstracts) for inclusion in the study according to the established inclusion and exclusion criteria. Subsequently, the lead researcher evaluated the complete contents of the articles and selected those relevant to the data extraction process. Dialogue with the principal supervisor and co-supervisors clarified all ambiguities concerning eligibility.

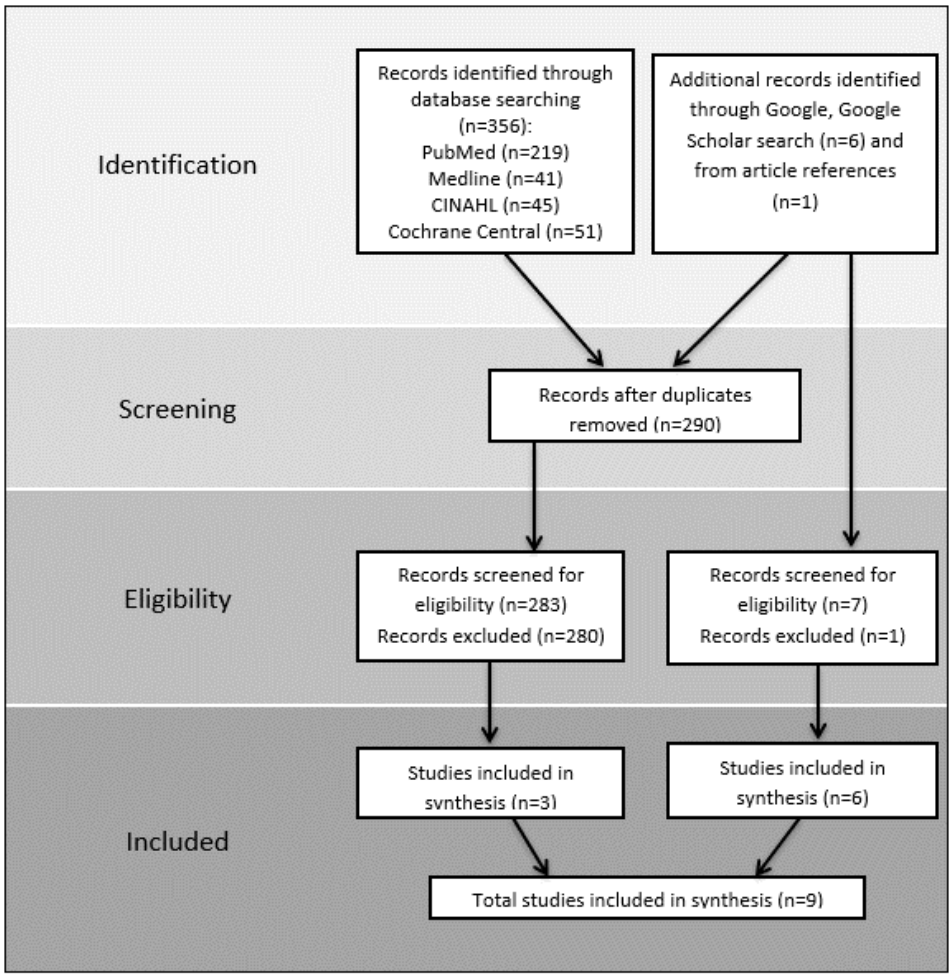
5.5.2 Study Selection and Data Extraction

Throughout this process, data was extracted from the selected abstracts and full texts, which included information on the research country where the study was conducted, the study design that was used, the outcomes of the study, the function of the study, the target population, the media, the type of communication, the methodology, and the limitations of these studies [Appendix 7]. Charting the data into sectioned homogenous research groupings based on the topics mentioned or study methodology was accomplished using textual narrative synthesis (Kastner et al., 2012; Lucas et al., 2007), which was included in the analysis. To reach a consensus, the topics developed from this charting procedure by the lead researcher were debated among all the reviewers. A tabulation of the levels of evidence and study types of the eligible studies that were synthesised to answer the research question can be found in Appendix 7, which follows the one provided by Wright, Swiontkowski, & Heckman (2003). Additionally, the indicators for study quality follow those mentioned in the research conducted by Barske & Baumhauer (2012), which are also available in Appendix 7.

5.6 Results

A total of 356 articles were elicited because of the original search. Following the elimination of duplicate entries, the total number that was obtained was decreased to 283. After conducting a search on Google Scholar, a total of six additional records were found to be relevant to the original research. On the other hand, an additional record was acquired by searching within an article's references section. This scoping review's inclusion and exclusion criteria were applied to examine and match all abstracts. Following a thorough screening process, six articles (Eble et al., 2020; Labib et al., 2021; Laskowski et al., 2020; Manz et al., 2021; Palmer et al., 2021; and Sharma et al., 2022) and three institutional guidelines (The College of Podiatry, 2020; Australian Podiatry Association, 2020 & Podiatrists Board of New Zealand, 2022) met the predetermined criteria for inclusion and exclusion as shown in Figure 6.

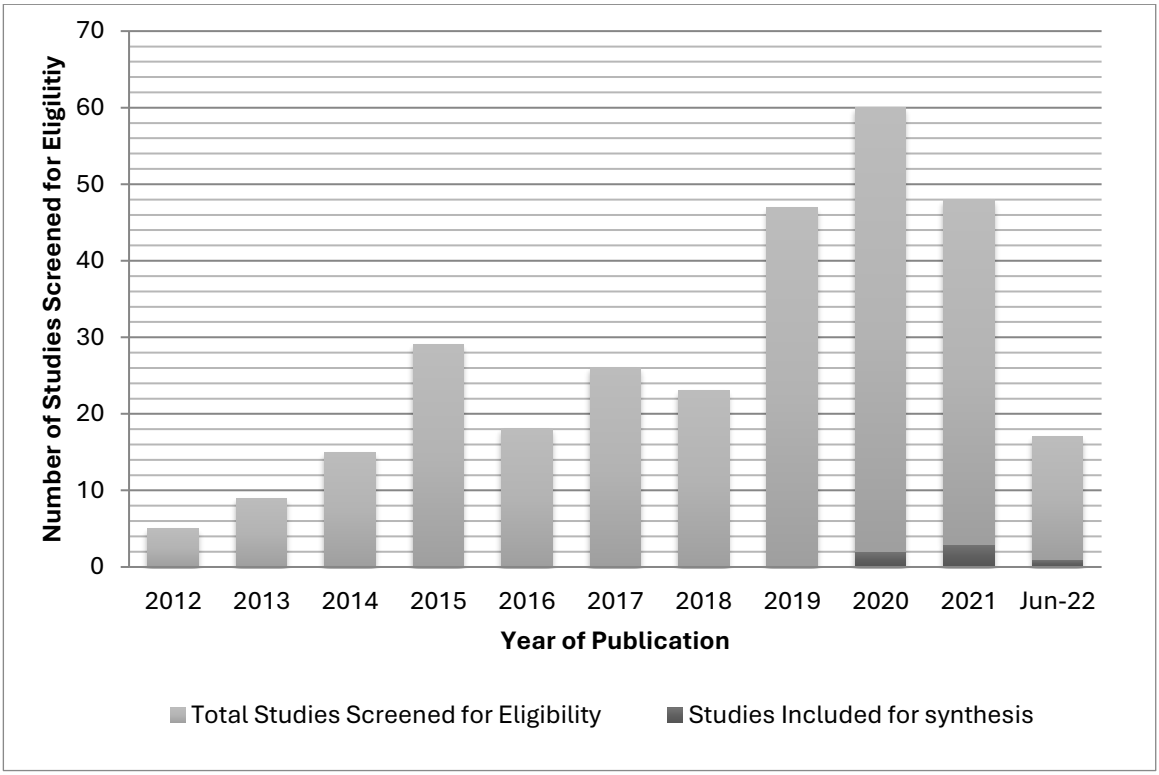
Figure 6: *Flow diagram for selection of studies included in the scoping review.*



There were six eligible articles relating in whole or part to the foot and ankle (Eble et al., 2020; Labib et al., 2021; Laskowski et al., 2020; Manz et al., 2021; Palmer et al., 2021; Sharma et al., 2022). However, the foot and ankle have been discussed from various professional viewpoints. For example, the only study that mentioned telemedicine in podiatry related to rheumatoid and musculoskeletal disease (Palmer et al., 2021), and another three articles focused on the foot and ankle from an orthopedic standpoint (Eble et al., 2020; Manz et al., 2021; Sharma et al., 2022). In contrast, two studies kept their virtual foot and ankle examinations open, referring to medical practitioners providing a virtual musculoskeletal examination (Labib et al., 2021; Laskowski et al., 2020). Also, in the UK (The College of Podiatry, 2020), Australia Australian Podiatry Association, 2020), and New Zealand (Podiatrists Board of New Zealand, 2020), three different but overlapping sets of guidelines for telemedicine in podiatry were set up in 2020.

When the publications were grouped by publication year (Figure 7), it was evident that interest in telemedicine research increased in 2020 when the global coronavirus pandemic struck. The eligible studies were classified according to the amount of evidence and research quality, the purpose of telemedicine, the type of media used, the outcomes sought in that specific research, and the existence of guidelines and recommendations.

Figure 7: *Search results generated by year of publication (excluding guidelines).*



5.6.1 Levels of Evidence and Quality of Research

All the research publications eligible for consideration were ranked according to the amount of evidence they contained, and the results were listed in Appendix 8. Additionally, the research papers were examined in terms of their quality by analyzing the research methods, statistical indicators, and analysis utilised in the studies included in this study. The results of this investigation are presented in the table that can be found in Appendix 8.

5.6.2 The Function of Telemedicine and Type of Communication Tools

Six research articles provided the primary functions of telemedicine. These were clinical decision-making (Sharma et al., 2022), treatment, and follow-up (Eble et al., 2020; Labib et al., 2021; Laskowski et al., 2020; Manz et al., 2021) or only follow-up (Palmer et al., 2021), which are categorised below (Figure 8). All the six identified research articles utilised synchronous communication (Eble et al., 2020; Labib et al., 2021; Laskowski et al., 2020; Manz et al., 2021; Palmer et al., 2021; Sharma et al., 2022). Various configurations, including video conferencing (Eble et al., 2020; Laskowski et al., 2020; Manz et al., 2021), telephone calls (Palmer et al., 2021; Sharma et al., 2022), or both (Labib et al., 2021) as depicted in the chart in Figure 9, were used to achieve a telemedicine consultation (Figure 9). As for the recommended guidelines by public entities, they also referred to synchronous communication; however, they referred to telehealth only through video conferencing (The College of Podiatry, 2020; Australian Podiatry Association, 2020 and Podiatrists Board of New Zealand, 2022). Only guidelines by the College of Podiatry (2020) conceded to commercial apps such as WhatsApp and Telegram if no practical alternative was present and the benefits outweighed the risks (The College of Podiatry, 2020).

Figure 8: *Percentage of studies identifying telemedicine function.*

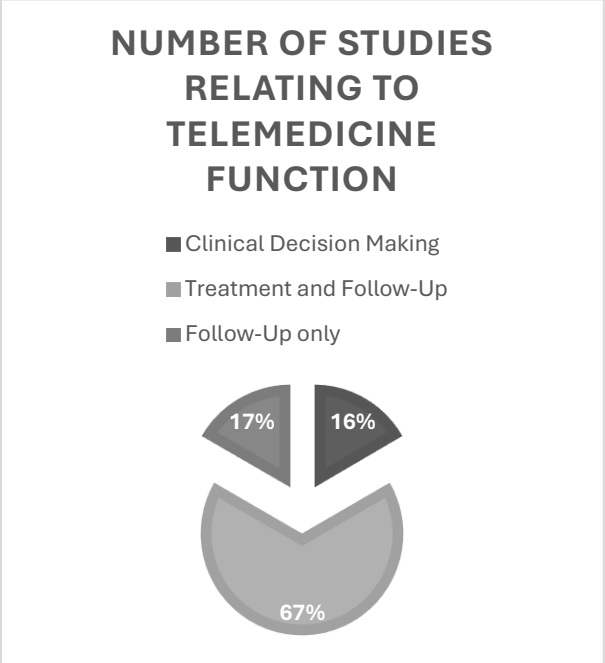
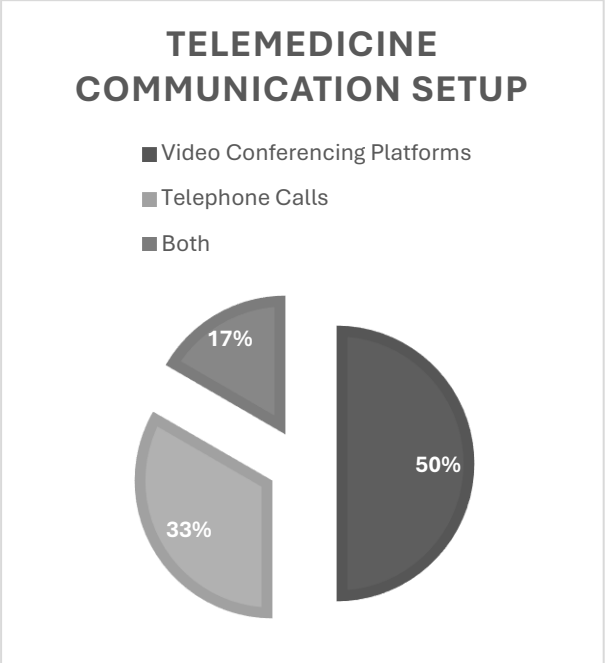


Figure 9: *Chart showing percentages indicating telemedicine communication setup.*

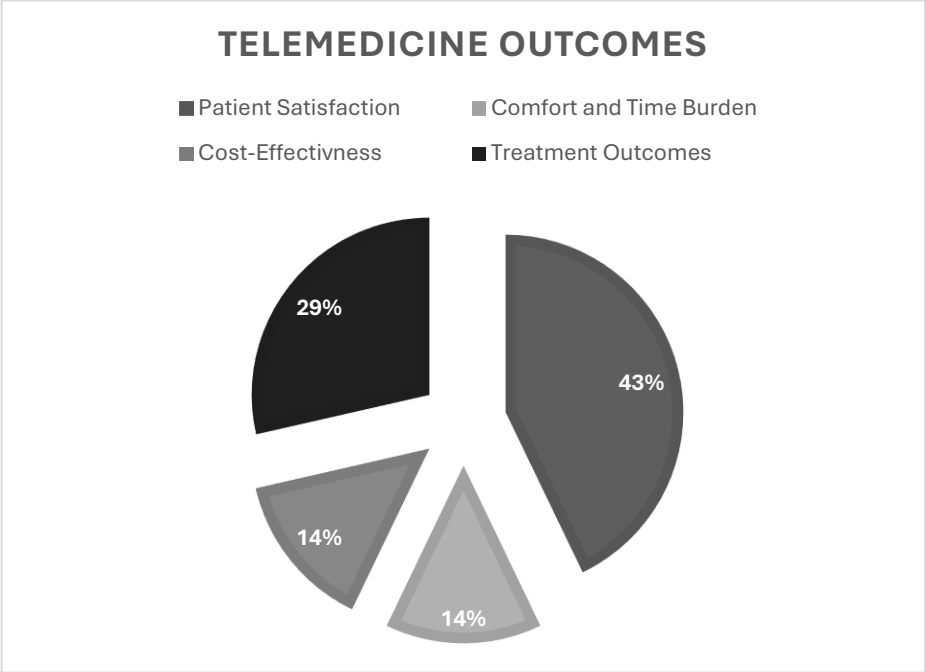


5.6.3 Outcomes

Four articles examined specific outcomes, which included patient satisfaction (Labib et al., 2021; Manz et al., 2021; Sharma et al., 2022), comfort, and time burden (Manz et al., 2021), cost-effectiveness (Palmer et al., 2021), and treatment outcomes (Palmer et al., 2021; Sharma et al., 2022). Specifically, treatment outcomes were centered on the number of contact

attempts required to reach a patient, call duration, and the number of completed calls per working day. Below is a chart comparing these results (Figure 10).

Figure 10: Charted percentages of telemedicine outcomes that resulted from the eligible studies.



5.6.4 Guidelines and Recommendations

Four research articles that met the eligibility criteria presented guidelines, procedures, or recommendations for telemedicine practices pertaining to the foot and ankle. Eble et al. (2020) provided guidelines for patient wear and directions for setting up the camera. These instructions included recommendations for the equipment to use, the clothing the patient should wear, the examination space, the position of the patient, and how to reposition the camera for standing and seated positions (Eble et al., 2020). In addition, they offered a comprehensive foot and ankle virtual examination template for clinicians that included a list of each examination to be performed, a checklist for medical record documentation, and corresponding verbal instructions to give to patients during the virtual examination. While the study by Laskowski et al. (2020) provided similar patient and clinician recommendations but no set template, it focused primarily on the musculoskeletal examination of the entire body, with only a small segment addressing ankle examination (Laskowski et al., 2020).

In a separate study by Labib, Goel, Manz, and Bariteau (2021), only the physician or a physician extender performing the telemedicine consultation was intended to receive the guidelines. The protocol outlined in this study was developed to provide consistent, high-quality care to telemedicine patients. In addition, diagnosis-directed examinations used in telemedicine visits to provide an objective examination of patients who cannot be physically examined are included. While some studies (Eble et al., 2020; Labib et al., 2021; Laskowski et al., 2020) described the guidelines, the study by Sharma et al. (2022) suggested that an orthopaedic clinical care pathway can introduce telemedicine consultations at different stages.

Furthermore, the College of Podiatry (UK) (2020), the Australian Podiatry Association (2020), and the Podiatrists Board of New Zealand (2020) provided guidelines from an institutional standpoint. These guidelines primarily aimed to clarify how to set up a telemedicine consultation, including the necessary patient setup. However, only the Australian Podiatry Association (2020) provided brief scenarios for when and how a telemedicine consultation for podiatry should be approached among the three guidelines. Also, all three institutional guidelines understood how necessary informed consent is and let patients decide for themselves if they want to be seen virtually (The College of Podiatry, 2020; Australian Podiatry Association, 2020 and Podiatrists Board of New Zealand, 2022).

5.7 Discussion

Generally, practice guidelines for telemedicine, with varied levels of comprehensiveness, have been made available, particularly during the pandemic; however, there are no corresponding standards for podiatry. This study's practice guidelines concentrate on the foot and ankle from an orthopaedic perspective; however, most studies did not address the involvement of podiatrists in telemedicine for foot and ankle treatment. Podiatrists have a crucial role in diagnosing, treating, and managing foot and ankle disorders; therefore, their

involvement in the study and creation of telemedicine practice guidelines for these areas is essential. The podiatrist's function intersects with other allied and non-allied health professionals (physiotherapists, orthopaedists, dermatologists, pedorthotists, etc.) owing to the extensive array of specialisations within podiatric medicine. Standardised telemedicine protocols must be formulated for podiatrists prior to their use in a primary care setting by podiatrists and other foot and ankle health professionals.

Telemedicine recommendations aim to furnish practitioners with pragmatic direction for incorporating telemedicine into existing healthcare systems (Royal Australasian College of Physicians, 2022). As stated by Leone et al. (2023), their study aimed to establish telehealth practice standards for allied health providers, encompassing podiatrists. Deficiencies were recognised in the practice guidelines, highlighting both similarities and discrepancies with recommendations from non-allied health practitioners. Furthermore, the authors indicate that existing guidelines insufficiently assist allied health practitioners in delivering telemedicine consultations.

The COVID-19 pandemic required the rapid transition of patient care from conventional means to virtual platforms, with telemedicine being the focal point throughout 2020. Prior to the last two years, telemedicine for foot and ankle care, namely in podiatry within primary healthcare, had not been explored. While Palmer et al. (2021) assert that telephone appointments are advantageous in rheumatic podiatry practice, the authors of this research have reevaluated their conclusions considering advancements in technology and communication. Nowadays clinicians possess numerous video-based tools that facilitate telemedicine consultations, making telephone consultations a less favoured communication option, especially when visual aids are required.

While telephone consultations are seen as a facet of telemedicine, the information accessible to the practitioner aiding the patient is constrained (Hasani et al., 2020). Contemporary

technology and video conferencing platforms can offer comprehensive information, which, when integrated with other communication methods, can enhance patient care. This relies on possessing the expertise to operate such devices and resolving connectivity challenges (Eble et al., 2020; Labib et al., 2021; Laskowski et al., 2020; Manz et al., 2021).

This scoping review examined and contrasted papers and guidelines that establish a solid foundation for creating an innovative telemedicine model in podiatry for the public primary care sector. Attention should be directed towards customising the recommendations from the pertinent publications in this assessment for foot and ankle care management. The key sources for the protocols and recommendations were expert opinion (Eble et al., 2020; Labib et al., 2021; Laskowski et al., 2020), case series (Palmer et al., 2021), a prospective cohort series (Sharma et al., 2022), and a retrospective cohort series (Manz et al., 2021). Most research employed quantitative methodologies, such as questionnaires, using a cross-section of both retrospective and prospective individuals. No control group was incorporated in any of the referenced research. The scarcity of research on telemedicine in foot and ankle care renders its methodologies challenging. Consequently, a noticeable gap exists in the literature, indicating that these studies lack the methodological rigour necessary to establish a universally applicable telemedicine paradigm for foot and ankle care.

Therefore, there is a need for more rigorous research approaches in foot and ankle care within this domain. In terms of analysis, primary outcomes varied; nonetheless, patient satisfaction was generally the principal goal pursued. Guidelines and recommendations are necessary for the implementation of new telemedicine services. Nevertheless, patient satisfaction is not the sole outcome indicator that must be evaluated to determine the success of implementation. To assess the sustainability of a newly established service, it is essential to perform further study focused on feasibility using validated instruments that encompass all pertinent variables. Feasibility studies generally concentrate on many objectives, such as

acceptance, demand, implementation, practicability, adaptation, integration, and expansion (Bowen et al., 2009).

Active patient involvement is essential in healthcare decision-making since it empowers individuals and improves service and health outcomes (Vahdat et al., 2014). Telemedicine has been utilised for treatment and follow-up scenarios; nonetheless, conventional face-to-face consultations remain indispensable for patient care and cannot be eliminated. Stojmanovski Mercieca (2021) indicated that, according to the characteristics of the podiatry profession, a hybrid model of care—comprising both in-clinic and remote consultations—was recommended by both podiatrists and patients. The optimal communication route for podiatrist telemedicine consultations remains undetermined due to the novelty and uniqueness of this research topic involving podiatry and telemedicine. Thus, it is essential to delineate the primary rationale for using podiatric telemedicine for individual patients.

