Exploring nurses' experiences of using digital health technologies to deliver care within the general practice setting: a mixed method study.

HART-WINKS, E.B.

2025

Exploring nurses' experiences of using digital health technologies to deliver care within the General Practice setting: a Mixed Method Study

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A thesis submitted in partial fulfilment of the requirements of the Robert Gordon University for the degree of Masters of Research

The study was supported by a grant from The Scottish Digital Health and Care Institute (DHI)

August 2024

Abstract
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Masters of Research

Exploring nurses' experiences of using digital health technologies to deliver care within the General Practice setting: a Mixed Method Study

Background: Defining digital healthcare is not an easy task as globally there does not seem to be a universally accepted definition. However, the World Health Organization (WHO) defines digital health as "the use of information and communication technologies for health". The Digital Health Innovation for Scotland (DHI) (2022) have identified digital health technologies (DHT) to include: connected health, eHealth, ePatients, Health Information Technology, mobile health (mHealth), telehealth, telemedicine and many more. Nursing is rapidly becoming a digitally driven profession and the COVID-19 pandemic has accelerated the need for digital technologies to be used across the board within healthcare to deliver care remotely, communicate with patients and colleagues and access information, services and training facilities. By understanding how DHT are being adopted and used, healthcare providers and researchers, can develop more effective strategies to integrate these technologies into everyday healthcare. Currently, a large portion of the literature on DHT within general practice is focused on the delivery of care from doctors.

Aims: The overall aim of this study was to explore digital technologies (such as but not limited to E-consultations, video consultations (NearMe), and digital devices to monitor conditions, electronic notes) used by nurses to deliver care and manage long term conditions (LTC) within the GP setting. The project aimed

to identify strengths and limitations of existing digital technology in practice, including barriers and facilitators to their use, and any training needs for nurses.

Methods: This research employed a convergent parallel mixed method study design and a world view of pragmatism was adopted. An online survey was sent via email inviting General Practice Nurses as well as nurses delivering digital care to take part in an interview. The survey was developed on JISC and a Likert rating scale approach was used throughout some of the survey. The survey responses were then analysed using descriptive analysis to present the data as frequencies and a content analysis process was used for the open text responses. The topic guide was developed using open ended questions from previous literature and research on the topic and once developed the topic guide was piloted prior to interviews. Interviews were then analysed using a thematic analysis method.

Key Findings: A total of 24 participants completed the survey and 11 participants were interviewed across three semi-structured interviews and one focus group (n=8). LTCs (Cardiovascular conditions (n=23, 96%), respiratory conditions (n=22, 92%) and then diabetes (n=16, 67%)) were reported as the most common conditions managed by nurses in General Practice through the survey responses. The LTC that were identified by the interviews/focus groups as being managed by nurses in General Practice included: hypertension, diabetes, respiratory conditions, cardiovascular conditions, weight loss/lifestyle, and women's health management. The framework analysis process, resulted in three main themes: (i) Experience and Confidence using DHT; (ii) Benefits and Challenges of using DHT, and (iii) Perceptions of using DHT.

Conclusion: The convergent parallel mixed method study findings were integrated to show the key findings identified through the data analysis. From the data integration, similar types of DHTs and LTCs were identified with communication and management of LTC the most common uses for DHT by nurses in GP settings. The majority of participants saw benefits in using DHT to deliver and manage LTC care and agreed that DHT has a role to play in the delivery of healthcare alongside face-to-face consultations and offering hybrid consultations is the way forward. However, barriers were identified to be addressed for DHT to be able to live up to its potential. These barriers could be addressed by building on this research and this study could be used as a guide for future research on DHTs and their future in General Practice for nurses. Despite the barriers and challenges identified, participants reported using technologies had made their job easier and they welcomed the changes that DHT brought.

Acknowledgments

Firstly, I would like to thank my supervisory team; Professor Lyndsay Alexander and Professor Kay Cooper. Thank you for your constant support throughout this MRes process and particularly for getting me through the last six months. Thank you for your patience and guidance and sorry for all the tears and stress!

I also need thank the Scottish Digital Health and Care Institute (DHI) for providing the funding for me to complete this MRes.

To the nursing participants, thank you for giving up your free time, when you are already so busy, to engage and participate in this research. I appreciate it so much. I also must thank the nurses who helped me with the recruitment process, adding to your already, ever growing workload. Thank you.

I would also like to thank my colleagues in the research office who I have worked with while completing my MRes. You provided me with so much extra knowledge and support, allowed me to ask silly questions and offered shoulders to cry on when times were hard. I appreciate and look up to you all so much.

To all my friends who have helped me over the last couple of years. Thank you for providing me with so much support, laughs, sweets, distractions, for listening to my many, many rants and for mopping up the tears. Your support and friendship means more than you will ever know. You all know who you are.

To my wonderful, supportive and ever suffering family, and my lovely fiancé Liam. Words will never be able to express my gratitude to you all for your support and encouragement throughout the last few years and always. Special shout out to my mum, the most incredible nurse and my biggest inspiration for everything I do. Enjoy retirement!

My final thank you goes to my dog and therapet, Mila. The cuddles and long walks were always the best escape away from writing.

Table of Contents

1. Introduction

1.1 Introduction to Chapter

This thesis will explore nurses' views and experiences of using Digital Health Technologies (DHT) in General Practice (GP). The first chapter provides the background and rationale for the research presented in this thesis, opening by outlining the definitions, terminology and language used to provide an overview of the nature of the research. It discusses the context of digital health technologies being used in GP by nurses and those accessing services in this setting. Furthermore, an introduction to DHT, supported by current policy, frameworks and literature on the topic will be provided, concluding with an overview of the thesis structure.

1.2 Digital Health Defined

Defining digital healthcare is not an easy task as globally there does not seem to be a universally accepted definition. The varied definitions in the literature and across the world for make defining digital healthcare difficult. Table 1 highlights the different definitions available from various government organisations and healthcare providers.