Various alternatives to treatment may be provided depending on the patient's main complaint. Neville et al. (2021) did not offer practice guidelines for podiatric telemedicine in their study. They conducted an investigation indicating that podiatrists deemed telemedicine the most effective method for administering drugs and consulting on medical and dermatological concerns. A prior study by the researcher of this current scoping review found that podiatrists deemed telemedicine consultations most helpful for preoperative objectives, followed by dermatological and postoperative issues (Stojmanovski Mercieca, 2021).

The seamless integration of telemedicine and service delivery is essential to guarantee patients that the quality of care will match that of in-clinic practice, hence fostering trust and encouraging the utilisation of telemedicine services. All methods of care provision must prioritise the patient's well-being as the primary goal.

The demand for a service and the rationale for proposing such an innovative service are critical factors that will subsequently affect the implementation outcomes. Manz et al. (2021) assert that their study was the first investigation into the effective implementation of a novel telemedicine approach inside an orthopaedic foot and ankle domain. However, the effective deployment of this service, as indicated in their research report, was contingent exclusively upon the satisfaction of patients, the convenience of service delivery, and the time burden. Moreover, although both orthopaedic consultants and podiatrists specialise in the foot and ankle, patients seek these healthcare providers for distinct reasons; thus, the successful implementation in this context is constrained, as the conditions addressed by orthopaedic consultants and podiatrists are not the same. Nonetheless, while orthopaedic consultants and podiatrists are professions necessitating physical manipulation and involvement for patient assessment, we are advancing our understanding of telemedicine's function in the management of foot and ankle diseases and care delivery.

Numerous studies indicate that telemedicine enhances healthcare accessibility and practicality; nevertheless, how can the area of podiatry adapt to this novel care delivery method? Sharma et al. (2022) proposed guidelines advocating for the implementation of telephone consultations inside conventional in-clinic practices, serving either as follow-up consultations or as primary triage consultations in a more adaptable protocol preceding in-person consultations prior to surgery. Consequently, similar suggestions for broader foot and ankle contexts, especially in podiatry, have not yet been established. Consequently, these proposals require meticulous consideration and additional assessment among podiatric patients, since it remains ambiguous if individuals with foot and ankle diseases appreciate this form of health assistance. A multitude of healthcare practitioners have adopted telemedicine to enhance treatment delivery. Nevertheless, the complete potential of telemedicine can only be actualised via ongoing public engagement and education, guaranteeing that all stakeholders are aligned, and the service remains evidence based.

Despite efforts to thoroughly search the literature, some studies may have been overlooked. This review's limitations mostly stemmed from the considerable heterogeneity of the data between studies, attributable to the varying outcome measures employed to evaluate telemedicine and the study cohorts, which predominantly originated from an orthopaedic clinical context rather than podiatry. The methodological quality of the included studies was meticulously evaluated, as indicated in Appendix 8.

5.8 Conclusion

This scoping study has revealed a significant gap in the existing literature about telemedicine practice guidelines in foot and ankle healthcare. To date, there is a lack of resources and guidelines to adequately assist podiatrists and other pertinent experts in telemedicine services within this healthcare sector. Consequently, there is an immediate need to formulate comprehensive and standardised telemedicine practice guidelines primarily focused on foot and ankle care. This study has been published in a peer-reviewed journal, *'Health Science Reports'* entitled, *A Scoping Review of Foot and Ankle Telemedicine Guidelines*. A full copy of the publication is available in Appendix 2.

Chapter Six – Study II: The Development of a Podiatric Telemedicine Definition and Guideline for a Primary Care Setting

6.1 Introduction

The scoping study discussed in Chapter 5 indicated a lack of telemedicine practice guidelines for foot and ankle care within the field of podiatry. Consequently, it was determined that criteria for podiatric telemedicine for low-risk patients are necessary. Hence to do so, it was imperative to establish terminology in this specific clinical domain, particularly amongst healthcare professions, as this can enhance information organisation and communication clarity regarding the domain (Andrews et al., 2016; Awaysheh et al., 2018; Bashshur et al., 2011), in this instance, podiatric telemedicine, is imperative to ensure what it would entail.

As a result, this study aimed to develop and provide a thorough understanding of the term "podiatric telemedicine," which is explained in detail in this chapter. This is accomplished by providing an accurate definition that was determined by the stakeholder participants who were involved in the development of the podiatric telemedicine guideline. Moreover, this study also aims to develop a podiatric telemedicine guideline to be proposed for implementation in a primary care setting for low-risk patients locally.

The term "podiatric telemedicine" will include domains for the different applications of use, scope of practice, and interactions with other healthcare professions. It is widely accepted that efficient communication between healthcare providers and patients leads to improved patient engagement (Çakmak & Uğurluoğlu, 2024). As a result, creating a clear definition for podiatric telemedicine could indirectly help to ameliorate this situation were setting the

right expectations of what the service is intended to offer, where patients and healthcare providers through clear understanding of what podiatric telemedicine entails, can foster better service engagement. Hence, clear definitions and well-established expectations become imperative as remote healthcare modalities such as telemedicine keeps growing fast (Sood et al., 2007). The dynamic nature of virtual healthcare brings about its own complexity that necessitates common knowledge among researchers, service users, healthcare providers and policymakers (Kruse et al., 2021).

Therefore, establishing a set of guideline criteria to define and outline podiatric telemedicine is essential to ensure that any variance or discrepancy in treatment and patient outcomes are kept to a minimum.

This study builds on the work of Study I, the scoping review, a previous investigation that emphasised the importance of establishing guidelines for podiatric telemedicine. The findings of the scoping review served as a basis to help develop evidence-based practice guidelines in relation to podiatric telemedicine. This research study was conducted using a modified version of the Delphi technique, whereby consensus agreement was sought from stakeholders (patients, podiatrists and senior management) to develop a robust guideline that could later be proposed for implementation in a primary care setting for low-risk patients. These guidelines served as a reference for both patients and healthcare providers for the use of podiatric telemedicine.

6.2 Rationale

In times where technology is driving healthcare to new length, developing new services that are patient-centred is no longer a luxury but rather a need. This is mostly due to the ever-increasing health needs, resource deficiencies and increased patient expectations. Hence, there is great pressure on healthcare systems to deliver quality care but at the same time

remain accessible and efficient mostly by providing timely intervention to prevent from undesirable health outcomes from arising, and at the same time have a sustainable service for all.

The focus of this modified Delphi technique study is not only for theoretical purposes but rather a pragmatic response to an identified need, which is the inclusion of remote consultation in primary care podiatry practice. Therefore, this study sought to involve stakeholders from the inception to develop this podiatric telemedicine guideline as it seeks to provide knowledge grounded in evidence and informed by stakeholder.

Hence, it is thought that academic enquiry and practical implementation strategies can better inform the development of this podiatric telemedicine services. Thorough guidelines and training programs are essential to ensure the successful implementation and viability of telemedicine for foot and ankle management in the post-pandemic era (Stojmanovski Mercieca et al., 2023). One of the Sustainable Development Goals (SDGs) set by the United Nations in 2022 is to promote positive health and well-being for people of all ages by the year 2030. The United Nations' Sustainable Development Goals (SDGs) program (202’2) states that the COVID-19 pandemic has significantly hindered the progress in global health over the past few years. Additionally, it has caused interruptions to critical health services in 92% of countries since the end of 2021 (United Nations, 2022).

Conscious of SDGs and the need for continuous healthcare development, it is imperative that research bridges the gap between knowledge and practice. This study sought to reach an agreement on podiatric telemedicine amongst relevant stakeholders, such as service users, providers, and policymakers, by obtaining their perspectives to develop an evidence-based podiatric telemedicine guideline, by highlighting their viewpoints with regards to this new service and the best way to implement this.

6.3 Aims and Objectives

The aim of this modified Delphi study was to develop a practical telemedicine definition and guideline recommendations that could be used in a primary care context to provide podiatric management to low-risk patients who require and can benefit from such service in a primary care setting. In the context of primary care, it is vital to remember that patients generally present with multiple health conditions, needing complicated and multi-faceted interventions (Santaguida et al., 2018), however this study sought to recruit only low-risk patients as a first tentative in introducing this service which include patients who require follow-up interventions for musculoskeletal conditions, dermatological conditions and to provide general footwear and footcare advice as required. Additionally, this study aimed to create telemedicine practices that are based on empirical knowledge and equipped with the necessary resources to provide patient care. The primary objective of this study was to develop guidelines intended to fulfil the needs of low-risk podiatry patients who are being treated by healthcare professionals specialising in podiatric care.

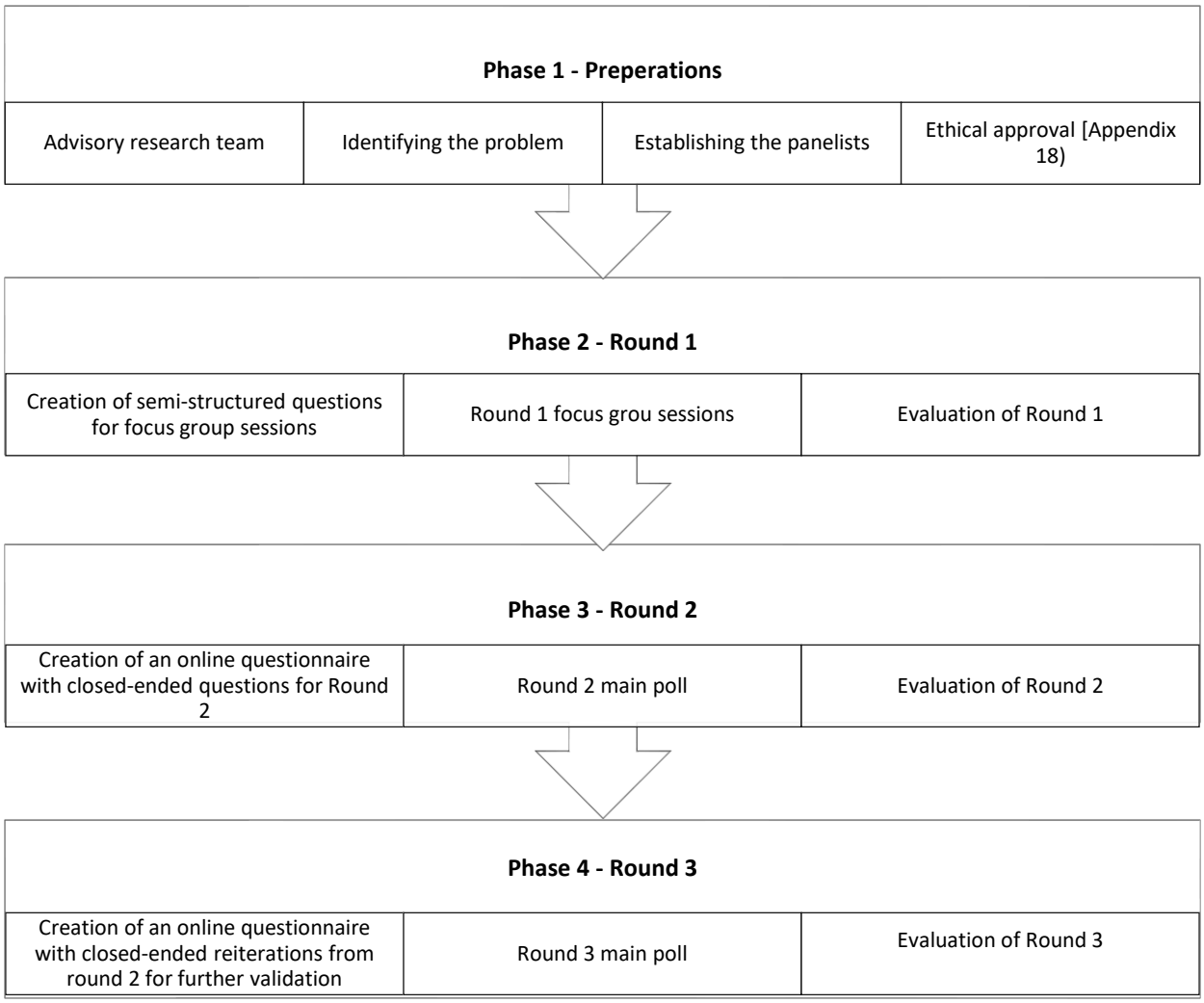
6.4 Materials and Methods

6.4.1 Study Design

This research employed a modified Delphi approach, following the suggested methodology by Waldmüller et al. (2020), which is described as a consensus-building methodology that employs literature analysis, stakeholder participation, and expert judgement to achieve agreement on a relevant subject matter, since it is seen as an advantageous technique when evidence is lacking, as it depends on the "collective intelligence" of group members to yield superior outcomes compared to individual contributions, hence enhancing content validity (Scott et al., 2022). As a result, consensus discussions result in a reliable way to get expert opinions on telemedicine for foot and ankle care management, especially in situations when

contradictory or insufficient information could make it difficult to express strong clinical reasoning (Zhao et al., 2021). As shown in Figure 11 the consensus-building technique consisted of four stages and three rounds of the Delphi method.

Figure 11: *The four-stage procedure followed to carry out this modified Delphi study for the development of a Podiatric Telemedicine guideline for a primary care setting.*



6.4.2 Eligibility Criteria

This study encompassed the subsequent eligibility criteria for implementation:

Inclusion Criteria:

1. Podiatrists employed in a primary care environment for a minimum of five years.

2. Service users who have attended a core podiatry clinical appointment within a primary care environment.
3. Senior managers with experience in podiatry and/or telemedicine service administration within a primary care environment.
4. Participants over the age of eighteen.
5. Participants fluent in Maltese and/or English language.

Exclusion Criteria:

1. Service users under the age of eighteen.
2. Participants unable to converse in Maltese and/or English language.

6.4.3 Participants

This study included a variety of stakeholders who were divided into three separate categories: service users (patients), healthcare professionals (podiatrists), and senior managers. All these participants worked at or made use of a podiatry service within a primary care setting. The goal of this research was to develop a podiatric telemedicine guideline that would include both practitioner and patient perspectives, to ensure a patient and person-centred approach. An intermediary was chosen to ensure the random selection of service users during the recruitment process.

Patient selection

For two weeks, the intermediary selected every second patient from a daily list of patients to ensure patients are randomly selected and an information sheet was provided, inviting participants to a focus group session to discuss the meaning of podiatric telemedicine and participate in the development of the podiatric telemedicine guideline for a primary care setting. The number of patients to participate in the research study was limited to five to ensure a more in-depth focus group discussion where patients can voice their perspectives

allowing adequate time for discussion and for practical reasons for the researcher to manage the focus group discussion. The recruitment process was stopped once that number of participants was reached.

Podiatrists' selection

An invitation was extended to podiatrists who worked within the public primary care setting, to participate in focus group sessions for the scope of developing a podiatric telemedicine guideline. These podiatrists were recruited through an intermediary. The recruitment of podiatrists required individuals to have at least five years of clinical experience in a primary care setting. Five podiatrists, out of the 34 who were eligible to participate received this invitation, responded, and joined the study.

Senior manager recruitment

The researcher also identified nine prospective senior managers who were eligible to participate based on their proficiency in podiatry and telemedicine in a primary care setting. A list of candidates was compiled and distributed to an intermediary to invite the selected individuals, who were then invited to participate in a focus group session. Considering that telemedicine is an emerging field in Malta, the availability of senior managers with knowledge in both podiatry and telemedicine was limited. Nonetheless, the individual's proficiency was solely confined to either podiatry management or telemedicine, yet they were nonetheless seen as suitable participants for this study.

To carry out this modified Delphi study, this research received approval from the University Research Ethics Committee of the University of Malta (FHS-2023-00576). Before agreeing to participate, prospective participants were given an information sheet and a consent form [Appendix 19]. Informed consent was obtained electronically through email, whereby the endorsed consent form was sent to the researcher ahead of the focus group sessions. The confidentiality of participants was ensured during the reporting process, and pseudonyms

were used to protect their identities. Additionally, the participants were instructed to refrain from disclosing any information that arose from the focus group discussions.

6.4.4 Data tools and collection

In the absence of international consensus in the context of podiatry and foot and ankle telemedicine guidelines for healthcare providers, an initial focus group discussion through semi-structured interviews as seen in Appendix 9 was conducted with three different stakeholder groups (patients, podiatrists and senior managers). One of the primary responsibilities of a qualitative researcher is to make sure that participants feel comfortable in their surroundings and are free to express themselves during focus group sessions (Sutton & Austin, 2015). Therefore, all participants were asked whether they preferred in-person or online sessions. While some participants expressed no preference, others expressed their preference for an online focus group session. The participants' feedback led to the decision to conduct the sessions online. The first round took place between February 2023 and March 2023.

The first round consisted of semi-structured focus groups conducted amongst all three stakeholder groups and included questions with regards to strategy, organisation, public policy, and development related to podiatric telemedicine. The literature and guidelines that guided the development of the first round of Delphi included:

1. The guidelines on developing and evaluating complex interventions by the Medical Research Council (Skivington et al., 2021).
2. A recent scoping review related to foot and ankle telemedicine practice guidelines (Stojmanovski Mercieca et al., 2023).
3. A recent policy brief providing telehealth consultation guidelines and training to guide Allied Health Professionals (Leone et al., 2023).

4. The Framework for the Implementation of Telemedicine Services (Pan American Health Organisation, 2016).

The focus groups were divided into distinct stakeholder groups to allow all participants to freely express their ideas while also obtaining an accurate and representative hold of each group's perspective on podiatric telemedicine. Furthermore, to avoid any potential influence amongst groups, it was decided to have separate stakeholder groups based on their roles across a healthcare system, with, the patient group providing their perspective from a service user point of view and podiatrists providing their perspective from a healthcare provider point of view together with senior managers providing their perspective from a management and policy-making point of view. Before the online focus group session, participants (5 service users, 5 podiatrists and 6 policymakers) were given a quick explanation of podiatric telemedicine and its implications. The Zoom Video Communications, Inc. platform was used, and the sessions were voice recorded and transcribed verbatim. These transcripts were then analysed through thematic analysis and themes and sub-themes emerged.

Following the first round of qualitative analysis through deductive thematic analysis (in Section 6.5.1), the second round of this modified Delphi entailed the distribution of a questionnaire with various statements which emerged from the focus groups which took place from May to June 2023. The data gathering process involved creating a questionnaire which aimed to obtain consensus on statements put forward which have been produced because of the thematic analysis carried out in analysing the data in round one and this questionnaire was developed using Google Forms, which was then emailed to the participants in the initial round as can be seen in Appendix 10. The collected data were analysed using Microsoft Excel® software (Redmond, WA, USA). Subsequently, the researcher attempted to increase the level of agreement in the current phase by enlarging the participant pool. This was accomplished by inviting additional service users, podiatrists, and senior managers working in primary care settings to submit their feedback on the podiatric

telemedicine guideline, which was still in the development stage. The distribution of invites was facilitated by employing the same intermediaries of the first round.

In the third round of this modified Delphi conducted in June 2023, only the initial 16 participants (5 patients, 5 podiatrists and 6 senior managers) were invited to participate, as the statements for reiteration in this phase had already been evaluated in the second round concerning preference, although additional clarification for final consensus was necessary. Consequently, while these 16 people participated in both the first and second rounds, it was considered adequate to involve only the initial 16 participants in this round to ensure a more controlled response rate.

The questionnaires used in rounds 2 and 3 as shown in Appendix 10 and 11 respectively, used a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) to indicate the level of agreement with the given statements.

6.4.5 Data analysis

The qualitative data that was collected from all three of the focus group meetings was analysed using deductive thematic analysis, which revealed several themes and sub-themes that were associated with podiatric telemedicine. During the second and third rounds of the rating method, the mean and median scores were calculated to form a consensus and indicate the level of agreement with each statement. From these results, the guideline was drafted for telemedicine in podiatry by considering statements that garnered a consensus agreement of 80% or more. The median scores were taken into consideration to reduce the impact of outliers on the consensus agreement. To evaluate the extent of agreement and consensus for the questions that moved on to the third round, further clarification was necessary. The same threshold was applied in the second round.

6.5 Results

The characteristics of participants in this modified Delphi study are summarised in Table 6, which details their general attributes as reported in the initial round of online focus group discussions, including areas of expertise and years of experience.

Table 5: *Participant characteristics involved in the focus group discussions.*

Gender	
Males n=6	Females n=10
Stakeholder Groups	
Service users (patients)	N=5
Podiatrists	N=5
Senior Managers	N=6
Years of Experience Senior Management and Areas of Expertise	
SM1	20+ / Podiatry
SM2	20+ / Podiatry
SM3	20+ / Primary Care and Telemedicine
SM4	10 - 15 years / Primary Care
SM5	20+ / Podiatry
SM6	5-10 years / IT and Digital Health
Years of Experience Podiatrists	
POD1	10-15 years
POD2	5-10 years
POD3	5-10 years
POD4	10-15 years
POD5	over 20 years
Rounds Completed	
Round 1	n=16
Round 2	n=71
Round 3	n=14

The study did not ask for a specified number of years of job experience from the participants. This decision was made in order maintain a broad scope, since stating the number of years of expertise could potentially undermine the identity of participants. This is a result of the small number of experts who work in management roles in these fields. In developing this telemedicine guideline for podiatry, the response rates are quite significant. This is attributed to the fact that it serves as an indication of how interested and involved the participants are in the research.

6.5.1 Round 1 – Focus Group Discussions

The verbatim transcripts were subjected to thematic analysis, which entailed the identification and categorisation of specific themes and sub-themes pertinent to podiatric telemedicine. The resultant theme and sub-thematic groupings are illustrated in Figure 12.

Figure 12: Themes and sub-themes representation that emerged from the focus group discussions with stakeholders [n= 16].

During this initial phase, all participants were permitted to articulate their perspectives on the critical strategic, organisational, public policy, and developmental areas considered vital for developing a telemedicine guideline in podiatry. The identification of themes and sub-

themes for the questionnaire's development in the second phase was guided by the collective perspectives of stakeholders, as illustrated in Table 7.