Across the United States of America, digital health is defined as "the use of technology to improve the delivery and management of healthcare" (The Hospital Corporation of America (HCA) 2024) while in the UK digital health is defined as "the use of technology to improve health and care" (The National Health Service 2023). More locally, in Scotland, the Digital Health and Care Innovation Centre (DHI) (2022) defines DHT as an umbrella term for a wide

range of digital devices and methods for delivering healthcare. Similarly, The Scottish Government (2021) stated that digital technologies play a crucial role in addressing the current challenges in healthcare and that "Digital technology is key to transforming health and social care services so that care can become more person-centred".

Table 1. Definitions of digital health across different government organisations and healthcare providers.

Reference	Definitions
World Health Organisation (2020)	the use of information and communication technologies for health offering innovative solutions for managing our own health, away from hospitals and clinics, offering patient empowerment and independence to improve their health and wellbeing
The Hospital Corporation of America (HCA)	the use of technology to improve the delivery and management of healthcare
The Food and Drug Administration (2022)	the use of digital technologies such as software, hardware and connectivity, to enhance the delivery of healthcare
The National Institute for Health and Care Excellence (2022)	digital health technologies are digital products that are used to benefit people's health and the social care system
The National Health Service	the use of technology to improve health and care
Digital Health and Care Innovation Centre (DHI)	describes DH as an umbrella term for a wide range of digital devices and ways of delivering healthcare
Scottish Government (2021)	digital technology has a role to play in addressing the challenges we face in health and care, and in improving health and wellbeing and range from smart phones and tablets, sensor and imaging technologies, the Internet, wearables, cloud computing, robotics, and artificial intelligence

There are also discussions on the terminology around digital healthcare and the differences between "health technologies" and "digital health" (Price 2015; Steckelman 2019). At first, the differences appear to be nuances in terminology but there are slight differences and the definitions, scope and goals of both are shown in Table 2 (Steckelman 2019).

The main difference between the two terminologies is that digital health focuses on the use of technologies whereas health technologies focus on the entire body of actual digital health technologies (Price 2015). The goals of health technologies are to improve diagnosis, treatment and disease prevention and the goals of digital health are to track health data, provide education and support and to connect patients with healthcare providers (Steckelman 2019). For the purposes of this thesis, the term digital health technologies (DHT) will be adopted to cover all terms and definitions unless discussing a specific technology described in Table 3.

Table 2. Health Technologies VS Digital Health. Definitions, scope and goals (Price 2015) (Steckelman 2019)

Features	**Definition**	**Scope**	**Goal**
Health Technologies	The technologies to improve healthcare delivery developing solutions to tackle a given challenge	Includes all digital health technologies, as well as health IT such as websites, emails, software, hardware, medical devices and genomics	To improve the diagnosis, treatment and prevention of diseases as well as the efficiency and effectiveness of healthcare delivery
Digital Health	The use of technology to improve health and well-being and refers to the convergence of health and technology to improve health delivery and outcomes	Includes wearable devices, mobile apps, telemedicine	To track health data, provide education and support and connect patients with healthcare providers

1.3 Types of Digital Health Technologies

NICE (2022) described DHT products as: “smartphone apps, standalone software, online tools for treating or diagnosing conditions, preventing ill health or for improving system efficiencies and programmes that can be used to analyse data from medical devices such as scanners, sensors or monitors”. The FDA (2024) lists digital technologies as: “mHealth, health information technology, wearable devices, telehealth and telemedicine and personalised medicine”. The Digital Health Innovation for Scotland (DHI) (2022) has identified DHT to include: connected health, eHealth, ePatients, Health Information Technology, mobile health (mHealth), telehealth, telemedicine and many more.

DHT encompasses a broad range of tools and systems aiming to optimise healthcare delivery, improve patient outcomes and support effective health management. Table 3 provides an overview of some different types of DHT, along with their definitions and key features.

Table 3. Types of DHT along with the definitions and key features (WHO 2024), (FDA 2024), (Digital Therapeutics Alliance (DTA) 2024)

DHT	Definition	Key Feature
Telemedicine	The use of telecommunications technology to provide clinical healthcare services remotely	Includes video consultations, remote monitoring and tele-diagnostics. Often used for communication between patients and healthcare providers, E Consultations, chronic disease management, remote diagnosis, treatment and follow-up care
Telehealth	Encompasses telemedicine services but also includes non-clinical services such as online training, online meetings, online medical education and online patient care	Involves healthcare education, public health interventions and healthcare administrations. Incorporates both clinical and non-clinical services.
Mobile health (mHealth)	Refers to the use of mobile devices such as smartphones, tablets and wearable devices to deliver healthcare services and information	This includes health and fitness apps for monitoring, managing and improving health, tracking physically activity, diet and sleep. Can provide reminders, education content and communication between patients and healthcare providers
Electronic Health Records (EHRs)	Digital version of patient records. Provides real time, patient centred records and makes information instantly available and secure to authorised users	Includes patients history, medications, treatment plans, immunisation dates and allergies. Enables coordinated care for different healthcare providers and supports decision making by providing access to medical history.
Remote Patient Monitoring (RPM)	Refers to the use of digital technologies to monitor and capture health data remotely	Commonly used for chronic disease management. Enhances patient care by providing continuous data and reduces the need for frequent face-to-face visits.
Wearable Technology	Refers to devices worn by individuals that collect health data and provide real-time feedback on various health metrics	Includes fitness trackers, smartwatches, heart rate monitors and smart clothing. Tracks health metrics such as physical activity, heart rate, sleep patterns and calories burned. Often integrates with mobile health apps for comprehensive health tracking
Artificial Intelligence (AI) in Healthcare	Involved the use of machine learning algorithms and software to mimic human cognition in the analysis, interpretation, and comprehension of complex medical and health data.	Includes technologies like natural language processing, image recognition and robotic process automation. Can be used for diagnostic support and accuracy, personalised and optimising treatment plans, administrative tasks and enhancing operational efficiency

Telemedicine focuses on delivering clinical services remotely through telecommunications, whereas telehealth encompasses both clinical and non-clinical services (DTA 2024). Telehealth and Telemedicine enable people with long term conditions (LTC) to manage their conditions, allowing more autonomy, reduce hospital admissions, and reduce dependencies on healthcare services and carers or family members (UK Telehealthcare 2022). Video consultations (such as NearMe) are used to enable healthcare professionals to support and communicate with patients or other healthcare professionals remotely, assist with diagnosis or recommend treatments and offer advice (UK Telehealthcare 2022). This allows for healthcare interventions to be done without the need for travel, aiding in preventive capacity in rural areas (Mataxen and Webb 2019).

Following on from this, remote patient monitoring (RPM) is considered a type of telemedicine which uses digital tools to monitor patients health remotely; primarily used for monitoring long term conditions (DTA 2024). Digital technologies offer innovative solutions for managing health out with hospitals and clinics, empowering patients and providing independence to improve their health and wellbeing (DHI 2022). Remote monitoring of patients' conditions is an ever-growing trend that goes out with the norms of traditional health monitoring and into everyday life.

Remote patient monitoring can also be done through mobile health apps. Mobile health (mHealth) refers to mobile devices and apps for monitoring and managing your health, which often link to wearable technologies that collect health metrics through devices like fitness trackers and smartwatches (FDA 2024). In addition to everyday wearable health trackers, Mohankumar et al. (2020) highlighted that wearable biosensors are frequently used by medical professionals for patients to track their vital signs (blood pressure, heart rate, temperature, blood glucose

etc). These devices (such as ECG monitors, connected inhalers, smart thermometers, blood pressure monitors, continuous blood glucose monitors) are worn by patients while they go about their normal life and can give healthcare providers more insights into symptoms, disease progression and the patients overall health (Mohankumar et al. 2020).

For patients with LTCs, it has been reported that 87% of people living with Type 1 diabetes and 77.7% of people living with Type 2 diabetes used a form of eHealth device in the last year to manage their condition (Hansen et al. 2019). In 2023, it was reported that around 5000 people were using digital hypertension monitoring services in Scotland and this number continues to increase with over 1600 people signing up to use the service in March 2023 alone (Scottish Government 2023).

DHT presented throughout this section encompasses an array of tools and systems to enhance healthcare delivery, improve patient outcomes and support healthcare management. Together, these technologies highlight the evolving landscape of DHT and their critical role in enabling healthcare systems to grow, develop, modernise and empower patients allow to have autonomy over their health.

1.4 The Growth of Digital Health Technologies

There has been a rapid move to integrate DHT in healthcare, accelerated by the COVID-19 pandemic. Until recent times, DHT was estimated to grow by 16.8% per annum; however, the growth in 2020 reached 80% as a result of the COVID-19 pandemic (Rutledge et al. 2021). In the UK in 2020, telehealth services increased by 99% compared to just 3% prior to the pandemic (NIHR 2020). Telehealth, telemedicine and other forms of remote care delivery became the

most frequently used point of healthcare for patients during the pandemic and continue to be heavily used in general practice (Rutledge et al. 2021).

Even before the COVID-19 pandemic there had been a shift to digital consultations and researchers were investigating the success and challenges of providing care digitally. A process map was developed, prior to the COVID-19 pandemic, from a systematic review which explored 'the impact of digital first consultations'. The 29 included papers provided quantitative data about online, telephone or video consultations at a GP to identify whether digital consultations as the first point of access will decrease or increase workload (Salisbury, Murphy and Duncan 2020). This review focused on GPs experiences and results showed that digital first consultations could increase demand on health and care services through easier access or could reduce demand by encouraging patients to use self-management solutions.

The growth of technologies in general has rapidly increased and with the majority of the population using some kind of technology as part of their everyday life, it is no surprise that DHT have become so popular (National Institute for Health and Care Research (NIHR) 2022). In 2021, it was reported that 48% of European adults were using health apps or wearable health trackers to monitor their health (European Union 2021). They might track their steps, follow a home workout video, use an app to track their meals or even store their 'vaccination passport' on their NHS APP (or a country-specific version). The Office for National Statistics (2022) reported on the 'Percentage of UK homes and individuals with technological equipment' over the period from April 2020 - March 2021 and the results showed 90% of private households had a computer and 93% had access to a mobile telephone. Estimates from this report also showed that from January to February 2020 84% of adults had access to a

smartphone (Office for National Statistics 2022). Globally, the market for wearable health devices is estimated to grow from 533.7 million units in 2021 to 776.23 million units by 2026 (American Medical Association 2021), which is reportedly driven by people being more health conscious and wearable technologies becoming more advanced.

These statistics highlight the growing use and impact of DHT across the world due to the growing demand for technologies. By understanding how DHT are being adopted and used, healthcare providers and researchers, can develop more effective strategies to integrate these technologies into everyday healthcare. The aim is to achieve better health outcomes, create a more efficient healthcare system and empower individuals to take an active role in their health.

1.5 Digital Health Strategies and Frameworks

The Global Strategy on Digital Health 2020-2025 envisions a future where digital health is fair and accessible to everyone, ensuring equal access to quality healthcare services (WHO 2020). As digital health rapidly expands, this strategy emphasizes that digital health solutions have the potential to make healthcare systems more sustainable and efficient, improve the quality of care, and be both cost-effective and fair. Similarly, the Scottish Digital Health and Care Strategy (2021) underlines the significance of digital health at a local level, stressing that its implementation is essential for addressing the backlog and increasing capacity within the National Health Service (NHS), challenges that intensified during the COVID-19 pandemic. Even before the pandemic, the Scottish Government recognized digital technologies as a vital component of Scotland's future.