Table 6: *Themes and sub-themes derived from the focus group discussions including stakeholder verbatim comments.*

Themes and Sub-themes	***Verbatim Comments***
Needs and Resources	
Human Resources	*"I think we are lacking in human resources to set up this kind of a podiatric telemedicine."* – Podiatrist
	"In terms of human resources, and I mean one needs to cater, all the shifts, all the hours when the telemedicine service is going to be, to be running, and this, I think, basically, we're short of stuff, and I think you need manpower in order to have this running smoothly. You can't open the service one day and than the next its not there, you can't offer it I think on a Monday and than the next availability you don't know when, I think it needs to run, every, everyday and also maybe having the same people." – Podiatrist
Training and Development for Providers	*"l, you need to have talented people on this team. It should be trained it should be, they should be podiatrists, with a vast experience, right candidate or the right provider has to be experienced, and I feel quite strongly about this."* – Senior Manager
	"The people who are going to be doing this offering the service need to be definitely be trained cause it's not just a thing in front of the screen, it's not just sitting and receiving a call. The person has, to have experience both clinically, but also with regards communication skills." – Senior manager
Outreach and Education for Service Users	*"Having internet and a mobile should not be much of a big deal for today. We should be all moving forward I suppose. It has to come from the individuals as well to get organised with these things. From your end (referring to healthcare providers) you should push more to inform people, those that do not have technological equipment to maybe encourage them and advance from that aspect."* – Service user
	"This is important, the education part because maybe some people, even other professionals, think that's telemedicine, whatever service we are providing is a little bit of a lesser and valid treatment." – Senior manager
Adequate IT and Connectivity Infrastructure	*"In order to have this setup you need to have, emm, a specific system, and for for the telemedicine purposes. So it has to be a system which will facilitate the upload of the images and video and video calls. It can't be any system, it has to be GDPR certified and has to be, emm, go through the checklist of the GDPR design. Because obviously, we would be storing heavy data." – Senior Manager*
	"If we're going to use a specific system for telemedicine we need to identify where it is and the system would be hosted and the access to the system and that it is protected, and, like all the other health systems basically. That access is controlled and that it is within a secure environment." – Senior manager
Contingency Plans	*"We have to have backup plans. For when, for example, just an Internet glitch, where, for example, or just a power cut, can ruin the services during the day."* – Senior manager

Readiness	
Cultural Resistance	*"I agree with what they have just said here, that since it is being done by doctors, I think the health centres are ready to introduce this service. Maybe who is not ready for it are the people, and the elderly who are used to attending the clinic when something happens."* – Service user
	"There's another sort of aspect that we need to consider how to reduce sort of resistance in terms of clients so that's where the education aspect comes in." – Senior manager
	"It's not a just an age thing, It's a cultural thing." – Senior manager
Internal Politics	"We need to discuss any plans with higher authorities. Of course, it's useless to make the perfect plan. It's useless, and then when you come, so try to implement that, you get you a flat no. So that is something which we must start thinking about at this stage." – Senior manager
Sustainability	
Transparency	*"I feel that in such large organizations there's a lack of transparency with policies, and we get the note that something is being implemented when it starts, you know, so I think the implementation phase needs to be well thought out and well planned."* – Senior manager
	"We need, to be sure that the service is sustainable, and to do that we have to prove ourselves that what we're doing is meaningful and what we're doing is reaching out to the people that actually need the service, because sometimes we do a lot of good work, but unfortunately, this good work is not recorded, and if we're not recorded, we all know that it's considered not being done so definitely, we need to keep up our work in keeping also good documentation, both statistically and clinically, and education." – Senior manager
	"The public must be informed that this service will not be good for all kinds of problems to avoid having complaints later on." – Service user
Acknowledge Limitations	*"Most people might have concerns with obviously foot, nails and other diseases related to the foot. So a telemedicine option would help, not in all areas of podiatry but in some of the basic ones."* – Senior manager
	"Not every patient knows how to use a computer, we might not have patients that are emm IT friendly that might not understand, emm, technology as well as we do." – Podiatrist
	"So, if we are ready, I would say no. At the moment. But, on the other hand, we must start, which is, we want to be ready. We'll have to start from somewhere. So, we have to identify persons who are interested to work there. And apart from the interested, they need to have an inclination, and they have to cause, I think it is a. It's not just I. I want to start doing telemedicine. I think you would have to have that ability to work in. Not everyone is a good listener, not everyone can explain and talk calmly on telephone." – Senior Manager

	Communication and Setup	
i.	***Scheduled vs. non-scheduled appointments***	*"I think ideally, unless you're going to do a 24 7 service, I think it should be with, emm with appointments, an appointment system, so that the podiatrist would know when to call, because otherwise there will be confusion. I think that's the best with with appointments."* – Podiatrist
		"How do you see best telephone/video calls to be scheduled, so, no. Because telemedicine should be something which is readily available, emm you would set it up on most of the day, let's say 12 h." – Podiatrist
		"I say without appointment. Cause if I need something now, I would want to call him and tell him listen, I have this, but I wouldn't emm want him to tell me, emm kind of, if he tells me call today at 1pm it's one thing but if he tells me to call in two days' time it's another." – Service user
ii.	***Telephone vs. video call vs. combination of both***	*"Telephone for older generations so that they they are more familiar to that system."* – Service user
		"I would prefer video call, cause it's the closest you can get to face to face." – Senior manager
		"Emm, I think both telephone and video should be available. Because what if someone doesn't have a mobile or computer and still wants to talk to a podiatrist on telephone. I don't see why someone should not be given the same opportunity to use the service if they need it. And besides you would still be reaching everyone because today everyone has a telephone." – Service user
iii.	***Hybrid Podiatric Care***	"I think it depends on the on the consultants, emmm, for example, you start with a video call or a call, and then you opt to see the patient and then follow up, via video call." – Podiatrist
		"I think that and a hybrid version would be the best to cater for all types of patients." – Senior manager

	Patient-Specific	
i.	***Low-risk patients***	*"Yes, I think there are certain amount of patients that could be diagnosed and treated through podiatric telemedicine immediately, and skin lesions as an example."* – Podiatrist
ii.	***Triage***	*"We constantly get phone calls from patients in the clinic, and we are constantly answering any questions they have. So, if it were to be within an appropriate infrastructure, then it would be extremely helpful, as SM4 said, I am sure that it would really reduce the the complaints and the waiting time we have at the moment. It can be used to triage, to triage patients, because, as you know, we have many low-risk cases who take up a lot of our appointments when in reality they can self-care."* – Senior manager
iii.	***Follow-up and advice***	*"Let's say there's a Maltese guy and he needs advice. He's abroad, and he's in pain with something and maybe he calls, and you can give him advice to make his life more easier for the time being at least whilst he's abroad, and then when he comes back, he would go to do the traditional podiatric appointment."* – Podiatrist
iv.	***Promote self-care***	*"We can use it to educate patients, to to manage their health themselves, because I think it is a problem across the board where we have many patients who who feel that coming to the appointments is all they need to do to manage their health, and what they have to do at home is not part of their life anymore, and so attending for the for the appointment is important for them, because they feel that that is how they are managing their health. But in reality, I think if we were to have a proper infrastructure, we can help them manage their health at home and reduce the load and the burden we have on the primary care and leave those slots for those who really need it."* – Senior manager
v.	***Consultation Duration***	*"I find from our experience here, that telephone calls, sometimes takes, actually, take longer than a face-to-face visits, sort of to extract information takes a little bit longer, especially if you're not, you know, it's a telephone call not a video call, so you don't have the visual cues, so you have to take that into consideration, so I think a 15 to 20 minute. Slot would be suitable."* – Senior manager
		"If the person is not understanding you, you need to try and re-explain, but then you cannot take all day. So, what you can do with the time, if the patient is not understanding, tell them, listen, we're not communicating, so better to come in person." – Podiatrist
		"It could be that in 5 minutes you manage to explain whatever you need to say, and you might have a more emm complicated situation, emm and you might take longer. So, I don't know exactly emm, if I had to give a time, a time. Emm, I think I would leave it open according to necessity, like when you call a call centre, kind of they don't tell you how much time you have allocated. When you are done you are done sort of." – Service user

6.5.2 Round 2 – Questionnaire for the Development of a Podiatric Telemedicine Guideline

The second round of the study entailed evaluating 55 statements generated from responses in the first round following thematic analysis. Participants were instructed to express their degree of agreement with these statements. Appendix 10 indicates that 51 of the included statements achieved an agreement level of 80% or greater, as determined by analysing the median to mitigate the influence of outliers. Conversely, two comments were omitted for failing to meet the requisite level of 80% level of agreement or greater, while two queries necessitated additional clarification to achieve unanimity. The enquiries pertain to the favoured communication method (69% favouring a combination of telephone and video calls, 27% preferring video calls, and 4% opting for telephone calls) and the duration of a podiatric telemedicine consultation (19% for 10-15 minutes, 21% for 15-20 minutes, 3% for over 20 minutes, and 57% for a duration tailored to the patient).

6.5.3 Round 3 – Questionnaire for the Development of a Podiatric Telemedicine Guideline

The final phase of this study was the assessment of two statements that were restated to reach consensus, related to the preferred mode of communication and the duration of podiatric telemedicine consultation. During this phase, stakeholders were asked about their level of agreement with the provision of podiatric telemedicine through a combination of telephone and video conferencing, and whether the duration of the consultations should be customised for individual patients. The enquiries were addressed, and the level of consensus attained the 80% criterion for each statement. The outcome of this round served as the foundation for the formulation of the Podiatric Telemedicine Guideline, as illustrated in Appendix 12 for healthcare professionals and Appendix 13 for patients.

6.6 Discussion

The adoption of consensus approaches is essential in situations where there is no agreement due to insufficient or contradictory evidence regarding a certain problem (Schifano & Niederberger, 2025). These strategies facilitate the synthesis of expert ideas to evaluate the degree of agreement (consensus assessment) or to address disagreement (consensus formation) (Boulkedid et al., 2023). Consequently, consensus methods are widely utilised to improve the efficient establishment of research objectives in medicine (Ota et al., 2008; Jurkovich et al., 2004; Nathens et al., 2006). This study sought to develop a telemedicine guideline for podiatry in a primary care context for low-risk patients and establish a consensus with regards to this guideline. A modified Delphi method solicited the perspectives of diverse stakeholders, including patients to guarantee patient public involvement, podiatrists as service providers, and senior management as policymakers to ensure the development of a robust evidence-based guideline for service users and healthcare providers in the field of podiatric telemedicine. The section below highlights the importance of such stakeholders in this development phase.

6.6.1 Patient public involvement

This study sought to understand the perspective of patients about the use of podiatric telemedicine at primary care level. Throughout the discussions, it was observed that the principal constraints of telemedicine highlighted by patients stemmed from insufficient IT skill and not having the necessary devices or connection to carry out video call consultations. Additionally, patients mentioned that podiatric telemedicine does not apply for all their podiatric care needs as hands-on intervention would be necessary. Patients also stated that they felt reluctant to make use of such a service since they were used to attending the clinic in person to address most of their foot and ankle ailments and hence such modality is not

customary. They highlighted the need for more education with regards to this service l to inform them better of what this entails.

However, patients acknowledged that this service could enhance patients' access to podiatric care and provide reassurance in acute and chronic podiatric conditions when in-person consultations are not possible immediately. Throughout the discussion, patients sometimes exhibited confusion and necessitated reiteration for clarification about the service's nature and how podiatric telemedicine would function. They articulated the necessity for enhanced community education and outreach programs to facilitate the more successful integration of telemedicine into the present service.

Incorporating patient and public involvement in research is recommended to enhance the processes of informing, strategizing, implementing, and eventually disseminating and translating research findings (Arumugam et al., 2023). Hence, this study abides by other research and included patient public involvement as was suggested in research by Jackson et al. (2020) whereby to attain relevance, all stakeholders must actively participate, rather than depending exclusively on healthcare providers and policymakers. This research corroborates with other research where it emphasises that implementing effective public and patient involvement methods is essential for producing high-quality research findings that benefit patients, the public, and the healthcare system (Brett et al., 2014).

This research incorporated patients as essential stakeholders in the formulation of podiatric telemedicine guidelines. Their viewpoints were considered in conjunction with those of other stakeholders including podiatrists and policymakers to improve the overall quality of the guidelines. Despite their limited exposure to telemedicine, the participants in this study were all frequent users of podiatry services and thus knew well what the service involved.

6.6.2 Healthcare providers and policymakers' perspective on introduction of podiatric telemedicine

This study sought to, alongside the perspectives expressed by patients, provide the viewpoints of healthcare providers and policymakers in relation to podiatric telemedicine at a primary care level. Podiatrists and policymakers' thoughts corresponded with the previously described patient perceptions.

This study found that the limited number of podiatrists could hinder future telemedicine services in podiatry within primary care. The significance of setting suitable expectations for service users and providers was emphasised, coupled with the acknowledgement that not all patients could benefit from this new service. Additionally, podiatrists and policy makers emphasised the importance of having contingency plans in place in the event of crises such as in the case witnessed with the COVID-19. However, they emphasised that telemedicine is the way forward and should be considered as an additional service to complement already established podiatry services. Hence such findings corroborated with a study by VanderWerf et al., (2022) whereby it highlights that establishing contingency planning is crucial to mitigate service disruptions during a service roll-out. Policymakers, namely senior managers, underscored the importance of formulating evidence-based guidelines, which senior managers proposed to submit to higher medical authorities for possible implementation in primary care services. Moreover, it was emphasised that healthcare personnel delivering this service should have the necessary training prior to performing these consultations, especially in communication skills.

The outcome from this study served as the foundation for the formulation of the Podiatric Telemedicine Guideline, as illustrated in Appendix 12 for healthcare professionals and Appendix 13 for patients.

6.6.3 Limitations of Study

It is crucial to acknowledge the specific limitations of this research, primarily because it was conducted in a smaller country than other European nations, which may not have identified any issues associated with extended travel distances, which is commonly mentioned as one of the benefits of telemedicine, breaking geographical barriers. Consequently, participants may not fully understand the usefulness for such services. Moreover, the study only included a restricted sample size of 16 participants for the initial round of this modified Delphi process. The Delphi technique lacks a globally recognised norm for sample sizes. Various researchers advocate for differing panel sizes: Linstone (1978, p. 296) recommends seven, Philips (2000) suggests a range of seven to twelve, and Wild and Torgersen (2000) assert that hundreds may be appropriate. Nonetheless, as observed by other scholars, the decision of sample size is contingent upon the study's objectives and the resources at hand (Turoff & Linstone, 2002). Owing to the nascent status of telemedicine as a service in Malta, the study refrained from designating stakeholders as "experts."

It is important to recognise that each stakeholder contributed distinct skills from diverse views about podiatry, telemedicine, and primary care. Senior management and podiatrists demonstrated a heightened inclination to discuss podiatric telemedicine, attributed to their substantial experience in podiatry, primary care, and telemedicine because of the COVID-19 pandemic. Furthermore, some patients invited to participate in the focus group session demonstrated hesitation and indicated a preference to abstain from participation. Patient participants also expressed a lack of confidence and demonstrated hesitation to engage in group conversations due to feelings of inadequacy regarding their competence on the subject matter. Furthermore, it is significant to note that the participants who were patients in the study had no prior experience with telemedicine consultations. As a result, patients' perspectives were mostly influenced by their attitudes towards technology, its potential benefits, and their perceived need for the service.

The extensive information collected can be primarily ascribed to the strategy choices of senior executives aimed at formulating swift responses to the pandemic. One of these options involved the adoption of telemedicine.

6.6.4 Way forward

The development of guidelines for telemedicine consultations in podiatry is a significant step towards initiating a new service at primary care level for low-risk podiatry patients. Nevertheless, the existence of guidelines alone is not sufficient to ensure smooth running of an innovative service. The importance of evaluating guidelines, giving adequate training to podiatrists and piloting a service cannot be underestimated.

Enhancing outreach initiatives for both professionals and patients alike related to podiatric telemedicine can serve as an opportunity to inform all stakeholders about this new service and what it can offer.

Guideline evaluation, training initiatives and piloting of the service were conducted as part of this research and will be discussed in more detail in the upcoming chapters of this dissertation.

6.7 Recommendations for Practice

This research is first to establish a guideline for podiatric telemedicine within a primary care context aimed at low-risk patients both locally and at international level. Consequently, this study recommends the introduction of a pilot initiative to introduce podiatric telemedicine with regards to offering this service at a primary care level. Therefore, this guideline could aid healthcare professionals with an evidence-based strategy to deliver podiatric telemedicine to service users. Furthermore, once piloted, feedback from both healthcare professionals and patients could serve as feedback to modify the proposed podiatric telemedicine guidelines and service accordingly if necessary. It is recommended that to

accomplish this goal, it is essential for healthcare providers to participate in continuous professional growth targeting digital health. Additionally, from a policymaker perspective it is recommended that the pilot study evaluates the effectiveness of the guidelines and implement required adjustments throughout the process. This research further recommends the need for further research in the field, specifically to examine feasibility and service delivery outcomes. This podiatric telemedicine guideline presents an opportunity for podiatry to expand its services beyond in-person consultations in a clinical setting and allows for core podiatric practices to include such modalities into their practice. Lastly, results from this research can serve as a model for other healthcare professions seeking to implement telemedicine within their profession.

Appendix 12 presents the Podiatric Telemedicine Guideline for healthcare providers developed during this study, whilst Appendix 13 presents the guideline for service users. The results of this study have been published in the peer-reviewed *Journal of the American Podiatric Association*, with the complete paper entitled 'Developing a Podiatric Telemedicine Framework for Service Users and Providers in a Primary Care Setting' available in Appendix 3.

6.8 Conclusion

Modified Delphi research with three rounds facilitated consensus among various stakeholders on the criteria essential for formulating an evidence-based podiatric telemedicine guideline. The established guideline emphasised domains essential for the integration of complex interventions in podiatric care. Incorporating the perspectives of patients, healthcare professionals, and policymakers was considered essential for the development of this guideline to enhance its robustness and efficacy. Podiatric telemedicine guidelines should be employed by foot and ankle healthcare practitioners during telemedicine consultations in a primary care setting. It is advisable to undertake further

studies to evaluate the feasibility, operability, satisfaction, and quality of applying the podiatric telemedicine guideline. The subsequent chapter will explore the training technique utilised with healthcare professionals before commencing the pilot service and pilot research strategy.

Chapter Seven – Podiatric Telemedicine: A Training Course Developed for Primary Care Healthcare Providers

7.1 Introduction

The COVID-19 pandemic has provided a new perspective on the necessity to expedite digital transformation in the healthcare sector, highlighting the significance of adopting telehealth services (Alkhalifah et al., 2022). This has also necessitated the development of innovative strategies to encourage not just their adoption and adaptation but additionally their proper, safe, and effective application (Haleem et al., 2021). This underscores the necessity of creating instructional resources that cultivate new abilities derived from the lived experiences (knowledge, skills, and attitudes) of healthcare professionals, with a focus on both service users and providers (Pan American Health Organisation, n.d.).

This training course aimed to provide an overview of podiatric telemedicine and its application within a primary care setting. The previous study that developed the podiatric telemedicine guideline was implemented and presented to podiatrists who participated during this course. The implementation of this podiatric telemedicine training course in a primary care environment aims to enhance podiatric clinical practice and decision-making by training podiatrists, facilitating knowledge exchange, and integrating new modalities of podiatric care to support the adoption of telemedicine within an existing healthcare structure. This training course offers possibilities to cultivate skills for the efficient operation of a remote podiatry clinic, ensuring enhanced accessibility to podiatric care for our patients.

7.2 Course Overview

The healthcare sector is continually embracing technological advancements to improve the accessibility of its services. Telemedicine is a beneficial service that facilitates healthcare services to patients from a distance, effectively mitigating obstacles associated with constrained time availability or transportation alternatives (Keesara, et al., 2020). The primary objective of this training programme is to offer a comprehensive examination of the diverse applications and challenges associated with podiatric telemedicine and to ensure sustainability of podiatric services at a primary care level. Moreover, it is crucial to evaluate the significance of telemedicine in providing podiatric services in primary care settings and determining the most efficient approaches for supervising foot and ankle healthcare.

This *Podiatric Telemedicine Training Course for Primary Care Providers* was designed to assist podiatrists and other foot, and ankle-related healthcare professionals understand how telemedicine can be integrated within the present healthcare system dynamic.

7.3 Learning Outcomes

This *Podiatric Telemedicine Training Course for Primary Care*, ensured that podiatrists and foot and ankle healthcare providers can:

1. Offer a justification for the suitable implementation of podiatric telemedicine, emphasizing its benefits and drawbacks.
2. Determine the factors impacting patients' receptiveness to podiatric telemedicine and identify and mitigate obstacles that practitioners and patients may encounter when using telemedicine.
3. Verify the functionality of team members participating in podiatric telemedicine encounters. In such situations, it is vital to specify their roles and responsibilities.

4. Recognise instances in which patient safety is compromised, and care must be escalated (either to an in-person consultation or a referral to the emergency room). Consequently, providers must understand when and how to do so.

5. Construct a treatment plan for the patient that integrates the medical history obtained during a synchronous podiatric telemedicine consultation and accurately notes all relevant details in the electronic patient record.

6. Conduct a comprehensive assessment synchronously with the patient or caretaker and utilise the data collected to guide treatment determinations.

7. Treatment planning and clinical evaluation (such as identifying potential health hazards) should consider environmental factors.

8. Demonstrate the potential challenges of remote podiatric telemedicine care on decision-making. For instance, challenges such as patients failing to send explicit images or videos that aid the consultation or failing to comprehend basic instructions could affect the decision-making process.

9. In synchronous telemedicine encounters such as video consultations and telephone conversations, exhibit and uphold the suitable decorum that fosters a positive relationship with patients.

10. Amidst synchronous video consultations, background, illumination, sound, framing, attire, interruptions, and privacy should be considered.

11. Adhere to the pertinent legal, licensing, billing, and privacy regulations of podiatric telemedicine in primary care, as the institution specifies.

12. Delineate the components of consent on consultations via podiatric telemedicine.

13. Demonstrate proficiency in operating the technology necessary for podiatric telemedicine services, including common technological malfunctions. If technical difficulties cannot be resolved, request the appropriate assistance.
14. Discuss the impact of podiatric telemedicine on health equity and how it may either mitigate or exacerbate socioeconomic disparities in healthcare accessibility.
15. Identify potential cultural, social, physical, cognitive, linguistic, and communication barriers that could impede patients' ability to benefit from technological interventions fully.
16. Employ podiatric telemedicine to deliver efficient healthcare services for specific scenarios, such as worldwide pandemics or public health emergencies.
17. Exhibit the ability to assess the benefits and drawbacks of technological advancements and their potential impact on patient care.
18. Acquire the ability to examine current obstacles that impede virtual care delivery and discern possible remedies (such as technological, procedural, pedagogical, and so forth).