The strategy *Realising Scotland's Full Potential in a Digital World: A Digital Strategy for Scotland (2017)* identified that digital technologies should be integrated into all aspects of everyday life making life more digitally accessible. Following on from that, in 2018 The Scottish Government introduced the *Scotland Digital Health and Care Strategy: Enabling, Connecting and Empowering* (Scottish Government 2018). The strategy highlighted areas in which to improve Scottish healthcare systems by using DHT to make digital health a core element of health reform. The strategy also aimed to improve the health and wellbeing of the Scottish people through the use of DHT.

What was unexpected when these strategies were introduced was the accelerated demand for DHT due to the COVID-19 pandemic leading to their prominence in Scotland's response to the aftermath of the pandemic. The adoption of digital health technologies (DHT) in service delivery has become increasingly important, especially in primary care, to alleviate the pressure on services that often begins in General Practice. The backlog in GP surgeries is noticeable, and digital health innovations have been seen as a solution to this issue (Neve et al. 2020).

Most recently in 2024, the *Care in the Digital Age: Delivery Plan 2024-2025* was published by the Scottish Government which was an updated from the first version published in 2022. The three aims of the strategy are:

- Aim 1: 'Citizens have access to, and greater control over, their own health and care data – as well as access to the digital information, tools and services they need to help maintain and improve their health and wellbeing.'

- Aim 2: ‘Health and care services are built on people-centred, safe, secure and ethical digital foundations which allow staff to record, access and share relevant information across the health and care system, and feel confident in their use of digital technology, in order to improve the delivery of care.’
- Aim 3: ‘Health and care planners, researchers and innovators have secure access to the data they need in order to increase the efficiency of our health and care systems and develop new and improved ways of working.’

(Scottish Government 2024)

To deliver the aims listed, there are six key priorities to be focused on: digital access; digital services; digital foundations; digital skills and leadership; digital futures; data-driven services and insight (Scottish Government 2024). The national plan provides details on how the Scottish Government plans to support Health Boards, primary care, social care and others to offer new and improved services through improved infrastructure systems and expanded access to digital services (Scottish Government 2024).

NHS Grampian released their own digital health strategy known as *Service Transformation through Digital: A Strategy 2020-2025 NHS Grampian*. The strategy's goal is to use digital technology to enhance health and care services within NHS Grampian, aiming to improve the lives of both staff and residents. It suggests that Grampian's distinctive geography and regional expertise make it ideally suited to spearhead the testing and assessment of new digital healthcare models for Scotland. The strategy has four aims, referred to as ‘*The Quadruple Aim*’. These aims are: ‘Better health and care outcomes, Better experiences for people, Better experience for staff and Lower cost per capita’. The *Strategy Road*

Map 2020-2025 (Figure 1) shows a timeline of how '*The Quadruple Aim'* will be achieved, along with case studies illustrating the expected outcomes for patients and staff once digital technologies become an integral part of health and care within NHS Grampian.

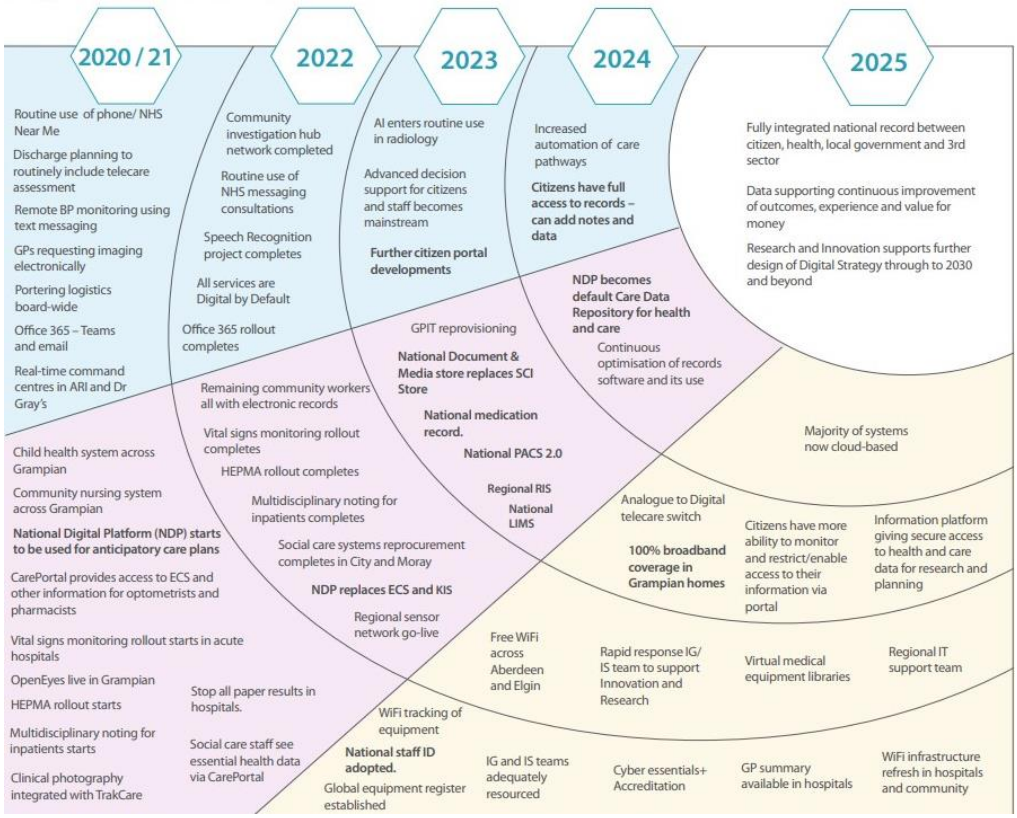


Figure 1: Strategy Road Map 2020-2025 (adapted from Service Transformation through digital: A Strategy 2020-2025 NHS Grampian)

1.6 Primary Care and Digital Health Technologies

Primary care is defined by the National Health Service (NHS) as 'the front door' of the service providing the first point of contact for patients within the healthcare system (NHS England 2023). The definitions encompasses general practice, community pharmacy, dental and optometry services. The WHO states there are five core functions of primary care defined as:

- '**First contact accessibility** creates a strategic entry point for and improves access to health services.'
- **'Continuity** promotes the development of long-term personal relationships between a person and a health professional or a team of providers.'
- **'Comprehensiveness** ensures that a diverse range of promotive, protective, preventive, curative, rehabilitative, and palliative services are provided.'
- **'Coordination** organise services and care across levels of the health system and over time.'
- **'People-centred** care ensures that people have the education and support needed to make decisions and participate in their own care.'