7.4 Proposal Stage of the Podiatric Telemedicine Training Course for Primary Care Providers

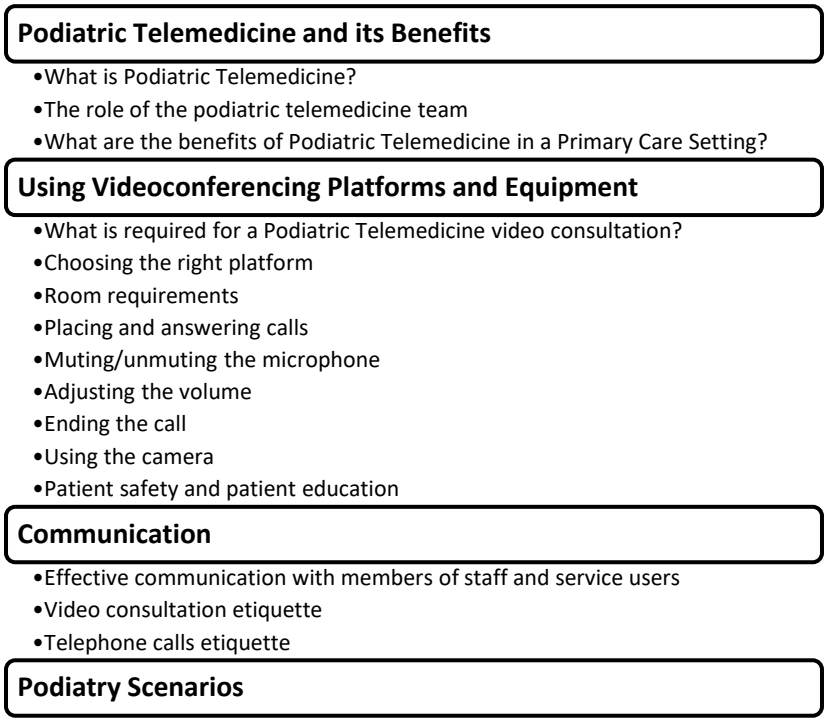
Before commencing the recruitment of podiatrists for this training course, a proposal was submitted to the Professional Lead of Podiatry and to senior managers in the Primary Care Department, Ministry for Health, and Active Ageing. Their approval of the delivery and recruiting of participants for this training course in podiatric telemedicine was crucial for ethical considerations and organisational policies to maintain transparency within the podiatry department.

This proposal involved the development of a telemedicine program for state-registered podiatrists in primary care, emphasising the necessity for podiatrists to be adapt in telemedicine practices due to rapid technological advancements and the increasing demand for remote healthcare services. The proposal emphasises the necessity for training in this sector and highlights the potential benefits it can confer in a primary care context for the broader community.

7.5 Podiatric Training Course Outline

The course outline of *Podiatric Telemedicine Training Course for Primary Care Providers* can be seen in Figure 13, which describes briefly the content included. This training course was spread over 12 hours (4 hours per session) and was delivered online. The expression of interest to apply for this training course was open to state-registered Podiatrists working and residing in Malta and Gozo in a Primary care setting. Moreover, eligible podiatrists were required to have at least 5 years of podiatric clinical experience in a Primary Care setting and have followed and received the Professional Interpersonal Skills with Patient and Relatives Programme (PISP) certificate (Malta Health Training, 2020).

Figure 13: Outline of the Podiatric Telemedicine Training Course for Primary Care Healthcare Providers.



7.6 Methods

After the proposal phase and the acquisition of necessary ethical approvals [Appendix 18] from the University of Malta Research Ethics Committee, the training course was delivered as outlined below.

7.6.1 Delivery of Training

A PowerPoint presentation was developed including the pertinent content to convey the training course contents during these sessions. The material also included interactive workshops to facilitate discussions.

7.6.2 Pre-training course questionnaire

A pre-training course questionnaire was created for participants to complete on the first day of the training session, prior to the commencement of the training. This questionnaire sought to assess participants' general comprehension and experience with telemedicine practices in podiatry, as well as their prior engagement in similar courses. The pre-training questionnaire

can be found in Appendix 14. These results were then transferred onto an Excel document for analysis.

7.6.3 Mentimeter Enquiries

A series of enquiries were presented to elicit participants' real-time comments during the discussion and to gather information pertaining to podiatric telemedicine utilising the Mentimeter platform. The enquiries encompassed:

1. What are your expectations for this training course?
2. When you think about telemedicine, what thoughts or associations come to mind?
3. How can you use this training in your work going forward?
4. What will you start doing differently?
5. What are your three biggest takeaways from this training?

7.6.4 Post-Training Course Questionnaire

A post-training course questionnaire was developed for participants to answer on the final day of the training session after finishing the course material. This questionnaire aimed to evaluate participants' feedback regarding the implementation of telemedicine in podiatry and their confidence in providing podiatric telemedicine compared to conventional in-clinic practices. The post-training questionnaire is in Appendix 15. The results were subsequently transferred to an Excel document for analysis.

7.7 Results

Seven podiatrists indicated interest in participating in *the Podiatric Telemedicine Training Course for Primary Care*. On the day the training course was scheduled, one of the seven participants was absent, resulting in a total of six attendees.

7.7.1 Pre-Training Podiatric Telemedicine Questionnaire

The pre-training podiatric telemedicine questionnaire assessed the participants' years of experience in primary care (Figure 14) and their educational background (Figure 15). All participants confirmed that they had no prior telemedicine training before this session; however, two of the six participants reported having conducted a telemedicine consultation previously. Additionally, it included questions about the level of agreement on podiatric telemedicine services and training (Figures 16 and 17), along with a baseline self-assessment (Figure 18).

Figure 14: *Participants years of experience working as state-registered podiatrists in a primary care setting.*

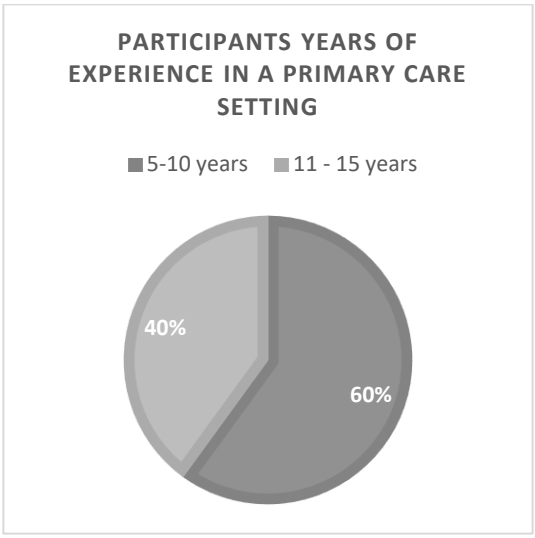


Figure 15: *Participants level of tertiary education.*

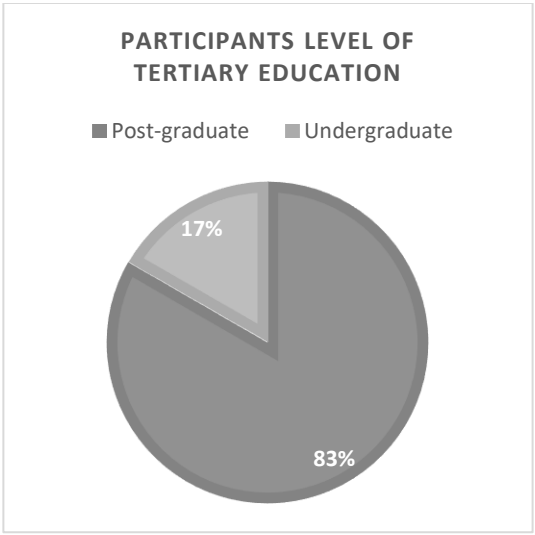


Figure 16: *Level of agreement statement related to podiatric telemedicine.*

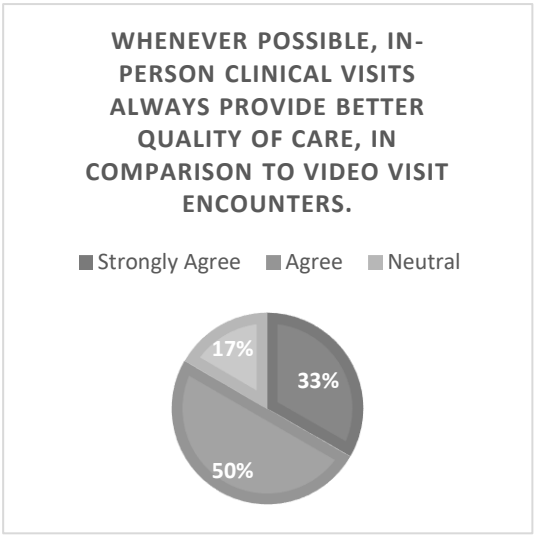


Figure 17: *Level of agreement statement on anticipation of use of podiatric telemedicine post-training.*

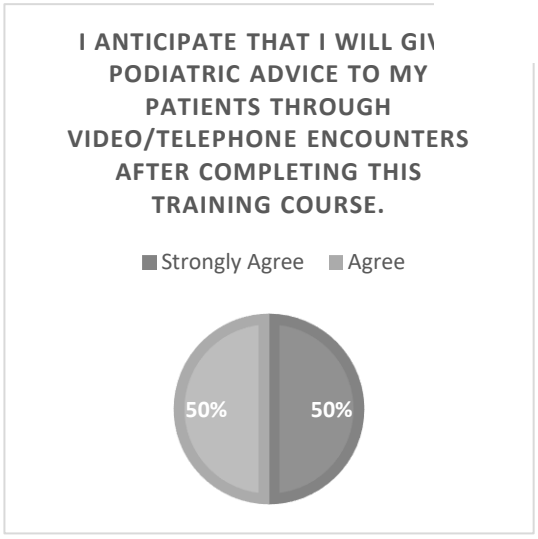
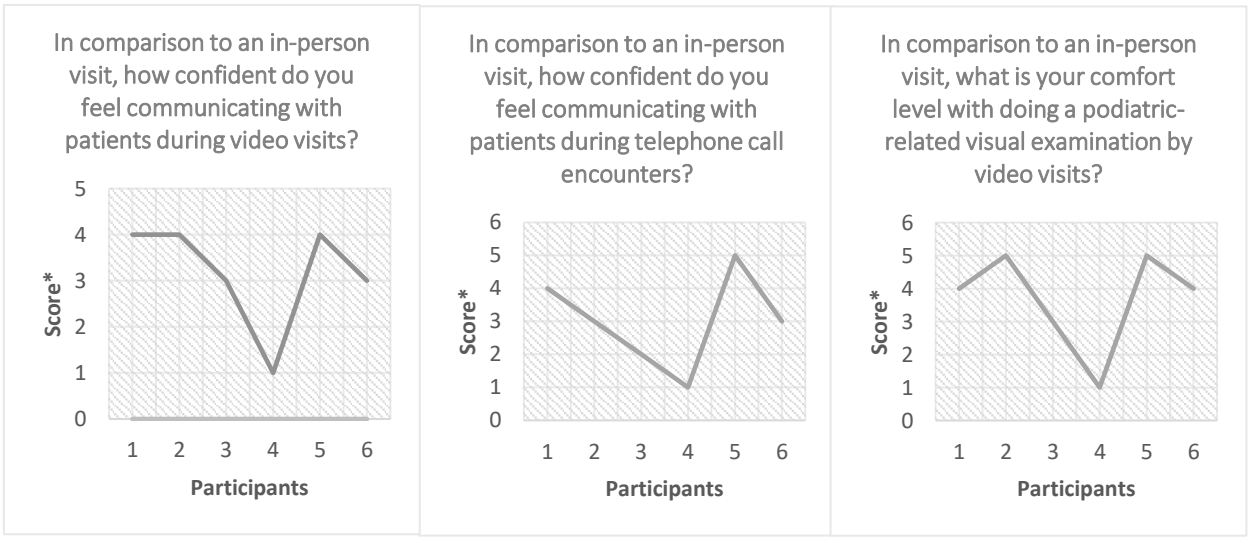


Figure 18: *Baseline Self-Assessment questions asking about level of comfortability with podiatric telemedicine. Score range from 0 (not at all comfortable) to 5 (very comfortable). **



7.7.2 Mentimeter Results

The following are the results derived from discussions with the participants regarding the specified topics (see Table 8, 9 and 10 and Figures 19 and 20). These questions are organised chronologically based on when they were asked throughout the training course.

Table 7: *Results derived from participants: 'What are your expectations for this training course?'*

Q. 1 What are your expectations for this training course?	To get to know what telemedicine involves and how one can use it to help patients
	Knowledge about a new service
	To learn the skills needed to communicate effectively and diagnose properly through a telephone/video consultation with the patient
	Info re platforms to use. Protocols.
	To become more comfortable to give out and hold telemedicine xconsultations - which I will add to my ongoing services. Eager to learn - for the time being I was doing them without any prior knowledge
	Learn the basic needs for podiatric telemedicine
	I want to learn about telemedicine and what it entails. What conditions can we give advice on are
	To learn which type of patients will require this service. To understand how a typical day for a podiatrist working in telemedicine would look like.

Figure 19: *Word cloud depicting participants responses: 'When you think about telemedicine, what thoughts or associations come to mind?'*

Table 8: *Results derived from participants: 'How can you use this training in your work going forward?'*

Q. 3. How can you use this training in your work going forward?	To be able to communicate better virtually with patients
	To be able to communicate and help patients who cannot be physically available in the clinic
	When a person calls, and you think this personn will benefit from a teleconsultation, tell them about the new service which is going to be offered soon...
	Lessen the load from the clinics
	Once the system is up and running - I would refer low risk patients to use telemedicine system for any general foot queries.
	To effectivtly diagnose and treat pathologies of the foot that can be addressed remotely
	More professional podiatry service through the phone

Table 9*: Results derived from participants: 'What will you start doing differently?'*

Q. 4 What will you start doing differently?	Be more comfortable while holding telephone consultations
	Promoting the use of telemedicine
	Refering to telemedicine
	Give more advice through the phone
	If advice is given on a telephone call, podiatrist can record it
	Timely consultations
	Recording phone conversations on ePR
	Timely consultations

Figure 20: Word cloud depicting responses from participants: 'What are your three biggest takeaways from this training?'

7.7.3 Post-Training Podiatric Telemedicine Questionnaire

The concluding post-training questionnaire comprised agreement scale enquiries (Figure 21) and post-didactic self-evaluation enquiries (Figure 22) to collect input regarding the delivered training course.

Figure 21: *Level of agreement statements with the training that has been delivered.*

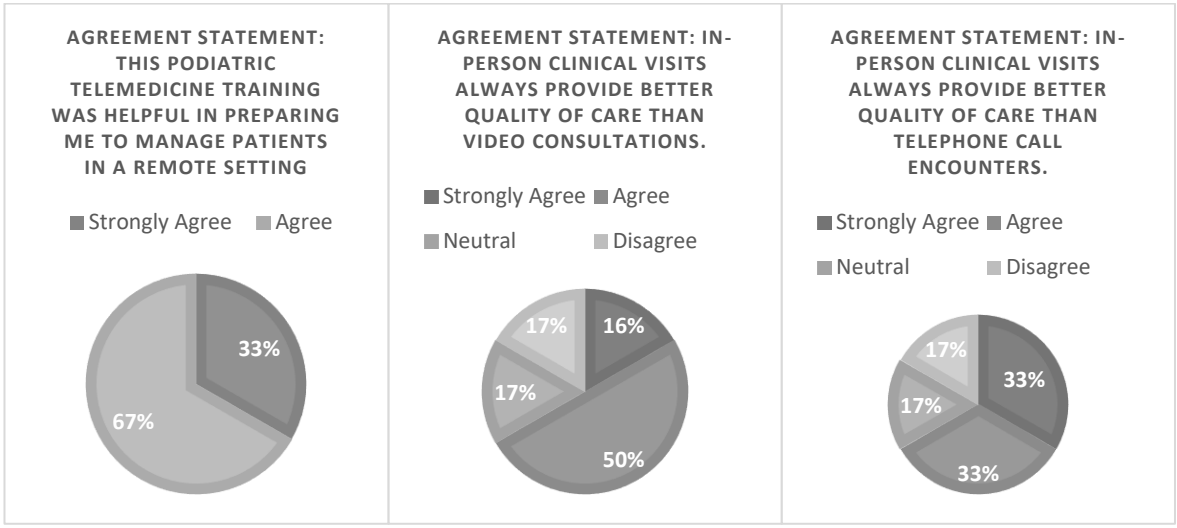
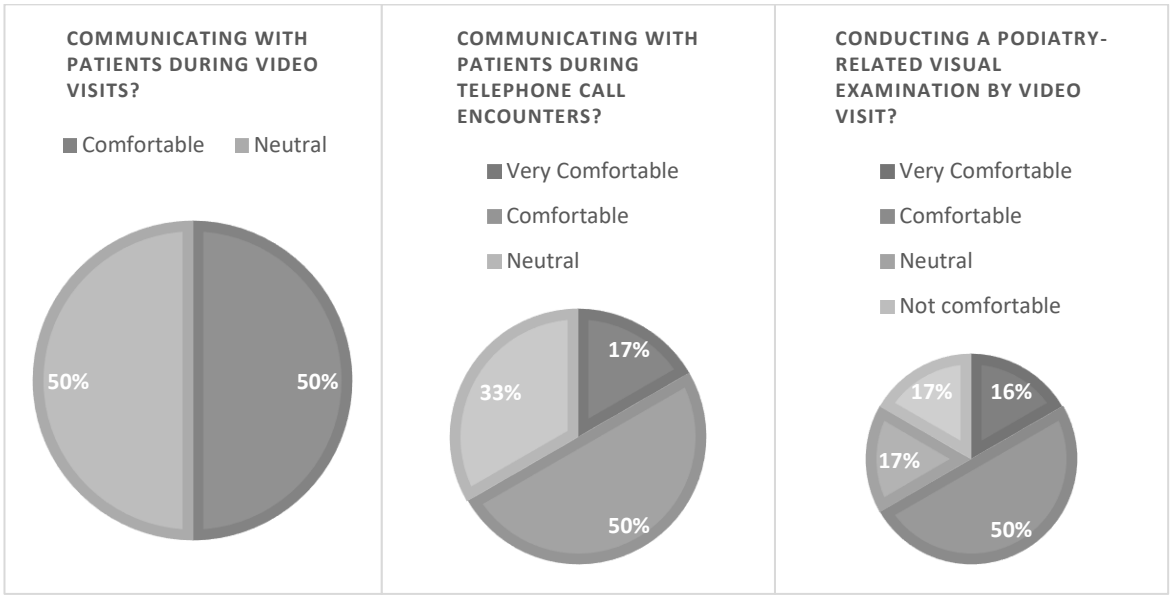


Figure 22: *Post-Didactic Self-Assessment Questions – In Comparison to an in-person visit, how confident do you feel with …*



Finally, when enquired about any remaining queries, the results indicated a continued need for information regarding logistical matters and additional training linked to video analysis from smart devices.

7.8 Discussion

The training sessions equipped participants with essential information and skills for incorporating telemedicine into their practice, addressing critical elements such as patient communication, remote diagnosis, and the utilisation of digital tools for patient care. This training project significantly improved podiatrists' capacity to provide remote care, broadened access to specialised foot and ankle care, and adjusted to the changing dynamics of healthcare delivery. The participants are now proficient in employing telemedicine in their practice, providing an innovative aspect of follow-up treatment to their patients.

This training course has equipped participants with the essential knowledge to conduct podiatric telemedicine consultations effectively; however, it is crucial to emphasise that podiatric telemedicine is not intended as a substitute for in-person podiatric clinical practice, given the inherently hands-on nature of the podiatry profession. This training and proposed service aim to enhance and support the existing offerings of the podiatry department, thereby alleviating the burden on clinical practice and improving accessibility and timely intervention for patients daily.

Participants noted that the training course was advantageous; however, it became apparent during the sessions that some individuals applied under the misconception that it was a work-from-home opportunity, leading to disappointment upon discovering that podiatric telemedicine practice is not currently a remote initiative. This raises the question: why does telemedicine, which entails remote consultations, imply that it may be conducted from home? Telemedicine consultations should not be regarded as a subordinate kind of consultation, but rather as equally significant, provided that the appropriate infrastructure is established. Therefore, it was noted from the outset that this training will not lead to remote work opportunities, yet.

This training course encountered several constraints, including logistical challenges and organisational restrictions, that restricted the number of podiatrists eligible to participate. Originally, the course was intended for podiatrists within the public primary care setting, but an internal departmental consideration had to be made to design it for five podiatrists to avoid disrupting clinical appointments. Despite this, we received interest from seven candidates, which we accepted due to the expected attrition rate. Conversely, seven out of forty-two eligible podiatrists applied (16.7%), indicating a significant level of disengagement within the field generally. Such disengagement sheds light on a number of important considerations which include limited awareness, confidence, or perceived relevance of telemedicine within core podiatric practice for low-risk patients. This suggests that, despite growing interest in telemedicine practices, there remain barriers to adoption within the podiatry profession which might be attributed to time constraints and limited human resources, or uncertainty about clinical effectiveness. The finding underscores the need for more targeted education, accessible training programs, and strategies to demonstrate the value of telemedicine in improving patient care, ensuring that podiatrists feel equipped and motivated to integrate these approaches into practice. Therefore, it is advisable to conduct additional outreach and personalised discussions in primary care clinics with podiatrists to enhance their understanding of the service and its components. It is advisable that this training be presented not as optional but as essential for all podiatrists to effectively conduct both clinical and remote consultations as necessary. This presents a chance to provide all staff with essential training, ensuring that in the event of a healthcare crisis like the COVID-19 pandemic, podiatrists possess the requisite abilities to transition back to remote consultations.

7.9 Conclusion

Upon completing this training course, podiatrists and other foot and ankle healthcare practitioners gained the requisite information and skills to effectively conduct telemedicine consultations in a primary care environment. This training session enabled the acquisition of supplementary skills in podiatric treatment in remote environments and encouraged the continual adherence to optimal standards. Nonetheless, it must be acknowledged that the necessity of enhancing the involvement of healthcare professionals in this area is imperative, as it is an essential practice that should be integrated within healthcare systems, serving as a contingency plan in times of crisis.

Chapter Eight – Study III: The Piloting of a Telemedicine Service for Core Podiatry in the Maltese Public Service

8.1 Introduction

This chapter addresses the implementation phase of the overall project, following the initial study's scoping review, and the development of the podiatric telemedicine guideline using a modified Delphi approach, centred on whether the research and training provided to podiatrists will be applied in practice. From the research conducted it has been determined that there is an interest in the introduction of podiatric telemedicine as part of the primary healthcare services, and comprehensive recommendations have recently been established to fill the gap in the literature about specific podiatric telemedicine protocols (Stojmanovski Mercieca et al., 2024).