(WHO 2024)

These core function are echoed by The Scottish Government (2020) highlighting that primary care lies at the heart of the healthcare system with a key priority being improving access for patients. EConsult system, telehealth, telemedicine and other remote ways of delivering care have been introduced across the UK and have been identified as beneficial and effective in providing healthcare digitally across primary care (Liddy et al. 2015).

A scoping review by Ndayishimiye, Lopes and Middleton (2023) explored the evolution of DHT in primary healthcare (PHC) delivery during the COVID-19 pandemic. The review analysed literature published during the years of 2019-2021 during the peak of the COVID-19 pandemic. Five PHC DHT functions were identified from the review: 'general PHC service (teleconsultations, e-diagnosis, e-prescriptions, etc.); behaviour promotion and digital health literacy (e.g., combating vaccine hesitancy); surveillance functions; vaccination and drugs; and enhancing system decision-making for proper follow-up of ongoing PHC interventions during COVID-19.' Some of the types of DHT identified from the scoping review being used for delivering PHC were: mHealth (ie. Mobile telemedicine, app-based telemedicine, SMS appointment systems); eHealth (ie. Telehealth, e-prescription, e-referrals, telemedicine); Devices (ie. Wearable health devices, remote monitoring devices); Monitoring (ie. remote monitoring, online monitoring); Consultations (ie. Tele-consultations, virtual consultations, video consultations) and sensing (medical sensor, digital sensor).

The review concluded that DHT have the potential to address many challenges faced by solve some of the issues that PHC has been facing since before the COVID-19 pandemic but further research with a narrower research question is needed (Ndayishimiye, Lopes and Middleton 2023).

1.6.1 Primary Care, Digital Health Technologies and Nursing Practice

In terms of the nursing profession, nurses within primary care play a pivotal role in delivering preventative, acute and long-term care to individuals in the community. Nurses work across many, if not all, areas of primary care including general practice, surgery, community health centres and home care settings. The growth of digital health technology has significantly transformed how nurses

deliver services in primary care. Over the past two decades, the UK healthcare system has shifted from solely face-to-face consultations towards a more integrated use of digital tools, driven by policies and innovations aimed at improving accessibility, efficiency and patients outcomes (NHS England 2022). The timeline in Table 4. shows how DHT have progressively reshaped nursing roles in primary care from early documentation systems, telehealth integration including remote monitoring and most recently, AI-based tools (McBride et al. 2018);(Greenhalgh et al. 2020); (Smith et al. 2020) (McGonigle and Mastrian). These digital innovations have improved care efficiency and patient management but have introduced new challenges for nurses in primary care with increased workload, technological competency requirements and maintaining therapeutic relationships with patients and other staff members (Smith et al. 2020).

Table 4. Timeline of DHT growth in nursing practice within primary care. (McBride at al. 2018; NHS Digital 2018; NHS England 2014; Greenhalgh et al. 2020; Smith et al. 2020; NHS England 2022; Lupton 2021; McGonigle and Mastrian 2022).

Year/Period	DHT Development	Impact on Nursing Practice
2000s	Introduction of Electronic Health Records (EHRs) in primary care	Nurses began transitioning from paper-based documentation to electronic
2008	Launch of the GP Systems of Choice (GPSoC) framework in the UK	Standardised electronic systems simplified access to patient records and enhancing care coordination
2013	NHS Technology Enabled-Care Services (TECS) promoted use of mobile health and remote monitoring	Nurses started using remote patient monitoring devices for LTC management and enabling earlier interventions
2014	Five Year Forward View highlighted the need for digital technology to transform care digitally	Nurses were encouraged to adopt telehealth and digital tools to improve accessibility, particularly for managing LTC
2019	The NHS Long Term Plan promoted digital-first primary care with online consultations and virtual care	Nurses integrated telehealth consultations, managing virtual triage, patient education, and digital communication
MARCH 2020	COVID-19 pandemic necessitated rapid adoption of digital health solutions	Nurses pivoted to remote consultations, video calls, and digital triage as face-to-face interaction became limited
2020-2021	Widespread use of telehealth, remote monitoring, and clinical decision support system	Nurses experiences increased workloads from managing digital systems but gained new tools for remote chronic disease management
2021	Introduction of AI-driven clinical decision support tools and enhanced wearable technologies	Nurses began incorporating wearable health data into care plans, improving proactive care but raiding concerns about data overload and security
2022-present	Hybrid models of care combining digital and in-person interaction become standard	Nurses balance digital health technology with traditional care, requiring skills in both technological proficiency and personal patient contact

1.6.2 Digital Health in General Practice Settings

Before 2020, digital technologies were already being implemented into primary care, but the majority of nurse led consultations in general practice were face-to-face. The COVID-19 pandemic accelerated the adoption of technologies within general practice and nurses began relying on telephone and video consultations, particularly for chronic disease management, medication reviews and lifestyle advice, to communicate and review patients (Greenhalgh et al. 2020).