8.2 Rationale

Nationwide, podiatric telemedicine was implemented as a swift reaction to the COVID-19 pandemic, carried out with minimal supervision, infrastructure, or regulatory frameworks (Stojmanovski Mercieca et al., 2023). The WHO acknowledges that healthcare facilities were inundated and unprepared to handle substantial changes during difficult periods (WHO, 2021). Telemedicine can improve access to healthcare services; nevertheless, its deployment necessitates a comprehensive evaluation of regulatory and strategic frameworks to mitigate possible risks and disadvantages while optimising sustainability in the healthcare sector (WHO, 2021).

The widespread utilisation of internet-enabled devices has been crucial in enabling this mode of healthcare delivery. Moreover, virtual platforms enable efficient patient triage, assessment, and timely intervention (Abernethy et al., 2022). These techniques are revolutionising healthcare service delivery, offering new opportunities for accessible, efficient, and patient-centered care (Singla & Singla, 2024). While telemedicine offers numerous advantages, it is essential to acknowledge that diagnosing ailments may pose greater challenges remotely than in face-to-face consultations, owing to the lack of a physical examination (Haleem et al., 2021). However, technological developments and evaluation techniques are continuously improving the effectiveness of remote consultations (Abernethy et al., 2022).

Telemedicine consultations offer a solution for patients requiring podiatry services who are unable to attend in-person appointments, enabling easy consultation, diagnosis, and management, provided that hands-on treatment is not essential (Stojmanovski Mercieca et al., 2024). Furthermore, these modalities have shown the ability to reduce healthcare costs and waiting times associated with traditional in-person treatments (Haleem et al., 2021). They are considered a sustainable and eco-friendly alternative (Thiel et al., 2023). This pilot study, carried out in a relatively small nation with health centres and community clinics distributed throughout the island, along with home visits, indicates that geographical barriers to podiatry services do not exist; rather, the problem pertains to extended waiting lists for podiatry appointments in the public primary care sector, reinforcing the concept of accessible podiatric care.

8.3 The Research Question, Aims and Objectives

8.3.1 The Research Question

The key research question of this project is: 'How feasibility is it to develop and successfully implement telemedicine in core podiatry within a primary care setting for low-risk patients?'

This implementation phase is the analysis that enables us to reach a conclusion addressing both the research issue of this study and the broader research endeavour.

8.3.2 Aims and Objectives

This study aimed to initiate a pilot podiatric telemedicine service, implemented in a primary care environment within the public sector for low-risk patients. The assessment concentrated on the feasibility of integrating podiatric telemedicine into already existing podiatry services. This pilot service and research study's main objectives were to provide follow-up care to patients who were good candidates for this service, assess symptom improvement, and evaluate patient management. This is the first study that adheres to the podiatric telemedicine framework defined by Stojmanovski Mercieca, Formosa and Chockalingam (2024).

8.4 The Philosophical Influence on the Study Design

The overarching aim of this study was to develop a telemedicine guideline for podiatry based on the best available data, aimed at ensuring the sustainable future of essential podiatric care for low-risk patients within a primary care setting.

There are many factors to consider when developing the research design and technique. The researcher adhered to the Research Onion framework proposed by Saunders, Lewis and Thornhill (2009), as illustrated in Figure 4 in Chapter 4 of this thesis. This PhD research was motivated by an interpretivist and pragmatic epistemological framework and employed an inductive approach to theory formation, utilising a mixed-method methodology conducted through a cross-sectional study throughout the implementation phase.

This final research study utilised a design that involved referring patients attending a clinical podiatry appointment, who met the established inclusion and exclusion criteria, to the

podiatric telemedicine team for a follow-up consultation instead of a standard clinical appointment. The podiatrist recommended a designated follow-up review date and subsequently contacted the patients based on their specified preferences. After the consultation, the podiatrist asked the patients if they were willing to participate in a telephone-based questionnaire to assess their service satisfaction rates. Additionally, a feedback survey targeting podiatrists was conducted to assess their perspective on the provided service. The subsequent sections provide a comprehensive overview of this implementation phase.

8.5 Ethical Considerations

Before initiating this pilot study on the deployment of a new service in a primary care context within the Podiatry Department, comprehensive ethical approval was obtained [Appendix 18]. A formal request was obtained from the Chief Executive Officer, Data Protection Officer at Primary Healthcare, and the Professional Lead of Podiatry to facilitate access to patient data and to recruit patients from the department for the new pilot initiative being offered. Ethical approval [Appendix 18] was obtained from the University Research Ethics Committee (University of Malta) on March 27, 2024 (FHS-2024-00067).

In compliance with the Declaration of Helsinki, the researcher preserved participant anonymity through pseudonymisation. Additionally, data is stored securely in a password-protected (encrypted) format, whereby than the data was identifiable to the participants upon the study's completion was eliminated. Participants were permitted to voluntarily decide whether to engage in this study and to withdraw their involvement at any stage of the investigation and they were thoroughly informed with the study and service details, as well as the importance of their involvement.

8.6 Methods

8.6.1 Podiatric Telemedicine Training

Before the commencement of this pilot service, the podiatrists who formed the Podiatric Telemedicine Team received training in podiatric telemedicine, as detailed in the preceding chapter. Only podiatrists who completed the program were eligible to conduct podiatric telemedicine consultations in a primary care setting.

8.6.2 Ethical Approvals

This pilot study received approval from a Research Ethics Committee at the University and the Primary HealthCare Department within the Health Service (Ref: FHS-2024-00067) and was carried out in a primary care setting during six months, from May to October 2024 [Appendix 18].

8.6.3 Study Site

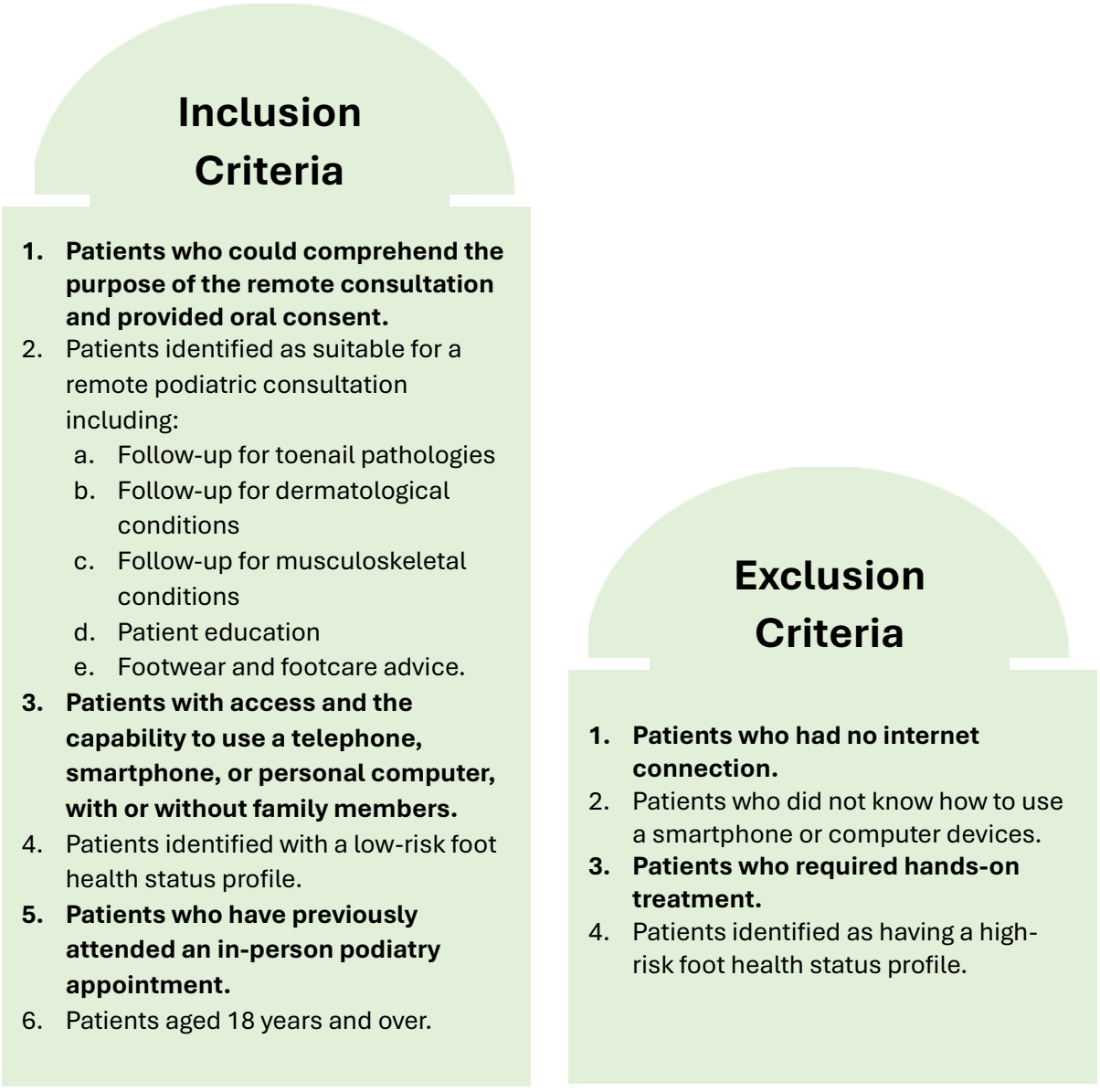
This pilot study was conducted in the public primary care setting in Malta. The podiatric telemedicine team consisted of three podiatrists conducting consultations from Birkirkara Health Centre, as well as Kalkara, Fgura, and Santa Lucija Community Clinics. The Professional Lead and Primary Healthcare Department approved these clinics for telemedicine services.

8.6.4 Study Population

This study was carried out with low-risk podiatry patients, as defined earlier in Chapter 1 who have no neuropathy, no ischaemic problems, no significant deformities, no foot ulceration and able to self-care (NICE, 2019), within the public primary care setting. Patient records were accessible through the electronic patient record system available within primary care. Podiatrists forming part of the Podiatric Telemedicine Team were–state -

registered podiatrists with over five years of clinical experience working in primary care podiatry clinics. Podiatrists working in a primary care setting were asked to identify potential patients suitable for a follow-up podiatric telemedicine consultation based on the specified inclusion and exclusion criteria highlighted below in Figure 23.

Figure 23: Inclusion and exclusion criteria for the pilot podiatric telemedicine implementation study.



8.6.5 Recruitment

Podiatrists informed eligible patients about remote follow-up consultations and enquired about their preference for either a telephone or video call arrangement. The podiatrists ensured that patients comprehend their foot and ankle related ailment, along with family

members (if necessary), to engage in dialogue and retain the information exchanged during the remote consultation. When telephone consultations were inadequate and video call contact was unfeasible, patients were provided with a standard clinical podiatry appointment. Eligible patients were recommended by their podiatrists through the submission of a referral to the podiatric telemedicine team or by scanning a QR code [Appendix 16], facilitating a streamlined referral process for podiatric telemedicine. These referrals were subsequently evaluated by the principal researcher, who also served as a lead member of the podiatric telemedicine team. The referrals were categorised based on the reason for referral and were contacted accordingly as per appointment scheduled. These scheduled remote consultations were delivered by podiatrists from a clinic room available within a primary care setting.

8.6.6 Conduction of a Podiatric Telemedicine Consultation and Data Collection Procedures

The podiatrist performing a podiatric telemedicine consultation was situated in a podiatry clinic, equipped with a computer with the patient's electronic records available.

Telephone-Based

Patients opting for a telephone consultation were scheduled to be contacted within a specific week. If a patient was not reachable on the first attempt, podiatrists attempted to reach these patients again three times per day for one week. Patients that remained unreachable after this one-week period had a regular podiatry clinic visit scheduled and mailed to them. Patients were requested to send photographs or videos by email depending on their ailment and reason for referral and were reached by telephone to facilitate the session. The podiatric telemedicine team arranged a call immediately or at a mutually agreeable time later for patients who had video call technology and provided consent [Appendix 20]. If image or video equipment was unavailable, compromising the clinician's ability to reach a clinical

judgement during consultation, a clinical appointment was scheduled for the patient within a week.

Video Call

Patients who chose a video call during the referral process at their last clinic session were requested to provide their email address, and a link was sent one week before the video consultation. At the start of the video conversation, the podiatrist displayed his/her work tag on the camera, confirmed the patient's identity, enquired whether anyone else was there with the patient, and voiced the purpose of the consultation. The major objective of this pilot service was to follow-up patients and monitor patients by offering general foot care and footwear recommendations as necessary. Neither telephone nor video calls were recorded, documentation was only done on the patient's electronic patient record as customary for all patients. The podiatric telemedicine consultation was conducted via Microsoft Teams video software. Microsoft Teams video software was complimentary for the patient and was endorsed for usage by our public healthcare system. During such video consultation, the podiatrist assessed the patient through a videoconference conversation, enquired about any new symptoms, conducted a virtual physical examination (if required), and discussed and established a treatment plan with the patient. The podiatrist was to address all foot and ankle enquiries posed by the patient.

At the conclusion of the telemedicine consultation (telephone or video based), patients were enquired if they wish to be contacted to complete a five-minute telephone-based questionnaire pertaining to the service. Patients who provided verbal consent were contacted within one week following the conclusion of each podiatric appointment. This questionnaire addressed the satisfaction level on the quality of the remote consultation facilitated by an intermediary.

Outreach Initiatives

Prior and during the pilot phase several presentations related to podiatric telemedicine were delivered to primary care podiatrists who were interested in utilizing this service. These presentations included information related to the running of the proposed pilot service of podiatric telemedicine. These presentations were held during the implementation phase and included:

1. A continuous professional development talk related to podiatric telemedicine targeting podiatrists working in a primary care setting was carried out (February 2024).
2. The drafting and finalisation of a standard operating procedure as required by the department was drafted and approved by all primary care podiatrists and senior management at primary care level (April 2024).
3. An online session conducted to provide a comprehensive overview of the strategy and implementation of podiatric telemedicine in a primary care environment (July 2024).
4. Individual one-to-one visits at numerous clinics to discuss the introduction of podiatric telemedicine and to provide an explanation of the referral process (July 2024).
5. A poster created and displayed in waiting areas and podiatry clinics to inform patients about the recently piloted podiatric telemedicine service (July 2024).

The Telehealth Usability Questionnaire

To assess patient satisfaction throughout the pilot process, the Telehealth Usability Questionnaire (TUQ) (Parmanto et al., 2016) was administered within one week following the conclusion of each podiatric telemedicine visit. The questionnaire aims to assess patient satisfaction and usability of podiatric telemedicine in a primary care setting. The

questionnaire addresses six factors: usefulness, ease of use and learnability, interface quality, interaction quality, reliability, and satisfaction (Parmanto et al., 2016). The tool applies a Likert scale (1=disagree to 7=agree). A mean score for each of the 21 questions with a total possible score of 7 for each question was computed. Furthermore, any verbal feedback received over the phone was noted and documented to better podiatric telemedicine services.

Feedback Survey from Podiatrists

A brief two-question survey was administered to primary care podiatrists to assess their thoughts on podiatric telemedicine and to collect their feedback regarding this new pilot service. This survey was established to assess podiatrists' comments and identify ways to enhance podiatric telemedicine and optimise engagement.

8.6.7 Statistical Analysis

The results from the Telehealth Usability Questionnaire amongst service users were analysed quantitatively and the survey amongst podiatrists gathered were analysed qualitatively and inputted into Microsoft Excel for analysis. The Checklist for Reporting of Survey Studies (CROSS) (Sharma et al., 2021) [Appendix 17] was used to report the results of the Telehealth Usability Questionnaire. Data analysis was conducted utilising Microsoft Excel, with results presented as mean, median, mode, ± standard deviation, and variance. While thematic analysis was used for the feedback provided by podiatrists, whereby themes were derived.

8.7 Results

8.7.1 Patient Demographics and Characteristics

Podiatric telemedicine was a pilot initiative aimed to enhance existing podiatric services by offering accessible care outside of clinical environments and facilitating prompt intervention. From May 2024 to October 2024, there were 37 podiatric telemedicine consultations conducted for 30 patients. All these interactions were conducted by telephone,

as none of the patients opted for video calls. The mean age of this patient cohort was 63 years (range 30 to 87), including 33% males and 67% females. A majority (12 out of 30, 40%) of the patients were follow-ups for foot and ankle musculoskeletal issues. The cases primarily consisted of follow-ups for plantar fasciitis, Achilles tendonitis, and hallux valgus accommodative recommendations. Ten patients (33.33%) were referred for dermatological follow-ups primarily due to superficial ulcerations and cutaneous fungal infections. Seven patients (23.33%) were referred for various nail pathologies, primarily for follow-up of conservative ingrown nail treatment, trauma, or nail infection. Typically, these patients would have had standard face-to-face clinical follow-ups in our primary care podiatry clinics for clinical evaluation and recommendations; however, podiatric telemedicine emerged as an effective alternative for their follow-up care.

8.7.2 Telehealth Usability Questionnaire

All patients who had a podiatric telemedicine consultation were contacted by an intermediary to participate in a telephone-based questionnaire. Patients were asked for their verbal consent to carry out the questionnaire and the intermediary was only provided the contact numbers of the patients and pseudomysed data, hence, the questionnaire was anonymous. Twenty-four patients (24/30, 80%) completed the TUQ. Table 11 shows the results obtained from the TUQ questionnaire.

Table 10: *Results obtained from the TUQ questionnaire.*

Telehealth Usability Questions	Mean	Median	Mode	Standard Deviation	Variance
1. Telehealth improves my access to healthcare services.	6.67	7	7	0.565	0.319
2. Telehealth saves me time traveling to a hospital or specialist clinic.	6.88	7	7	0.338	0.114
3. Telehealth provides for my healthcare need.	5.33	5	5	0.816	0.667
4. It was simple to use this system.	6.50	7	7	0.590	0.348
5. It was easy to learn to use the system.	N/A	N/A	N/A	N/A	N/A
6. I believe I could become productive quickly using this system	5.17	5	5	0.816	0.667
7. The way I interact with this system is pleasant.	6.67	7	7	0.482	0.232
8. I like using the system.	6.71	7	7	0.464	0.216
9. The system is simple and easy to understand.	6.63	7	7	0.495	0.245
10. This system is able to do everything I would want it to be able to do.	4.33	4	4	1.049	1.101
11. I can easily talk to the clinician using the telehealth system.	6.79	7	7	0.415	0.172
12. I can hear the clinician clearly using the telehealth system.	6.88	7	7	0.338	0.114
13. I felt I was able to express myself effectively.	6.50	6.5	6	0.511	0.261
14. Using the telehealth system, I can see the clinician as well as if we met in person.	N/A	N/A	N/A	N/A	N/A
15. I think the visits provided over the telehealth system are the same as in-person visits.	5.29	5	5	0.999	0.998
16. Whenever I made a mistake using the system, I could recover easily and quickly.	N/A	N/A	N/A	N/A	N/A
17. The system gave error messages that clearly told me how to fix problems.	N/A	N/A	N/A	N/A	N/A
18. I feel comfortable communicating with the clinician using the telehealth system.	6.50	7	7	0.590	0.348
19. Telehealth is an acceptable way to receive healthcare services.	6.33	6	6	0.637	0.406
20. I would use telehealth services again.	6.83	7	7	0.381	0.145
21. Overall, I am satisfied with this telehealth system.	6.83	7	7	0.381	0.145

All patients regarded telemedicine as an effective alternative to in-person podiatry appointments. All patients concurred that podiatric telemedicine diminishes travel requirements and enhances accessibility to podiatric care. Most patients either "agreed" or "strongly agreed" that podiatric telemedicine was a positive experience, that they appreciated its use, and that it was straightforward and easy to comprehend, allowing for clear mutual communication and enabling patients to express themselves effectively. Furthermore, they have either "agreed" or "strongly agreed" that podiatric telemedicine is a viable method for obtaining podiatric care, that they would utilise the service again, and that they were generally satisfied with the service rendered. Moreover, patients have "somewhat agreed" that podiatric telemedicine addresses their healthcare requirements concerning foot and

ankle conditions, and they believe this service could enhance their efficiency in managing time for clinical appointments, as it eliminates the need for commuting and lengthy waiting periods for consultations. Furthermore, they "somewhat agree" that podiatric telemedicine services are equivalent to in-person consultations, as patients noted that the telephone call was comprehensive and that the podiatrist diligently enquired about all facets of the patients' conditions, requesting supplementary materials such as photographs when appropriate. When patients were enquired if podiatric telemedicine fulfilled all their expectations, they neither agreed nor disagreed, as their primary concern revolved on the necessity of hands-on involvement. They argued that, in the absence of direct intervention, podiatric telemedicine effectively addresses foot and ankle issues. Lastly, of the twenty-one questions, four from the TUQ were deemed inapplicable because no video calls occurred, as patients chose telephone consultations instead.

Hence, to assess internal consistency, Cronbach's alpha was calculated for the seventeen relevant items out of the original twenty-one, based on responses from twenty-four participants. The resulting Cronbach's alpha was **0.639**, indicating moderate reliability. While this falls slightly below the commonly accepted threshold of 0.70, it is considered acceptable for exploratory research, whereby this research was looking into the responses of patients in relation to the podiatric telemedicine service received. It is important to note that the relatively small sample size may have contributed to this lower reliability estimate, as smaller samples tend to produce less stable variance estimates and can underestimate internal consistency. Future studies with larger samples could provide a more accurate assessment of the scale's reliability.

Hence, the main aim of this research on the feasibility of a pilot podiatric telemedicine service in a primary care context for low-risk patients has been established, although it has highlighted the insufficient engagement observed among healthcare providers in referring

patients to this service. Which has been highlighted in the 'Feedback Survey for Podiatrists', in the next section.

8.7.3 Feedback Survey for Podiatrists

Following thematic analysis, out of forty-four podiatrists eligible to answer this online feedback survey, twenty-eight replied (63.64%). Out of these twenty-eight podiatrists, only five podiatrists confirmed that they had referred patients for a podiatric telemedicine consultation (17.86%). Through thematic analysis it emerged that eleven out of those who did not refer patients said that the patients did not require a podiatric telemedicine follow-up (39.29%), others mentioned that they did not know that the service existed (28.57%), others mentioned that they see high-risk patients (10.71%), 14.28% showed disengagement with service and lack proactivity towards new services while 3.57% stated that they do not see podiatric telemedicine as beneficial. The results of this feedback survey are summarised in Table 12.

Table 11: *Results generated from the Feedback Survey for Podiatrists in a primary care setting.*

What has prevented you from referring patients so far?
No patient required such service till now since telemedicine started.
Did not know it already started.

Lack of opportunity.
Patients having problems that require hands on treatment.
None from my end as patients were either treated, given advice or seen as extra or referred to the appropriate clinic accordingly or given appointments.
All my patient reside in Gozo and this will make it difficult for them to be able to attend the walk-in clinic provided by the telemedicine team, in case they need to be seen urgently.
Patients needed an in-patient appt to physically treat their pathologies.
We were never informed of the service being offered.
Not aware that this service is being offered.
Did not require it.
I have missed the informative session about Podiatric telemedicine due to exigencies of the service so I am unsure about pathway for referral.
I am not aware of what this service entails.
I see high risk stage 2 vascular patients and Rheumatology patients that require physical examination/tools to assess and check joint inflammatory state respectively.
I don't know how it works or anything about it.
Since i see high risk patients (rheumatology) a physical examination is important to identify joint inflammation, or other complications.
Had no idea it existed unfortunately.
All patients required manual treatment.
So far did not meet any right candidates.
At first didn't know that system was in full working order.
There was no need.
Don't know where to refer and I don't think it is much beneficiary to the patients.
Referring was not necessary as yet.
May have given advice over the phone myself when relevant but do not recall having found the necessity or relevance to do so otherwise.

8.8 Discussion

This in-depth pilot study with podiatrists and patients in a public primary care setting established an important foundation for understanding podiatric telemedicine use. At time of writing, the current waiting time for a podiatry appointment in a primary care setting in a Health Centre is 96 days, and for community clinics 104 days, this data was extrapolated

from the electronic patient record system used at the podiatry department in primary care. Conscious of such waiting times, this study aimed to assess the feasibility of podiatric telemedicine in delivering prompt intervention and management assistance to low-risk podiatry patients who do not necessitate hands-on intervention. The study primarily sought to facilitate the smooth incorporation of podiatric telemedicine into existing podiatry services, hence enhancing accessibility to podiatric care and delivering prompt interventions to mitigate waiting times and improve patient satisfaction with the provided service.

Despite the significant momentum generated for telemedicine, podiatric telemedicine for the follow-up of low-risk patients remains an emerging domain within podiatry (Stojmanovski Mercieca et al., 2024). This study found that integrating telemedicine into podiatric care seems to enhance foot and ankle management for low-risk patients. Findings represent the first exploration of podiatric telemedicine for low-risk patients, demonstrating beneficial effects such as better accessibility to podiatric care for service users. Nevertheless, podiatrists presented divergent perspectives, demonstrating a lack of engagement with the piloted service. This pilot study directly surveyed podiatrists in primary care settings to assess their perspectives regarding the influence of podiatric telemedicine on the management of low-risk patients with foot and ankle conditions. The results of these feedback surveys appear to highlight several challenges, including questioning whether the service is adequate, and the lack of information related to the service.

8.8.1 Predominant Referral Ailments via Telemedicine Consultations

The predominant categories of ailments referred to the telemedicine pilot service pertained to musculoskeletal diseases and dermatological skin and nail pathologies. It is well known that certain ailments may be inappropriate for referral to a podiatric telemedicine consultation, especially when hands-on intervention is necessary, such as in cases of nail trimming, conservative therapy of ingrown toenails, or debridement of hyperkeratotic

lesions amongst others (Stojmanovski Mercieca et al., 2024). Furthermore, these findings are congruent with previous research indicating that telemedicine for musculoskeletal follow-ups (Brunilda et al., 2024; Neville et al., 2021) and dermatological issues (Neville et al., 2021) pertaining to the foot and ankle is a viable method for evaluating these problems.

8.8.2 Preferred Communication Methods for Telemedicine Consultations

Findings from this study suggest that although both telephone and video calls are feasible methods to deliver telemedicine consultations, telephone calls emerged as the preferred contact option in this study amongst the study group. Consequently, this aligns with a recent study indicating that virtual platforms for musculoskeletal podiatry telemedicine exhibit significant potential in enhancing accessibility for patients and clinicians, facilitating efficient and flexible service delivery (Brunilda et al., 2024).

Given patients' apparent preference for communication methods, it is essential to customise virtual platforms to meet their specific needs, including preferences, age, internet accessibility, and familiarity with electronic devices (Brunilda et al., 2024). This necessity is supported by the established podiatric telemedicine framework underpinning this pilot service (Stojmanovski Mercieca et al., 2024).

8.8.3 Resistance Towards Change in Podiatric Care Delivery

Although patients have provided favourable feedback regarding podiatric telemedicine consultations, the survey results from podiatrists revealed contradictory findings and raised concerns about reluctance to change. Podiatrists have traditionally engaged in hands-on interventions; however, during the COVID-19 pandemic, primary care podiatrists were directed to conduct follow-ups with patients remotely via telephone conversations, a service implemented ad-hoc without specific guidelines and prior training due to the urgency of the situation. Research indicates that the aspiration and relationships fostering bottom-up change might yield beneficial results for healthcare delivery (Harrison-Blount et al., 2019). The

advantages of multidisciplinary cooperation and establishing networks across healthcare teams and organizations have been emphasised in several studies and policy documents (Jankovic et al., 2024; Bitter et al., 2013). Research shows that the successful transformation of intricate systems, such as hospital services, necessitates collaborative teamwork and cohesive group dynamics to implement and evaluate complex service interventions (Skivington et al., 2021).

Consequently, from a scientific and clinical standpoint, establishing a podiatric telemedicine service presented podiatrists with the potential to transcend their comfort zones and cultivate innovative podiatric care modalities in their daily practices. Resistance to change and cultural behaviour due to the incorporation of digital healthcare methods of communication rather than traditional clinical setting appointments significantly influenced the adoption of the new service. This was corroborated by the responses from the feedback survey, despite the implementation of different outreach programs and an internal standard operating procedure in action. These findings contradict those of a recent study, which indicated that healthcare providers, particularly podiatrists, recognised the potential of a podiatric telemedicine service. The study suggested that with the implementation of specific guidelines and adequate professional training and outreach, providers would exhibit greater confidence in the service (Stojmanovski Mercieca et al., 2024).

During this pilot service, the research team continuously considered interventions to enhance engagement from podiatrists. Recent research has examined methods for managing resistance and proposed several assumptions (Warrick, 2023). Initially, resistance to change was identified as a potential detriment to podiatric telemedicine services during the pilot process; however, it was subsequently viewed as an opportunity to explore new avenues for research. This study aimed to ascertain the reasons behind podiatrists' lack of engagement with the service and claims of insufficient information regarding its functions despite multiple attempts to communicate its benefits. This study recognises and finds

encouragement in the assertion made by Harvard Business Review: "*Let me reemphasize the point that resistance to change is by itself neither good nor bad. Resistance may be soundly based or not. It is always, however, an important signal calling for further inquiry by management"* (Lawrence, 1968).

Further research on podiatrists' behaviours, including disengagement, lack of involvement, diminished performance, or morale, is warranted to ascertain the reasons for such resistance (Warrick, 2023). According to Waldman and O'Reilly, when changes occur, one-third of the individuals will endorse the change, one-third will exhibit scepticism and seek additional information, and one-third will oppose the change (Waldman & O'Reilly, 2022). Numerous factors contribute to resistance to change, and comprehending these factors helps mitigate such opposition and guide leaders in their management. The reasons may encompass human factors (Burnes, 2015), organizational factors (Burnes, 2015), change agents (Endrejat et al., 2021; Klonek, Lehmann-Willenbrock & Kauffield, 2014), and the management of change (Bordia et al., 2011; Ford et al., 2008).

8.8.4 Study Limitations

Despite the overall favourable findings of this pilot study from service users, a heightened emphasis on podiatrist engagement is essential, as these results must be interpreted in the context of certain limitations. The primary methodological limitations included a small sample size, resulting in insufficient statistical power to ascertain the significance of the data, and an absence of direct patient outcome assessments. These limitations indicate that the conclusions of this study should be interpreted with caution. This study suggests a favourable trend for podiatric telemedicine in managing foot and ankle conditions among low-risk patients. This pilot study also reveals the necessity for more significant and methodologically sound investigations to ascertain the effects of podiatric telemedicine on both podiatrists and patients. Moreover, while patients were given the option to select between telephone and

video calls, with telephone calls being the preferred choice, it would be advantageous to implement additional outreach and educational initiatives aimed at the community to encourage the adoption of video calls, as they would enhance the patient-practitioner relationship by closely resembling traditional in-person consultations. Additionally, this study could not evaluate video calls because they were not chosen and hence not utilised in this study despite still being available.

The pilot study lasted five months due to constraints in the research timeline, necessitating modifications to the original service model. Initially, two pathways were intended, including a triaging pathway; however, only the follow-up referral pathway was implemented due to logistical and human resource limitations. To date, this service is still ongoing despite the pilot study and data collection process ended as part of this doctoral research. Presently, the referral pathway has now been opened to not only podiatrists but also general practitioners and physiotherapists working at primary healthcare enable them to refer patients via this innovative service in view that the current waiting list for new cases is approximately three months. This innovative service is offering the possibility that any patients who are deemed urgent and cannot wait for three months for their scheduled appointment are triaged urgently and given an earlier appointment. Furthermore, this service is currently also being used as an additional follow-up for those patients that require monitoring from one consultation to another.

8.8.5 Recommendations for Future Research and Practice

This research sought to evaluate podiatric telemedicine service at a short timeframe, i.e. 6 months. This research now recommends the need for future research, to evaluate podiatric telemedicine's long-term effects in relation to timely intervention and current waiting time for patients (i.e. approximately 3 months waiting list). Also, ensuing research should encompass a broader array of foot and ankle conditions, together with a greater sample size.

Moreover, it recommends fostering better engagement of service with podiatrists considering that the level of engagement throughout this pilot study in relation to podiatric telemedicine was disappointing. Therefore, this research recommends enhancing existing services to maximise podiatric care, address patient requirements, and utilise technological innovations to their advantage for better podiatric care. Such future research would be necessary to modify internal protocols as required for improved service delivery in a timely and effective manner.

8.9 Conclusion

This study offered evidence on the feasibility of podiatric telemedicine for providing effective podiatric care to low-risk patients in primary care settings but highlighted the reluctance from healthcare providers. This work contributes positively to the ongoing research in podiatric telemedicine. This pilot study recommends the encouragement of telemedicine services for podiatric care and indicates the necessity for more extensive investigations into podiatric telemedicine as a service for both low-risk and high-risk foot management. Additionally, it emphasised the need for research addressing the challenges and barriers encountered during telemedicine consultations, aiming to implement strategies that transform these obstacles into opportunities for enhanced podiatric practice.

Chapter Nine – Discussion and Concusion

9.1 Introduction

This dissertation described the background literature related to telemedicine in relation to foot and ankle management and specifically sought to investigate its implementation in the podiatric domain in a primary care setting. It also presented a scoping study delving into the literature, looking into current foot and ankle telemedicine practice guidelines, developing a specific podiatric telemedicine framework, and implementing this framework in a primary care setting through a series of investigations as explained throughout this dissertation. This doctoral research project evaluated the feasibility of establishing a remote podiatry service in a primary care setting for low-risk patients. This assessment aimed to engage all principal stakeholders, including service users, healthcare professionals, and policymakers, to establish a thorough comprehension of the service's development and implementation, thereby fostering a sustainable, person-centred care model.

This chapter discusses all the findings that emerged from this PhD research, and it also describes the new podiatric telemedicine service introduced in the primary care setting as a result of the work completed during this study. This discussion addresses the clinical significance of these findings and their potential contribution to the remote management of podiatry patients in a primary care context. Furthermore, this chapter illustrates how the research findings led to alterations in clinical practice with the introduction of this new service, which is still running to date. Finally, the limitations associated with this PhD dissertation and recommendations for future study are also emphasised.

9.2 The Philosophical Context

This initiative, designed to establish a podiatric telemedicine service within the local public primary care system, was conceived due to several unprecedented developments associated with the COVID-19 pandemic. The subject matter encompassed the role of telemedicine during that period and the department's unpreparedness to execute such a strategy due to insufficient training, primarily utilising telemedicine as a contingency measure in the event of complications. This research project was inspired by the Greek Philosopher, Heraclitus, with his theory, *The Doctrine of Flux and the Unity of Opposites* (Graham, 2021). As detailed in Chapter 4, this theory describes that entities undergo perpetual transformation and that opposing elements coexist harmoniously (Graham, 2021). This research draws significant inspiration from this theory, whose overarching objective is to effect transformative advancements in podiatric care.

The proposed transition being championed diverges from the established methodologies that have historically been utilised within this domain, characterised by in-person consultations conducted in a clinical environment. Thus, the amalgamation of conventional clinical experiential practices with technologically facilitated virtual modalities of healthcare provision represents a plausible strategy, predicated on the acknowledgement that such modifications are imperative considering the ever-evolving nature of the profession.

As described and taught by Heraclitus, where reality is in a constant flux: "No man ever steps in the same river twice" (Graham, 2021). In this research on podiatric telemedicine, this metaphor puts forward the inevitable evolution of healthcare delivery, whereby yesterday's in-person practices need to change to meet future needs. Nevertheless, Heraclitus also claimed that "strife is justice," implying that conflict and arguments can create a prospect to release an element of creativity and balance (Graham, 2021). Therefore, from this point of view, the reluctance shown in this study towards the introduction of podiatric

telemedicine mostly by podiatrists working in a primary care, should not be seen as an obstruction towards a new service being developed, but rather should be considered as a dynamic strength that puts forward critical concerns which include ethical, clinical, and logistical factors. It also induces an environment for collaboration amongst different stakeholders on the potential of creating a more resilient podiatric care pathway. Throughout this research process, as a researcher influenced by the theory of Heraclitus which states that nothing stays the same, emphasising that everything is constantly shifting, growing, or transforming over time (Graham, 2021), it was important to highlight to all stakeholders that what has been traditionally practised for several years, could be adapted, altered, or changed to improve an existing podiatry service without disrupting the one in place.

Such belief also compliments the theories related to organisational change management (Rufo, 2012), whereby it is essential to examine at a managerial level, and across all stakeholders, on the why and how such reluctance towards podiatric telemedicine can be tackled through the lens of such theory that can expose new strategic ways how to go about transformation in podiatric care. As stated by Lewin, through his 'Three-Staged-Theory' of 'Unfreeze-Change-Refreeze' model of organisational change approach, stakeholders need to 'unlearn' custom practices before trying to include new ones (Carpenter et al., 2010, p. 177). Recognising that it is difficult to 'unlearn' such practices, due to the hands-on nature of the podiatry profession, from a clinical and research point of view, the best way to go about such change is by identifying case scenarios where podiatric telemedicine can be used and 're-learn' other alternative routes how such care can be delivered, just as how podiatrists learn how to provide new treatments to patients. Therefore, as described by Lewin, the 'unfreezing' stage would entail a shift in mindset and everyday podiatry routines, which service users and providers are accustomed to. This means challenging service users' and providers' emotional attachment to in-person podiatry consultations. This should be encouraged by putting forward the benefits and drawbacks of such a service to set user

expectations about the service. Setting these expectations can give healthcare providers and patients the option of using the service. Moreover, this theory further resonates with the Heraclitean view in terms of "strife is justice" (Graham, 2021), as 'unlearning' traditional methods of podiatry care can create a certain tension regarding empathy loss or technological disparities which can reveal the need to focus on certain uncertainties through critical dialogue and ways how to adapt to such innovative practices readily. Such a shift in mindset and openness to dialogue can bring about the next phase of Lewin's theory related to the "change" phase (Carpenter et al., 2010, p. 177). In this study, the "change" phase was the pilot study where change was implemented, and podiatric telemedicine was introduced as a new service. This formed part of one of the podiatry department's additional services at the primary care level. This phase further inspired new developments and amendments that may be needed to ensure stakeholder engagement. Lastly, through Lewin's theoretical lens, the "refreezing" phase should allow policy-setting up and ensuring that service users are appropriately aware and informed about this service. Moreover, healthcare providers are equipped with the competencies necessary to deliver a sustainable podiatric telemedicine service in addition to traditional podiatric care.

Alongside Lewin's 'Three-Staged-Theory', integrating behavioural change theories into efforts to mitigate resistance to podiatric telemedicine offers a systematic approach for comprehending and altering stakeholder behaviours. Behavioural theories primarily focus on capabilities, opportunity, and motivation as catalysts for change. The primary perceptions of stakeholders are crucial as they influence the intentions of patients and healthcare providers to participate in podiatric telemedicine. Thus, insufficient patient referrals raise a significant concern over the underlying reasons for this occurrence.

The Podiatry Department possesses significant capacity to offer podiatric telemedicine, and the COVID-19 pandemic created an impetus for developing this service, highlighting the necessity for remote consultations to enhance accessibility to podiatric care and facilitate

timely interventions. Nonetheless, the reluctance from some podiatrists to refer their patients to this innovative service remains, although, to date, this service has been in place for over one year, more referrals are being received, highlighting the point of Lewin that resistance to change is being embraced. Exposing people to alternative ways of understanding different healthcare cultures may encourage them to consider changing their current work practices. Whether they choose to adopt new opportunities or not will be up to them. Disrupting existing clinical practice patterns is not easy and warrants several approaches to change. Practitioners tend to become comfortable with their current organisational culture and may find a lack of willingness to adopt innovative care delivery models (Potthoff et al., 2022).

Changing behaviours at the individual level means inhibiting habitual actions and producing new habits that might feel awkward or unfamiliar to those involved (Potthoff et al., 2022). Although in this study, patients who were offered this innovative service embraced this change, the preference of patients to use telephone calls over video calls for their remote consultation highlights a significant insight regarding the introduction of digital technology in the healthcare system. Moving from a known present state to an unknown desired future state must be carefully considered since the transition state requires careful management, especially since this innovative change is large and complex (Skivington et al., 2021). This may stem from a lack of familiarity with such services or technological advancements. The perception, for many, that telemedicine might be inferior to traditional in-person consultations needs to be addressed.

Planned change represents an intentional attempt to improve operational effectiveness (Hodges, 2014, p. 23). Change is needed to keep updated with new services, such as telemedicine. Whatever the reason for a proposed change, deciding what needs to be changed and how to be changed is difficult, especially in a country like Malta, where change is not embraced easily. These considerations should not be ignored, but instead addressed to identify the need for change and adaptation, highlighting that this service is not to replace

an already established and existing traditional podiatry practice but to foster a new way of improving podiatric care in Malta, which can assist traditional podiatric practice further.

9.3 Identifying the Need for Change in Podiatric Practice and Adaptation to Telemedicine

In no country is there complete satisfaction with the existing healthcare delivery method, and there is a continuing search everywhere for health organisations to change and improve (Thapa et al., 2019). In fact, a local clinical audit of telemedicine practices by general practitioners in primary care indicated that teleconsultations may serve as a suitable substitute to in-person consultations in specific contexts (Vassallo et al., 2024). Consequently, they alleviate the burden on district health centres, preserving the 'walk-in' service for patients necessitating a more comprehensive clinical evaluation and investigation (Vassallo et al., 2024). Therefore, recognising the advantages provided to patients requiring GP advice prompted the need to further investigate the potential of telemedicine for the podiatric profession by modifying it according to podiatric needs. Considering the rapid advancement of podiatric practice locally (Primary HealthCare Malta, 2023), it was timely to investigate alternative innovative methods of providing podiatric care to alleviate the workload and long waiting time presently encountered inside primary care clinics. Whilst it is well recognised that conventional podiatric practice cannot be replaced, remote care delivery modalities, specifically telemedicine, can be enhanced.

Although acknowledging the scarcity of information and knowledge and adopting telemedicine practices locally (not just about podiatry) throughout the healthcare system, telemedicine was primarily adopted to respond to the COVID-19 pandemic. The notable deficiency in literature and clinical environments was observed locally and internationally, leading to the scoping review given as the initial study of this research project, as detailed in

Chapter 5. This scoping analysis emphasised the scarcity of literature concerning telemedicine practice guidelines for foot and ankle care and advocated for creating recommendations tailored specifically for podiatry and other foot and ankle healthcare professionals. Consequent to these results, the researcher created podiatry-specific guidelines for podiatric telemedicine, which, as stated in Chapter 6, were designed to address both healthcare practitioners and service users. To the researchers' knowledge, this podiatric telemedicine framework is the first to be established and formulated through a modified Delphi approach that included service consumers, healthcare practitioners, and policymakers.

The Medical Research Council Framework for Complex Interventions (Skivington et al., 2021) was chosen as the overarching framework for this research. This research aimed to establish an innovative service, classified as a complex intervention (Skivington et al., 2021). Consequently, the investigation of podiatry as a profession and the analysis of service implementation within a primary care framework were essential elements of this research. This research sought to implement change in core podiatric practice for low-risk patients, requiring the involvement of all stakeholders to facilitate the sustained advancement of this service. This study considered many aspects, including geographical, organisational, social, and cultural characteristics, that could have significantly impacted the implementation of this pilot service during the Delphi study. Despite favourable participation and enthusiasm from stakeholders during the development of the podiatric telemedicine framework in the second study, podiatrists exhibited considerable reluctance to the introduction of remote podiatric care delivery. Given their everyday routines, most podiatrists─overlooked alternative methods for delivering care to patients who do not require in-person intervention. This reluctance to refer patients for remote consultations was seen during the implementation phase, despite the acknowledgement of this service by the department and higher authorities, which remains operational to date. It is highly unrealistic to expect change strategies to be

effective immediately in an organisation with established practices, beliefs, and values (Scott et al, 2003). However, attempts to "reform" the design of the health system has been a recurrent theme in Western European countries for many years (World Health Organisation, 2019). Although reform processes have already commenced in Malta, changes are being implemented at a slow pace in relation to telemedicine practice.

Moving away from a medical, curative model of care towards a more comprehensive system of care is warranted (Iacobucci, 2018). As shown in this research, the need for podiatric telemedicine in a primary care setting have been highlighted and has provided specific evidence-based guidelines for the delivery of podiatric telemedicine, to help in the transition of clinical care to remote telemedicine options to provide patients more convenient and accessible podiatric care from the comfort of their home. Furthermore, this framework can serve as a safeguard should healthcare emergencies require remote consultations rather than in-person visits, as seen during the COVID-19 pandemic.