Current literature shows nurses in general practice using digital tools to remotely track and monitor LTC such as diabetes, cardiovascular conditions, respiratory conditions, mental health conditions and lifestyle changes (Gibson et al. 2020). Historically, patients with LTC require regular in-person reviews with general practice nurses, focusing on health monitoring (eg, blood pressure monitoring or blood tests), medication reviews and titration and lifestyle support and education (e.g. diet, exercise, smoking cessation) (Gibson et al. 2020) (Shaw et al. 2021). Many of these interactions with nurses have been moved to remote monitoring using digital tools to remotely track and manage LTC reducing the need for frequent in-person visits.

Online consultations are becoming one of the most commonly used forms of consultation in General Practice and have the potential to ease the strain on healthcare services, allowing for more targeted care and reserving in-person visits for emergencies and specific conditions (Liddy et al. 2015).

Most current research on DHT in general practice has focused on how care is provided by doctors. A qualitative study assessing the benefits and impact of an eConsult system in GP practices, particularly in terms of workload and management, found several advantages. These included the ability to access

consultations at any time, avoid long waits on the phone to book appointments, and discuss issues patients might not feel comfortable raising with a receptionist (Banks et al. 2018). While the study identified some positive aspects of the eConsult system, these were outweighed by an increased workload for GPs and lack of significant time savings, which contradicted the benefits reported in previous studies. Although this study was published in 2018, the interviews were conducted between 2015 and 2016. Given the rapid advancements in digital health technologies since then, more up-to-date research is needed.

Additionally, the study included interviews with twenty-three doctors from 6 general practices but only one nurse. Since nurses are often the primary point of contact for patients and play a key role in managing both acute and long-term conditions through nurse-led clinics (Booth et al. 2021), it is important to explore their experiences with digital healthcare. This includes assessing their readiness to engage with digital service delivery, their current involvement, and any knowledge or skills gaps that need to be addressed. It is also crucial to understand patients' experiences of receiving care from nurses using digital technologies in general practice, as research and evidence remain limited.

This thesis aims to take an important step in exploring and identifying nurses' experiences of delivering and receiving care through digital technology in the GP setting. This is essential for informing service delivery that effectively meets patient needs and is supported by a suitably skilled workforce.

1.7 Digital Health Technologies and Nursing

Nursing is rapidly becoming a digitally-oriented profession, with the COVID-19 pandemic significantly boosting the need for digital technologies in healthcare.

These technologies are crucial for remote care delivery, interacting with patients and colleagues, and accessing information, services, and training (Booth et al. 2021). Although delivering care or health information via phone is familiar to nurses, digital health extends beyond just phone conversations. Nurses managing these communications are adept professionals skilled in triage and virtual patient assessments (Mataxen and Webb 2019).

NHS 24 is Scotland's well-established national telehealth and telecare organisation, providing a telephone triage system that nurses have been involved with since it was founded in 2001 (NHS 24 2023). The special health board runs a telephone advice and triage service for people across Scotland during out-of-hour periods (NHS 24 2023). In addition to nurses, NHS 24 employs a range of specialist staff including dental nurses, psychological wellbeing practitioners, physiotherapy advisors, pharmacy advisors and many more (NHS 2023).

There is still a significant need to further advance nursing into a digitally-enabled field, as this transformation is crucial for enhancing patient care and expanding capacity (Booth et al. 2021). To stay relevant in the digital healthcare era, nursing must embrace current recommendations, including upskilling nurses in digital health and involving them in the creation of digital tools. Given that nurses are directly involved in delivering care, their participation in these developments is essential for improving care and service delivery (Booth et al. 2021). Therefore, there is a need to explore nurses perceptions and experiences of their training, skills and ability to deliver care using DHT.

A key challenge in nursing care is the conflict between traditional ideals of compassionate care and the adoption of digital solutions, which may make some

nurses hesitant to embrace these technologies (Booth et al. 2021). A scoping review by Ali et al. (2021) explored how compassionate nursing care relates to DHT and identified best practices for integrating compassionate principles into the digital healthcare environment. The review included 28 studies and highlighted three main themes: 1) the evolving understanding of compassionate care in the context of digital health technology, 2) how different types of digital health technologies impact compassionate care, and 3) strategies to enhance education and skills in both digital health and compassionate care. The findings revealed that compassionate care, a fundamental aspect of nursing, is not well-integrated or understood in the context of DHT, indicating a need for further research to clarify this relationship.

In 2018, the Royal College of Nurses launched the "Every Nurse an E-Nurse" campaign aimed at modernizing the nursing profession by promoting digital health solutions. The campaign envisioned improved patient outcomes, enhanced staff experience, and more efficient workflows through the adoption of DHT (RCN 2018). Although nurses have been incorporating DHT into their care practices since before the pandemic, the use of digital care methods has accelerated and is expected to continue growing (Kaihlanen, 2022).

The General Practice Workforce Survey (2019) estimated that 2,465 nurses work in general practice across Scotland, with 392 in NHS Grampian. ISD Scotland (2024) reports that NHS Grampian has 69 surgeries: 27 in Aberdeen City, 30 in Aberdeenshire, and 12 in the Moray area. However, there is a lack of specific evidence, policies, and frameworks addressing the use of digital technologies by nurses in General Practice.

The Queen’s Nursing Institute’s report, “Nursing in the Digital Age: Using Technology to Support Patients in the Home” (2018), discusses the impact of digital technology on patient care and its current use in community nursing. The report reflects nurses' views and experiences with digital technologies, showing both benefits and challenges. The adapted graph (Figure 2) from the report illustrates the various ways nurses use digital technologies for care and communication. Nurses expressed a willingness to adopt digital tools, recognizing their potential to benefit both staff and patients. The report also highlights significant regional differences in the implementation of digital health technologies across the UK, with issues such as financial costs, connectivity problems, and resistance to change being noted. While this thesis focuses on nurses in General Practice, the QNIS report underscores the importance of integrating digital technologies into community nursing to enhance patient care and nursing practice.