Although technological limitations exist, particularly regarding digital literacy among some individuals, this should not discourage service users and healthcare providers from using such a service when appropriate. Instead, it should be viewed as an opportunity for growth for the profession and service, enhanced outreach to more service users, and development of more evidence-based practice services to the community. As telemedicine practices aim to facilitate more efficient communication with healthcare providers, this can potentially lead to more timely interventions. A testimony of this is the recent study by Brunilda et al. (2024) which established that the implementation of a virtual musculoskeletal podiatry service markedly alleviated patients' pain, provided effective conservative management plans to patients and reduced waiting times from referral acceptance to initial appointment, thus benefiting patients and alleviating NHS waiting lists (Brunilda et al., 2024).

9.4 Podiatric Telemedicine – Insights on Challenges and Opportunities

Telemedicine has become an essential instrument of modern healthcare, including remote consultations, diagnostics, and follow-up care (Anawade et al., 2024). The integration of this system is commonly supported due to its potential to relieve pressures on healthcare systems, particularly in primary care environments (Ezeamii et al., 2024). Nonetheless, obstacles include digital literacy, data security, and healthcare inequality (Haimi, 2023). Some asserted that telemedicine improves accessibility and efficiency (Anawade et al., 2024; Haleem et al., 2021), while others emphasised its drawbacks, such as diminished clinical accuracy and the potential increase of healthcare disparities (Gajarawala & Pelkowski, 2020; Haleem et al., 2021). This section aims to critically assess the insights from the three studies conducted during this research on developing and implementing a podiatric telemedicine framework in primary care, addressing the challenges faced and proposing strategies to mitigate these issues while identifying opportunities to enhance healthcare and podiatric care overall.

Primary care serves as the initial access point for healthcare services; yet it faces increasing patient demand, a deficit of physicians, and geographical challenges (Greenhalgh et al., 2020). Podiatry services in a primary care context are distributed across various health centres and community clinics accessible throughout the island, locally, providing complimentary transportation for patient pickup and return home. While podiatry services in primary care are readily accessible, this does not imply that the approach is efficient or that further action is unnecessary. Technological improvements should prompt the need to seek additional methods for delivering podiatric care. Occasionally, individuals only require reassurance and a consultation with a podiatrist over a specific condition that may be trivial or potentially detrimental to their foot health. Throughout this research project, one notable

observation was that elderly patients consulted via telemedicine expressed gratitude not only for providing podiatric care and advice but also for the podiatrist's call, which made them feel valued and reassured regarding their foot health and concerns.

This underscores the need and relevance of both patient-centred and person-centred care. In this research, patients consistently prioritised their preferred method of receiving podiatric care. Allowing eligible patients to select between a remote or in-person follow-up appointment empowers them to decide on their podiatric care preferences. Although telemedicine may risk depersonalising healthcare by replacing face-to-face consultations with seemingly transactional virtual interactions, healthcare professionals must adopt strategies that enhance patient engagement, ensuring that telemedicine consultations remain interactive, empathetic, and responsive to patients' psychosocial needs. Consequently, hybrid podiatric care that combines telemedicine with traditional in-person consultations can maintain the human aspect of podiatric care while leveraging the efficiencies of digital health technologies for follow-up as needed and for appropriate foot and ankle guidance and management.

9.4.1 Challenges in Podiatric Telemedicine

The challenges in implementing podiatric telemedicine were significant. The deployment of a pilot podiatric telemedicine programme in a primary care environment faced challenges primarily owing to internal regulations and poor engagement issues, technical concerns, ethical dilemmas, digital divide and patient-provider relationship.

The Implementation Process – Plan Deviation

The research plan initially outlined two operational pathways, the first of which functioned as a triage service for patients contacting call centres and podiatry clinics, enabling referral to the podiatric telemedicine team for remote assessment. The second pathway was designated for follow-up appointments for patients who could benefit from telemedicine and

did not require hands-on assistance. Owing to internal departmental discussions and insufficient human resources, only the second pathway was sanctioned to be included in this initial piloting of podiatric telemedicine. Consequently, this hindered the enrolment of patients suitable for podiatric telemedicine consultations, as it relied solely on referrals from podiatrists in primary care settings. During the implementation phase of this pilot service, various initiatives were undertaken to enhance insight and inform podiatrists about the service. These included ongoing professional talks organised by the department, the display of posters in all primary care clinics to raise awareness among podiatrists and patients, and direct one-on-one outreach with podiatrists. Additionally, several emails were sent out throughout the pilot period to ensure podiatrists were informed about the service, yet engagement remained poor, as highlighted in the sections below:

Healthcare Providers Disengagement

Despite significant technological developments, inadequate engagement and telemedicine adoption have been evident for several years. As Puskin and Sanders (1995) highlighted, clinician acceptance of technology remains a worry that has yet to be resolved. They additionally stated that for telemedicine systems to succeed, they must be regarded as beneficial and valuable by the patients and practitioners utilising them. Considering such a statement, which was made over 30 years ago, it is still concerning that despite the numerous technological advancements, acceptance and engagement with such practices are still low. Several factors contributing to this reluctance and disengagement may be ascribed to podiatrists' emotional and cultural ties and beliefs regarding podiatric care, technological apprehension and usability issues, privacy, security, and regulatory obstacles, digital divide and healthcare equity challenges, as well as the possible decline of private podiatric practices due to the proliferation of free primary care podiatry services accessible to the community.

Healthcare professionals and service users equally value the practices of in-person consultations: the handshake that conveys empathy, the thorough physical examination that

reveals unarticulated ailments, and the shared physical environment that builds trust. Podiatrists who regularly see patients, some of whom may have been receiving routine podiatry treatment for several years, develop relationships beyond the exclusive realm of podiatric care. This situation reflects Heraclitus's concept of unity through opposites, suggesting that clinicians seek stability in their established methods and the adaptability necessitated by technological advancements. This contradiction creates an instinctive reluctance to exchange in-person rapport for digital channels for conducting video or telephone calls. Consequently, a viable solution to mitigate emotional and cultural attachment is to train all podiatrists in primary care to deliver telemedicine services, enabling patients requiring telemedicine consultations to be attended by the same podiatrist who typically provides in-person care at the clinic, thereby preserving the established connection throughout the patient's journey in the podiatry clinic. This approach enables patients to avoid restating specific details and maintains trust, as the podiatrist doing the in-person consultation differs from those providing remote consultations.

Additionally, implementing technology may have engendered confusion and scepticism over the service (Offermann et al., 2023), as engaging with patients in this manner within the podiatry department up to a few years ago was atypical. There may be an element of apprehension stemming from potential technical difficulties during a remote telemedicine session, which could become more time-consuming if the podiatrist or patient cannot resolve the issue independently and requires assistance. In this scenario, the podiatrist may question the utility of telemedicine consultations, considering that a technical issue could necessitate an in-person appointment with the patient. The anxieties that technology may provoke highlight Heraclitus's insight, suggesting that the tension arising from these circumstances might be harnessed to develop new strategies for addressing such issues through suitable training and support to push through such challenges.

Moreover, it was observed that a high level of reluctance towards changing dynamics from clinical to remote consultations was predominant. This unwillingness towards podiatric telemedicine can be described as multifactorial, embedded in both human psychology and systemic limitations. From a Heraclitean standpoint, that "everything flows" and that comprehension results from the pressure of opposites, this response underlines necessary inquiries about empathy, equity, security, and the advancing care delivery models (Graham, 2021). This hesitancy towards change from podiatrists could be attributed to the fear of losing the podiatrist-patient relationship, often formed in a clinical environment. Such apprehension has also been corroborated in other research and highlights how this can hinder telemedicine practices from gaining steady uptake in already established healthcare systems (Anawade et al., 2024). Therefore, in this context, it is essential to recognise that this research embraces reluctance as a catalyst and an opportunity for further growth. This is not only to encourage and support telemedicine practices, but also at a professional level to promote further modalities of how podiatric care can be delivered and to ensure that human interaction and rapport can still be maintained through effective communication.

Although telemedicine has the potential to democratise healthcare, certain groups may still face challenges related to inadequate broadband access or devices, rendering virtual visits a burden rather than an advantage. This mismatch reflects Heraclitus's idea that underlying tensions influence observable results: if the digital divide remains unaddressed, telemedicine may exacerbate, rather than mitigate, health disparities. Consequently, although the service is complimentary and does not burden patients financially, the necessary devices and equipment may impede telemedicine use. Therefore, promoting and cultivating a learning environment for the community to utilise and understand these services is crucial, as knowledge enables the community to expand and leverage available possibilities and services. Consequently, in accordance with Heraclitus' principles, resistance cannot be eliminated but instead redirected by converting adversities into opportunities for progress.

Various tactics may be employed to convert these challenging circumstances into opportunities; nevertheless, it is essential to recognise that such innovative service delivery dynamics cannot be fully embraced and executed instantaneously. The significance of thorough training and education cannot be overstated. Based on personal observation as both a user of services and a healthcare provider, the community remains largely unaware that telemedicine services offered by general practitioners are now operational, much less the availability of podiatric telemedicine services. The notion of telemedicine is nascent in Malta, necessitating considerable effort to educate the public on its advantages and applications when required.

Conversely, practical seminars and virtual simulations could enhance proficiency in telemedicine platforms, enabling healthcare professionals to cultivate confidence in virtual 'bedside manner' and resolve obstacles before engaging with patients remotely. Furthermore, students pursuing undergraduate studies in podiatry should be acquainted with telemedicine and adopt a progressive perspective regarding podiatric care services. This approach aims to promote the utilisation and underscore the significance of telemedicine in enhancing access to podiatry services, facilitating prompt interventions, and reducing patient wait times for consultations with podiatrists.

While advocating for the imperative to bridge the digital divide, a paradox arises over the justification for reducing this barrier, given that podiatry clinics are available in every region in Malta, enabling patients to obtain urgent care when required. From a policymaker's viewpoint, promoting universal access to dependable internet connectivity may not constitute a sufficient justification to ensure the community's seamless access to the internet solely for telemedicine. Telephone consultations are thus considered more beneficial and readily acceptable for patient communication. Therefore, the rationale for promoting digital technology and ensuring a dependable internet connection is based on the observation that, not only in podiatry, but many primary care consultations also do not invariably require

direct physical intervention, and telemedicine can sufficiently address a patient's enquiries. Consequently, primary care should formulate a strategic plan that envisions the remote delivery of care when appropriate, alleviating the burden on clinical practice and reserving in-person appointments for urgent issues necessitating traditional consultations.

Given that primary care podiatry clinics predominantly operate in the morning with limited availability in the afternoon, a telemedicine service extending its hours could accommodate patients unable to visit the clinic for various reasons or due to the absence of services during those times. Implementing podiatric telemedicine during periods when clinical practice is unavailable would enhance the profession by providing increased accessibility to podiatric care and facilitating timely interventions. Although it is recognised that general practitioners can address such situations via their 24/7 telemedicine service, they lack direct channels to promptly refer patients to the podiatry department, as patients receive a referral to schedule an appointment or are asked to book an appointment over the phone. In contrast, a podiatrist from the podiatric telemedicine team could immediately assess and offer same-day consultations if necessary. This viewpoint indicates that the proliferation of podiatry services in primary care could hinder private podiatry practices, perhaps resulting in adverse conditions for podiatrists and reinforcing obstacles to podiatric telemedicine. While these conclusions were not explicitly stated in the research, it is evident that the growth of public primary care services is perceived as a hindrance to private practice. Consequently, although the need to regularly obtain feedback from healthcare providers regarding such services is clear, it is apparent that resistance may stem from other unmentioned issues.

Therefore, from a philosophical perspective aligned with Heraclitus, opposition to telemedicine is not a fixed obstruction but a context in which significant transformation occurs, thus demanding a complex intervention, which is how the development and implementation of this service was considered. By addressing the fundamental issues and structural barriers that generate scepticism, stakeholders can convert opposition into a

framework, guiding telemedicine towards models that respect the enduring nature of human connection and the certainty of change. Metaphorically likened by Heraclitus to a flowing river, tension is not an adversary but a catalyst for progress, urging researchers, clinicians, and policymakers to advance with awareness, maintaining equilibrium between tradition and innovation.

Onboarding of Patients

Owing to the previously noted plan deviation authorised by primary care higher authorities during the implementation phase of this pilot study, the only option for enrolling patients and referring them for podiatric telemedicine consultation was via a podiatrist referral following an in-person consultation with the patient and deeming the patient appropriate for the study. The podiatric telemedicine team, comprised of three state-registered podiatrists, two employed full-time and one part-time, all consulted with patients in-person and virtually during their everyday patient load. For the podiatrists in this research study, implementation posed fewer challenges than patient onboarding. Findings and observations during the pilot phase indicate that patient onboarding faced challenges primarily due to podiatrists' disengagement with the service. Reasons for these included perceptions of inefficiency and lack of utility given the hands-on nature of their profession. Some podiatrists noted that their elderly patients may lack the technological resources for telemedicine consultations, while others stated they were offering ad-hoc telephone services and did not refer any patients to this service. Additionally, despite multiple attempts to disseminate information regarding this new service, a few podiatrists reported that they still did not have sufficient awareness about the running of this pilot service, and thus expressed a preference for maintaining in-person consultations due to the high-risk nature of their patients.

The reasons above were considered significant and informed the modifications needed to attract and engage more users towards podiatric telemedicine and amend internal procedures required to ameliorate the service. Additionally, revision of such procedure's sheds light on

the need to enhance human resource capabilities whereby these should be prioritised alongside primary clinical personnel, particularly podiatrists, while recognising their participation in innovative initiatives and advancing their knowledge and technological skills. If the aim of introducing podiatric telemedicine in primary care is to be implemented, it necessitates a collaborative effort wherein podiatrists in clinical environments collaborate closely with the podiatric telemedicine team and refer patients appropriately in a timely manner. Pursuing activities that seek to make a real difference in health outcomes and fostering a culture of placing the patient at the centre of healthcare services is warranted (Maddox, 2024), highlighting the importance of a person-centred approach (Coulter & Oldham, 2016).

Introducing a strong communication strategy amongst clinicians helps avoid misunderstandings that can ultimately thwart the best-laid plans (Oliveira, 2024). This new podiatric telemedicine service was not initiated to hinder existing services but to enhance and promote the existing ones. Traditional reservations need to be overcome by healthcare professionals, and the introduction of a "new environment" should be discussed and analysed constructively. A study by Gagnon et al. (2016) corroborated this resistance and argued that reluctance to adopt telemedicine stemming from apprehensions of workflow disruptions, heightened workload, and potential liability concerns might be reasons for such resistance towards new healthcare modality practices. Additionally, Inniss (2024) further supported and highlighted reasons for opposition towards telemedicine use in podiatry through his study, whereby the author interviewed 13 podiatrists in the private sector, revealing that the geriatric demographic's difficulties primarily hindered patient onboarding in understanding the process and providing inadequate images or angles for foot examinations. Some patients lacked the necessary technology but still used telephones, complicating the ability to conduct examinations without visual contact. Such findings of telephone use resonate with findings from this research since all consultations were carried out over the phone.

Moreover, several podiatrists expressed unease in providing remote diagnoses (Inniss, 2024), which was also noticed from the podiatrists' feedback working in a primary care setting in this research. This research further corroborates with Inniss (2024), who stated that the absence of physical contact with patients significantly impeded the onboarding process, as hands-on intervention and examination were not feasible. These results align closely with findings from this study, indicating that most patients in podiatry clinics within a primary care context are elderly, mostly requiring trimming of nails and debridement of hyperkeratotic lesions, which demands in-person intervention.

Nonetheless, additional conditions are present, and this study revealed that most patients referred for telemedicine consultations necessitated follow-up for dermatological and musculoskeletal conditions, as well as general footwear and footcare recommendations. Most referred patients were geriatric, and all preferred a telephone contact over a video call. Patients were requested to submit images or videos related to their condition as required via email to the podiatrist delivering podiatric telemedicine; if this information was not supplied, they were scheduled for a subsequent clinic visit. It was observed that telemedicine was being contemplated as an interim solution between appointments, particularly for individuals with dermatological conditions experiencing prolonged waiting periods.

Technology Infrastructure

For this study to proceed, all technological infrastructure needed to comply with departmental norms, as a standard operating procedure outlining the necessary infrastructure for conducting podiatric telemedicine consultations. These had to be established prior to the initiation of this pilot programme. The recent implementation of an electronic patient record system in primary healthcare enabled telemedicine consultations, allowing authorised healthcare providers to view patient health data electronically from any location. A limitation observed during the pilot investigation was the downtime of the electronic patient record

system, which prevented telemedicine consultations until the system was restored. Moreover, a contributing reason to technological infrastructure issues was the occasional experience of poor internet connections, which impeded the use of the electronic patient record. This study did not conclude or verify any deficiencies in hardware or software related to telemedicine platforms, as all podiatric telemedicine consultations were conducted by telephone and therefore required patients to send photographs or videos through email.

Sustainability, Digital Divide, Health Equity and Legal Implications

This research focused on the feasibility of developing and implementing a podiatric telemedicine service within a primary care context. Sustainability was a crucial element of this research project. A recent study indicated that for such services to be sustainable, stakeholders should prioritise recognising cultural resistance, implementing user-focused outreach and educational initiatives, acknowledging service limitations to align healthcare provider expectations, ensuring adequate IT knowledge and skills, and maintaining a reliable internet connection (Stojmanovski Mercieca et al., 2023). During the implementation process, a significant pushback from healthcare practitioners was noticed. As a researcher, it raised enquiries around readiness for change, acceptance of novel services, and cultural norms that podiatrists have always been accustomed to, which required a hands-on intervention, and the possibility of telemedicine might have been just a remote idea. One of the fundamental advantages of telemedicine is its ability to enhance accessibility to healthcare; nevertheless, the utilisation of digital platforms also raises a significant concern known as the digital divide (Smith et al., 2020). Marginalised groups, such as the elderly and those with socioeconomic disadvantages, frequently lack access to essential technology (Nouri et al., 2020). Although telemedicine is promoted as a means of promoting equity, it paradoxically threatens to exacerbate gaps by favouring technologically adept, affluent patients over others with limited digital access. Rural patients may encounter heightened

obstacles due to insufficient broadband connectivity (Wang et al., 2021). The efficacy of telemedicine relies on patient engagement; however, variations in digital literacy may marginalise those who require it most, exacerbating existing healthcare disparities instead of alleviating them.

This effort aligns seamlessly with the National Health System Strategy for Malta 2023-2030, which aims to incorporate digital methods to engage and support patients outside of clinical environments (Ministry for Health, 2023). Malta's telemedicine service advanced swiftly during the COVID pandemic, culminating in the establishment of the Primary HealthCare Telemedicine Centre, manned by family physicians and specialist trainees. Virtual medical consultations have become commonplace, facilitated by an efficient Client Support Centre (Primary HealthCare Malta, 2023). These services have maintained and improved patient care and have persisted after the pandemic (Vassallo et al., 2024) but have not been broadly introduced by other professions. A robust legal framework is essential to facilitate telemedicine delivery, serving as a significant enabler for successfully implementing the Digital Health Strategic Roadmap. The proposed National Electronic Health Record (NEHR) Regulations under the Public Health Care Act establish the legal framework for the bidirectional exchange of personal health data between the NEHR platform and its users. The EU's proposed European Health Data Space Regulation directly applies to Malta without the need for national law transposition, significantly influencing the advancement of digital health services in Malta and throughout the European Union regarding both primary and secondary health data usage (European Parliament & Council of the European Union, 2025). Additional pertinent EU legislation, like the General Data Protection Regulation and the Network and Information Security (NIS) Directive, will persist in shaping the evolution and operation of digital health services (European Parliament & Council of the European Union, 2016).

Furthermore, as stated in the National Health Systems Strategy for Malta 2023-2030, the effective adoption of digital health services is contingent upon citizens' and healthcare professionals' digital health literacy (National Health Strategy, 2022). This strategy fosters intersectoral collaboration among the Ministries of Health and Education and tertiary educational institutions in Malta, aiming to enhance digital and health literacy among all citizens (National Health Strategy, 2022). This initiative supports increased citizen engagement and patient self-management through the improved utilisation of digital technologies, while also advancing the digital competencies of health professionals. Furthermore, the cultivation of proficient digital health professionals constitutes an additional problem to be addressed by the Digital Health Strategic Roadmap (Ministry for Health, 2023). Consequently, efforts should not concentrate exclusively on a single profession but encompass all professions to guarantee that technological advancements are adopted comprehensively, facilitating accessible and improved healthcare for patients and ensuring that all stakeholders are adequately informed and equipped to implement such innovative practices when feasible.

Ethical Dilemmas

Throughout this research study, ethical considerations posed challenges throughout the deployment of podiatric telemedicine. This study ensured strict adherence to patient privacy, obtained informed consent verbally or in writing before any intervention, and maintained the doctor-patient relationship to the greatest extent possible, recognising that these factors become increasingly complex in telemedicine practice. A study by Abdul-Rahim and Alshahrani (2023) indicated that ensuring the security and confidentiality of patients' personal information and fostering a trusting relationship between healthcare providers and their patients in a virtual environment is a significant problem in telemedicine. Careful analysis and effective policies must be enacted to address these issues, as data security is a significant concern in telemedicine practice (Abdul-Rahim & Alshahrani, 2023).

In podiatry, physical examinations are essential for precise diagnosis and cannot be entirely substituted by virtual consultations. Podiatric telemedicine enhances patient access to podiatric care; yet it is evident that it lacks the physical interaction between patient and clinician. Podiatry is predominantly a tactile speciality, and most procedures conducted during routine visits necessitate physical contact. Podiatric telemedicine is constrained by the absence of the human element (tactile interaction) during virtual consultations. A recent study by Inniss (2024) demonstrated that podiatrists assert that their role during an in-person visit extends beyond mere physical contact with the patient for treatment. A natural connection exists that cannot be attained via telemedicine. This study indicates that the absence of physical contact and sustaining a connection sometimes proved challenging. Occasionally, patients perceive that they can address specific difficulties with the respective podiatrist, resulting in the session functioning as a ‘counselling session.’

Furthermore, data from this study indicated that podiatrists were hesitant to engage with patients without direct hands-on intervention. Inniss (2024) agreed that while podiatrists believe they can communicate effectively via telemedicine, the absence of a physical component is clear. Consequently, the practitioner-patient relationship must be maintained throughout this process of podiatric telemedicine consultation, necessitating efforts to prevent its erosion. Hence, podiatrists familiar with traditional in-person encounters may confront challenges throughout the transition, noting difficulty in fostering rapport with patients via virtual consultations. Patients may also oppose telemedicine due to a desire for face-to-face care, doubts over the quality of distant consultations, or unease with digital platforms. In the absence of effective change management tactics, such opposition may obstruct the successful incorporation of telemedicine into primary care systems, specifically in podiatric care, as was the case in this pilot study.

9.4.2 Podiatric Telemedicine Opportunities

The implementation of podiatric telemedicine enhances the efficiency of health resource management, including healthcare personnel and equipment, offers a departure from conventional methods of delivering podiatric care, and fosters a learning environment for all stakeholders involved. This upcoming section addresses these domains.

Efficient Healthcare Resource Management

Podiatric telemedicine enables podiatrists to deliver services to patients remotely, hence diminishing the necessity for podiatrists to be present with the patient. Podiatric telemedicine enhances the overall quality of podiatric care services by facilitating more rapid interventions. Enhanced accessibility to podiatrist consultations enables patients to obtain expedited and specific care without waiting several weeks for an in-person clinical session. Telemedicine may bypass the core podiatry appointment when specialised podiatric care is required. For instance, if a patient presents via telemedicine with a primary complaint of a musculoskeletal condition, through remote examination of the patient, the patient can receive conservative management treatment. They can also be scheduled for a biomechanical appointment immediately, rather than enduring a core podiatry appointment that may result in a wait of nearly 10 weeks, followed by a referral for a biomechanical appointment, which would entail an additional waiting period of several weeks. The adoption of telemedicine presents potential to create innovative healthcare models. Through technology, healthcare practices can be established in more adaptable and digitally integrated formats, such as podiatry consultations via mobile applications, 24/7 teleconsultation services, or the employment of wearable technology for real-time patient health monitoring. These technologies can transform the historically inflexible healthcare service delivery method to be more adaptable and responsive to patient requirements.

A Leap into New Beginnings

As mentioned in the literature review, telemedicine services in Malta advanced rapidly during the COVID pandemic (National Health Strategy, 2022), although not across all health professions. Post-pandemic operations resumed their standard traditional procedures; clinics reverted to face-to-face consultations. This awakened concerns about the abrupt transition, with insufficient consideration for continuing remote podiatric consultations.

This research study aimed to investigate the viability of establishing and integrating a podiatric telemedicine service within the existing podiatry offerings within the primary care framework. This is an unforeseen opportunity for a new beginning and the expansion of podiatry services inside the public sector. It presents a possibility of delivering podiatric care using unconventional methods. Recognising that it may not apply to all patient cases, it could enhance existing practices by reducing inefficient clinical sessions and reserving them for patients requiring hands-on assistance. Therefore, remote methods should not dissuade podiatrists from reevaluating traditional care delivery practices (Morrow, 2020). This opportunity warrants careful consideration and should be embraced, as it allows for the development of new services for the podiatry profession and other healthcare fields. Such an initiative aims to establish remote consultation practices, ensuring their implementation and accessibility through evidence-based research and practice in anticipation of potential future health crises.

Potential for Growth – A Learning Opportunity

At the commencement of COVID, the utilisation of telemedicine surged in podiatric clinical care practices (Terry, 2020). Podiatrists adapted to the "new normal" and discovered methods to implement telemedicine in their practice (Bowen et al., 2021). This PhD research has been regarded as a learning experience for patients, podiatrists, and

policymakers alike. Podiatric telemedicine was an innovative concept in Malta, with patients enquiring about the feasibility of remote podiatry consultations throughout the development process, as they did not comprehend that podiatry encompasses more than merely toenail trimming and lesion debridement. This underscores the necessity of enhancing the profession's promotion to educate patients about podiatry. Cultural norms are challenging to alter; patients familiar with podiatry sessions in a clinical environment must be informed and educated about alternative practice modalities, clarifying that a telemedicine consultation does not imply an inferior service. The initiative to educate patients about podiatry should commence with all practising podiatrists. Patients should not be treated merely as numbers in our clinics; they must be educated about their foot health and made aware of the resources accessible to them should the need arise. Each new project involves a learning curve encompassing healthcare personnel, patient education, and operational efficiency (Greenhalgh et al., 2020).

Implementing change presents problems that can be transformed into opportunities for growth, whether in professional, clinical, or research contexts. Inniss (2024) identified a specific problem in his study: podiatrists encountered difficulties educating patients about new technologies for remote consultations. This leads us to another consideration: podiatrists in this study may lack sufficient time to inform and educate patients about new podiatric care services due to the challenges associated with patient education. It may be more feasible for them to bring patients to the clinic rather than educating them on other podiatric care modalities that could necessitate greater digital expertise from the patients' perspective. Telemedicine enhances accessibility and is most effective when there is dependable connectivity to a cellular network or Wi-Fi (Haleem et al., 2021). These findings may clarify why patients preferred a telephone call over a video call. Telemedicine can enhance the organisation, efficacy, and accessibility of healthcare globally (Haleem et al., 2021). Thus, this approach should not be overlooked; instead, it should be advocated for incorporation

into existing healthcare practices. As a result, these findings necessitate more education and outreach measures to set a new standard for remote podiatric practice and healthcare in general.

Training initiatives should emphasise digital literacy, ethical considerations, and optimal practices for virtual consultations. Podiatrists and healthcare professionals must engage in continuous professional development to incorporate telemedicine effectively into their workflow while maintaining the standard of care. Outreach initiatives could enhance telemedicine adoption, especially among resistant patient populations, through public awareness campaigns, community workshops, and customised digital education programmes that bridge the knowledge gap and cultivate trust in remote healthcare solutions. Such systems should target all demographic ages.

Furthermore, academia plays a pivotal role in remote clinical practices; the issue has evolved into an opportunity, which the University of Malta addresses with its Master of Science in Digital Health degree (University of Malta, n.d.). Moreover, establishing a role as recommended in the National Health Systems Strategy for Malta 2023-2030 within the Information Management Unit to engage consultants possessing expertise, knowledge, and interest in Digital Health Strategic and Operational Development is imperative. This role aims to assist the Chief Information Officer advance and accelerate digitalisation across the National Health System (National Health Strategy, 2022).

Hybrid Podiatric Care

Incorporating podiatric telemedicine as a potential method for consultations during follow-up appointments highlights the feasibility of a hybrid service that combines traditional clinical practice with remote means. This enhances accessibility to podiatric care and facilitates timely interventions to conserve time and resources and prevent limb loss.

Therefore, for the effective adoption of podiatric telemedicine and the retention of services following the pilot phase, the opportunities could be adopted for future enhancements.

9.5 The Contribution to Knowledge

The most significant contribution to knowledge as a result of this research study to date is a set of published evidence-based guidelines for both patients and healthcare providers in the domain of podiatric telemedicine (Stojmanovski Mercieca et al., 2024), also found in Appendices 10 and 11. This project has comprehensively analysed the presently available telemedicine guidelines for managing foot and ankle pathologies to formulate these guidelines. The results indicate that with the current contributions, further improvements are necessary to the existing literature/guidelines, focusing on enhancing their rigour.

The current body of literature predominantly consists of orthopaedic guidelines, with limited inclusion of references pertaining to podiatrists. Therefore, due to these findings, the subsequent inquiry sought to address this shortcoming identified in the academic literature: the absence of a specific set of guidelines designed for podiatric telemedicine that encompasses core podiatry services. This evidence-based guideline attempted to offer guidance to practitioners specialising in foot and ankle care regarding the utilisation of telemedicine for forthcoming remote consultations. The guideline was developed with careful consideration of the local healthcare system to ensure its relevance and suitability within the specific local context.

However, it is also possible to adapt this guideline to meet the needs of other healthcare professionals, not only podiatrists, should the need arise. This guideline can be tailored to specific professional needs, acknowledging that no profession is alike. However, overlapping scenarios may arise, and this guideline can benefit other professions by allowing them to follow up using an evidence-based guideline when no hands-on intervention is required. The final implementation phase of this research project provided further insights

into the current body of knowledge regarding telemedicine, with a specific focus on podiatry. Implementing the developed guideline during a pilot study and extensive outreach and training initiatives clarified telemedicine's potential in podiatry within the local public primary care domain, thereby augmenting patient care quality. It is essential to highlight that telemedicine for podiatry was designed to complement the existing clinical services. To the best of the researcher's knowledge during the time of research, this study was the first to develop and implement podiatric telemedicine in a primary care setting for low-risk patients.

Moreover, this PhD research has been the first to address the gap in the literature regarding the establishment of podiatric telemedicine guidelines. It has brought valuable insights to the existing literature concerning the implementation of podiatric telemedicine in the Maltese public primary care setting by identifying stakeholder perspectives. Thus, this should positively impact uptake for organisational learning strategies to facilitate the process of developing, disseminating and supporting evidence-based practice.

The findings of this PhD research project have contributed to narrowing the gap in podiatric telemedicine practice literature. The initial scoping research demonstrated the necessity for telemedicine practice guidelines relevant to podiatry. This study led to the development of podiatric telemedicine guidelines, which were subsequently piloted and implemented in a primary care setting within the public sector. Therefore, this research contributed to both development and implementation domains.

9.6 The Impact of the Research on Service Users and Providers, Society, and Future Research

Podiatric telemedicine is a novel and progressive method for delivering podiatric healthcare services. However, there are instances where practitioners may unintentionally engage in telemedicine without adhering to proper structure and evidence-based practices. Despite this,

the service user still benefits from the convenience of seeking expert advice from the comfort of their homes, resulting in time savings and reduced travel-related stress and expenses.

The potential benefits of increased availability of podiatric care through remote consultations include improved patient satisfaction and related outcomes, as well as reduced strain on primary healthcare and healthcare systems in general. In addition, podiatric telemedicine can contribute significantly to society's general welfare through timely intervention and preventive measures, thereby decreasing the prevalence of chronic foot ailments and fostering a heightened awareness of foot health. Nevertheless, it is crucial to consider that confident clinicians may still demonstrate reluctance towards telemedicine due to apprehensions regarding the constraints of remote assessments, patient data confidentiality, and the indispensability of in-person care for podiatric treatment involving physical intervention. Hence, resolving these concerns may enhance the acceptance and engagement of telemedicine among service users and providers.

The adoption of telemedicine holds the potential for researchers to explore new opportunities in driving evidence-based practices, refining treatment, advising protocols, and fostering global collaboration among experts. In brief, the implementation of podiatric telemedicine holds the potential to bring about significant changes, offering advantages to individuals seeking health assistance through its convenient and easily accessible care. Moreover, it benefits society at large by enhancing foot health outcomes. Additionally, researchers in the field can anticipate expanded opportunities for investigation and knowledge acquisition.

9.7 Dissemination of Findings

Currently, podiatric telemedicine services for low-risk patients in a primary care setting are still operational. The findings and insights from this research have been shared with relevant stakeholders, encompassing service users, healthcare professionals as providers of care, and policymakers. The means of disseminating the findings of this research have been through

various channels, including social media platforms, articles published in local news portals, presentations at local and foreign conferences, publications in academic journals, poster presentations, online webinar sessions, and lectures delivered at local and international venues.

All research conducted during this PhD research project has been published in internationally recognised journals that underwent peer review by field experts, as seen in Appendix 2, Appendix 3 and Appendix 4. This research has been presented at several podiatry and telemedicine-related conferences overseas and locally. Moreover, this study is anticipated to yield subsequent investigations disseminated through publication, thereby initiating a chain reaction of numerous scholarly materials that can be exchanged among researchers and practitioners.

The public and other healthcare professionals are provided with various outreach initiatives regarding the following domains by incorporating podiatric telemedicine as an opportunity for growth towards prevention and self-care:

1. The value of preventive foot care and self-management
2. The advantages of enhancing podiatry services within primary care settings to supplement the current clinical consultations
3. The advantages of focusing on low-risk patients may extend to the high-risk population needing podiatric intervention.
4. The increase in awareness among service users and healthcare professionals outside the foot and ankle care field regarding the diverse range of services and treatments that podiatrists can provide

9.8 Strengths and Limitations of the research

While the limitations of each study were addressed in the pertinent chapters, the following are some biases associated with the entire research. According to Mateo and Williams (2020), alleviating bias is a crucial professional duty of healthcare and public health practitioners tasked with population health and well-being. Bias may occur at any phase, including data collection, processing, and interpretation (Pannucci & Wilkins, 2010). Recognising and comprehending bias is crucial in research, since it affects the validity and reliability of a study and can result in misinterpretation of findings, with its total eradication being nearly impossible (Pannucci & Wilkins, 2010). This research identifies three types of biases, also discussed in Chapter 4 of this dissertation: self-affirmation bias, confirmation bias, and anchoring bias. The biases were recognised, and strategies to alleviate them were implemented as detailed in Chapter 4. It is important to acknowledge that despite the biases and restrictions encountered during this PhD research journey, podiatric telemedicine did not conclude at the end of the deployment phase. Podiatric telemedicine in primary care remains operational, with modifications to the standard operating procedures implemented and effective from January 2025. Due to the inadequate participation of podiatrists in this service, it was determined that the referral pathways system for follow-ups will be accessible not just to podiatrists but also to general practitioners and other allied health professionals operating within the primary care framework. As a result, the low referrals received did not dissuade the research team; instead, it motivated them to explore alternate strategies to expand their services and avoid confining the referral system exclusively to podiatrists.

Furthermore, as the study concentrated exclusively on podiatrists within Malta's public primary care setting, these findings do not apply to other clinical contexts, such as speciality clinics or outpatient facilities and should be used cautiously. This would necessitate further research in such specialised fields as this research only focused on podiatric telemedicine

for low-risk patients. Additionally, considering that the podiatry profession may be practised differently in other countries, these findings can be adapted according to the respective podiatrists' practice and needs.

9.9 Concluding Remarks

This PhD dissertation aimed to establish and execute a podiatric telemedicine service in a primary care environment for low-risk patients. This research revealed a significant necessity for enhancing professional inspiration and engagement about innovative podiatric interventions. As a result of this PhD research, podiatric telemedicine has been acknowledged and introduced within the national healthcare system at the primary care level to be implemented as a pilot service for research purposes and to continue running as a newly established service by the Podiatry Department at the primary health care level.

This PhD was accomplished through various studies that addressed the research subject. Before initiating the primary study, a scoping investigation was performed to investigate and understand the existing recommendations pertaining to podiatric telemedicine. This study highlighted the absence of recommendations for podiatry and established a rationale for the necessity of podiatric telemedicine guidelines at the primary care level. The findings of this study indicate that podiatric telemedicine remains nascent and underexplored, presenting a potential for further research to promote and solidify its therapeutic relevance. Consequently, the data indicates that such services could take advantage of service users, providers, and the healthcare system, revealing an unexplored sector with potential benefits.

The second study involved a modified Delphi method to formulate podiatric telemedicine recommendations for implementation and piloting in a primary care environment. This study generated guidelines for service users and healthcare providers to conduct podiatric telemedicine consultations via phone or video call. This guideline was applied in a pilot

project, representing its practical implementation's final instance. This pilot study faced challenges primarily due to a lack of engagement from healthcare providers and reluctance to adopt innovative podiatry techniques. Despite patient satisfaction with the service, podiatrists remained hesitant to provide referrals, even after multiple outreach efforts aimed at healthcare professionals. Healthcare authorities have endorsed this pilot initiative to deliver accessible care. This raises the question of what follows subsequently. What strategies can enhance podiatrist involvement in developing modern podiatry services?

Notwithstanding the obstacles encountered during this PhD research endeavour, this presents an opportunity to explore the field of podiatric telemedicine further and advance research initiatives to establish evidence-based practices that demonstrate the necessity of embracing digital health technology and remote clinical consultations. These actions are not to replace traditional methods of care but should be considered for implementation to enhance existing services and ensure preparedness for potential future health crises, whereby this time, telemedicine deployment would be supported by empirical evidence.

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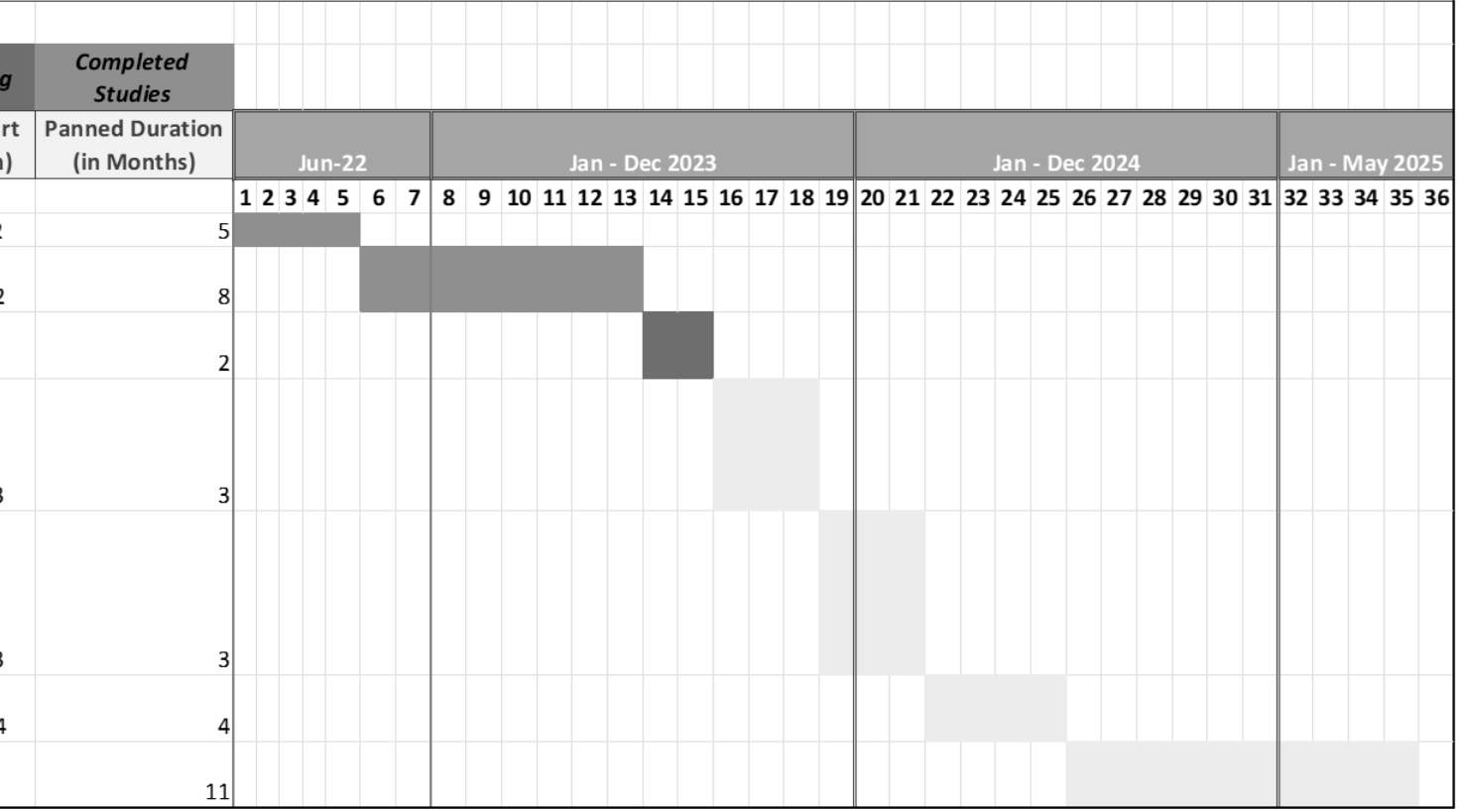
Appendices

Appendix 1 – Gantt chart outlining the research timeline

Timeline of the Research Project

Plan Duration	*Ongoing*	*Completed Studies*
Activity	Plan Start (Month)	Panned Duration (in Months)
Study I - Scoping Review	Jun-22	5
Study II - Modified Delphi	Nov-22	8
Transfer Phase Documentation	Jul-23	2
Study III - Stage I (Training) and Stage II (Outreach and Education) (Ethics)	Sep-23	3
Study III - Stage I (Training) and Stage II (Outreach and Education) (Implementation)	Dec-23	3
Study III - Stage III (Pilot Study)	Mar-24	4
Analysis and Final Write Up	Jul-24	11



Appendix 2 – Published full paper in Health Science Reports, ‘A Scoping Review of Foot and Ankle Telemedicine Guidelines’

Appendix 2 -
Scoping Review.pdf

Appendix 3 – Published full paper in Journal of the American Podiatric Medical Association, ‘Developing a Podiatric Telemedicine Framework for Service Users and Providers in a Primary-Care Setting’

Appendix 3 - Delphi Study.pdf

Appendix 4 – Published full paper in Studies in Health Technology and Informatics, ‘Extending the Scope of Telemedicine to Podiatric Medicine’

Appendix 4 - Full paper extending the

Appendix 5 – Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

Appendix 5 - Prisma Checklist.pdf

Appendix 6 – Scoping Study – Scientific Database Research Strategy


Appendix 6 - Database Research S


Appendix 6 - Research Strategy (2

Appendix 7 – Scoping Study – Categorisation of Data Extract (Excel File)

Appendix 7 Data Extraction.png

Appendix 8 – Scoping Study – Levels of Evidence

Appendix 8 - Levels of Evidence Scoping

Appendix 9 – Modified Delphi Study – Round 1

Semi-structured interview questions

Appendix 9 -
Round 1 Semi Struct

Appendix 10 – Modified Delphi Study – Round 2

Consensus Questions

Appendix 10 -
Modified Delphi Ro

Appendix 11 – Modified Delphi Study – Round 3 Consensus Questions

Appendix 11 -
Round 3 Modified D

Appendix 12 – Modified Delphi Study – Podiatric Telemedicine Guideline (Healthcare Provider)

Appendix 12 -
Podiatric Telemedici

Appendix 13 – Modified Delphi Study – Podiatric Telemedicine Guideline (Patients)

Appendix 13 -
Podiatric Telemedici

Appendix 14 – Pre-Training Feedback Questionnaire

Appendix 14 -
Pre-Training Feedba

Appendix 15 – Post-Training Feedback Questionnaire

Appendix 15 -
Post-Training Feedb

Appendix 16 – Podiatric Telemedicine Referral QR Code

Appendix 16 - QR Code.pdf

Appendix 17 – Checklist for Reporting of Survey Studies

Appendix 17 - CROSS.pdf

Appendix 18 - Ethics Approval Documents

Appendix 18 -
Ethical Approvals.pr