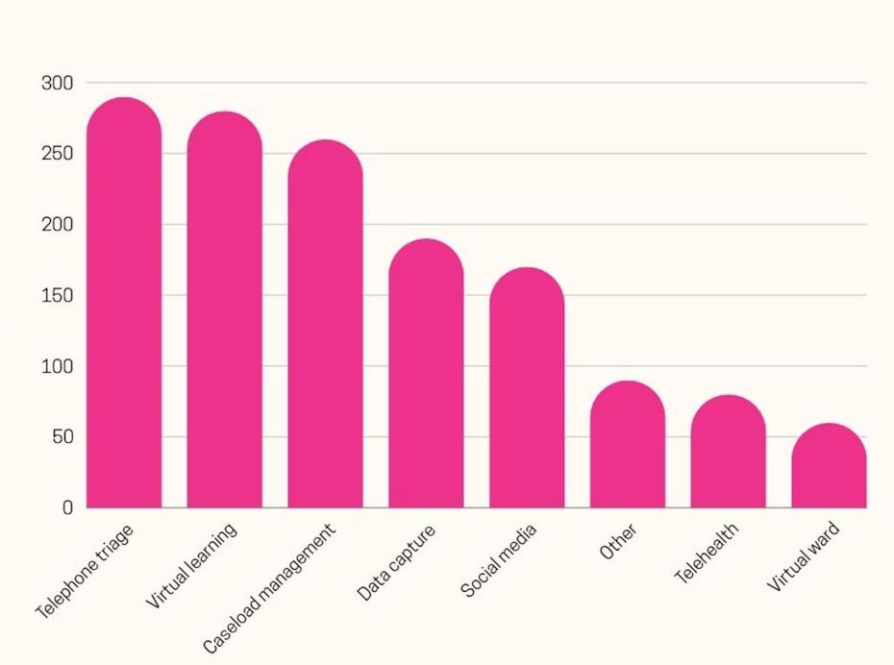


Figure 2: Graph showing what digital technologies nurses are currently using to support patients at home (Adapted from *Nursing in the Digital Age: Using technology to support patients in the home, 2018*)

1.8 Summary

This chapter has introduced types of DHT, the strategies and frameworks surrounding DHT, the growth of DHT now being used to support and manage care and DHT being used to provide digital and remote consultations. The following chapter will further explore the literature surrounding digital technologies being used in primary care by nurses as identified through a scoping review.

2 Scoping Review

2.1 Introduction

As highlighted previously in Chapter 1, research surrounding DHT use in General Practice has mostly involved General Practitioners. To guide the primary research, aspects of DHT used by nurses across all areas of primary care was required to be reviewed and mapped to identify what has already been reported on the topic to inform the next stage of research presented in Chapter 3 onwards. A preliminary search of PROSPERO, The Open Science Framework (OSF), the Cochrane Database of Systematic Reviews and *JBI Evidence Synthesis* was conducted and no current or ongoing systematic reviews or scoping reviews on the topic were identified.

2.2 Rapid Scoping Review Question

The objective of this scoping review was to assess the extent of the literature on nurses' use of digital technology within primary care.

The review question was:

What evidence exists on digital technologies used by nurses working in primary care settings to deliver healthcare services?

The following sub-questions were addressed:

1. What digital technologies have been used by nurses working in primary care to deliver healthcare services?
2. What conditions are digital technologies used for treatment and management by nurses in primary care settings?
3. What has been reported in the literature on the barriers and facilitators of using digital technologies by nurses working in primary care?
4. What gaps exist in the evidence-base regarding the use of digital technologies by nurses working in primary care settings?

2.3 Methodology

A rapid scoping review was conducted using the JBI scoping review methodology (Peters et al. 2020) and the Cochrane Rapid Review Methods Group Guidance (2020). This section will present the justification to modify Scoping Review methodology to conduct a Rapid Scoping Review, the Rapid Scoping Review method and the results of the Rapid Scoping Review.

A scoping review is a form of literature review that involves mapping the evidence already available on a topic or subject (Peters et al. 2015). The methodology was originally proposed by Arksey and O'Malley (Arksey and O'Malley 2005) then enhanced by Levac, Colquhoun and O'Brien (Levac, Colquhoun and O'Brien 2010) before being further refined by the JBI Collaboration (Peters et al. 2015 & 2020). Scoping reviews are an exploratory type of evidence synthesis whereas systematic reviews are explanatory evidence synthesis aiming to identify and investigate a cause or reasoning for a phenomenon occurring or how effective something is (Munn et al. 2018). A systematic review, although robust, would not provide the same broad scope of literature that is required in a scoping review (Munn et al. 2018). Whereas a scoping review enabled the literature to be mapped and an overview of studies that are already available on DHTs to be obtained.

As well as identifying what evidence is already available in the field, scoping reviews can identify concepts and definitions already in literature, see how research has currently been conducted, identify characteristics and factors around a concept, scope the current literature and identify and analyse gaps in knowledge (Munn et al. 2018). Other similar "big picture" review types, such as mapping reviews and evidence and gap map (EGM) reviews, were also considered as a methodology; which are summarised in Table 5.

Campbell et al. (2023) describe the differences in their terminology and meaning, the theoretical routes that underpin these differences and highlight the similarities while showing their unique differences. Mapping reviews allow a 'transparent, rigorous, and systematic approach to identifying, describing, and cataloguing evidence and evidence gaps in a broader area' (Campbell et al. 2023). They may have a broader focus than scoping reviews and may or may

not be accompanied by an EGM. EGMs are described as a systematic presentation which displays the available evidence relevant to the research questions being asked (Campbell et al. 2023).

All three address broad, big picture research questions supported by methodological guidance. However, carrying out a scoping review allows a more inductive, in-depth approach including fewer studies and the ability to carry out a greater level of data extraction compared to the other reviews discussed (Campbell et al. 2023).

"Big Picture" review types	**Characteristics of review**
Scoping Review	- Broadly examines the extent, range, and nature of research activity - Identify gaps in the existing literature - Clarifies key concepts and definitions - Establishes research priorities - Uses a systematic approach
Mapping Review	- Provides a visual and/or tabular representation of the state of knowledge in a particular field - Maps out key concepts, theories and evidence - Identifies trends and patterns in literature - Highlights areas of high and low quantities of research - Uses systematic methods to identify and analyse literature

Evidence and Gap Map Review	- Creates a visual representation of the evidence available on a specific topic - Identifies both the existing evidence and gaps in research - Focuses on systematic mapping of evidence related to a particular research question or policy issue - Uses systematic search and selection criteria

Table 5: Summary of review types and key characteristics (amended from Campbell et al. 2023)

The JBI guidance was updated in 2020 making it the most up to date methodology for scoping reviews (Peters et al. 2020). The researcher has completed the JBI training in Scoping review methodology and Robert Gordon University (RGU) have provided methodological support via the supervisors. The rapid scoping review followed a comprehensive search strategy and protocol (APPENDIX 1) which was uploaded to OSF (https://osf.io/4tfvr/) and reviewed by experienced researchers in the team with previous experience in scoping reviews.

2.4 Inclusion Criteria

2.4.1 Participants

This rapid scoping review considered studies that included nurses working in the primary healthcare setting (including international equivalents such as family practice). This included Advanced Nurse Practitioners, practice nurses, community nurses, district nurses, family nurses and any specialist nurse based in primary care. Literature that included nurses working in hospital-based settings or care homes were excluded from this review. In addition, literature

was excluded if it related to other healthcare professions. Studies with mixed populations were included if at least 70% of participants were nurses or findings for nurses were reported separately.

2.4.2 Concept

The concept examined by this review was the use of digital technology to support, deliver or manage patient care. Any type of digital technology being used by nurses was included (such as, but not limited to eHealth, Telehealth, eConsults, telephone, digital health devices). Digital technology specifically utilised by medical or other healthcare professionals within the primary care setting was excluded.

2.4.3 Context

This scoping review considered studies that were conducted in Primary care settings in any country. Settings out with acute or secondary care/hospital were of interest. Globally, this is defined as Primary care according to the World Health Organisation (WHO, 2024). For the purposes of this review, the term "primary care" was adopted to represent settings across all nations and the different terms were included within the search strategy.

2.4.4 Types of Sources

This rapid scoping review considered all study designs. This included both qualitative and quantitative studies and systematic reviews. Quantitative studies included both experimental and quasi-experimental study designs such as randomised controlled trials, non-randomised controlled trials, before and after studies and interrupted time-series studies. In addition, analytical observational studies including prospective and retrospective cohort studies, case-control

studies and analytical cross-sectional studies were considered for inclusion. This review also considered descriptive observational study designs including case series, individual case reports and descriptive cross-sectional studies for inclusion. Qualitative studies were also considered to be included, but not limited to, designs such as phenomenology, grounded theory, ethnography, qualitative description, action research and feminist research.

2.5 Methods

In this scoping review, the current use of digital technology by nurses within primary care was mapped and synthesised. Due to the time and funding constraints of a funded one year Masters in Research, a rapid scoping review approach was adopted using JBI scoping review methodology (Peters et al. 2020) and followed the guidance by the Cochrane Rapid Reviews Methods Groups (Garrirrt et al. 2020).

Rapid reviews are a type of knowledge synthesis where parts of the review process are streamlined in order to gather information efficiently (Tricco et al. 2015; Khangura et al. 2021; Lal and Adair 2014). Originally mentioned in literature in 1997 by Best et al. (1997) they have been used as a method to provide a summary of the literature in a timely and efficient manner by using methods to streamline the traditional review (Moons, Goossens and Thompson 2021). A rapid review does not mean the review is less robust, the review formed a streamlined approach to focus the sensitivity and specificity of the search and synthesise the evidence in a timely matter. As previously state, the main reason for adopting a rapid scoping review over a standard one was due to time constraints in this MRes timeline. A full scoping review can take between

0.5 - 2 years to conduct whereas rapid reviews can take ≤ 5 weeks to complete (Khangura et al. 2012). This project was time sensitive due to full time registration for an MRes therefore a full scoping review would not have been possible. The scoping review adopted a streamlined approach to synthesise the evidence in a timely manner.

2.5.1 Search strategy

The search strategy aimed to locate both published and unpublished studies. An initial limited search of Medline and CINHAL databases using the keywords 'nurse', 'digital health' and 'primary care' was undertaken to identify articles on the topic. The text words contained in the titles and abstracts of relevant articles, and the index terms used to describe the articles were used to develop a full search strategy. The search strategy, including all identified keywords and index terms, was adapted for each included database and/or information source. The search strategy was peer reviewed by a librarian prior to operationalising.

The size of the search strategy was reduced by limiting the number of information sources and increasing the precision of the search (Garritty et al. 2020). Input and guidance was obtained from an librarian on database selection and search strategy. The databases searched were MEDLINE (EBSCOhost), CINHAL (EBSCOhost) and AMED (EBCOhost) (See APPENDIX 2 for full search strategy for MEDLINE, CINHAL and AMED). Sources of unpublished studies/ gray literature were Google (incognito mode search, limited to PDFs, searched until page 10 of search results), and Networked Digital Library of Theses and Dissertations (NDLTD). Modified search terms were used for searches for unpublished/gray literature.

Only studies published in English were included in order to manage time and studies published from 2013 to present day were included for relevance.

2.5.2 Source of Evidence Selection

Following the search, all identified records were collated and uploaded into Zotero and duplicates were removed. All records were then uploaded to Covidence (v2477; Veritas Health Innovation, Melbourne, Australia), a bespoke systematic review software, to facilitate screening and data extraction. Following a pilot test, titles and abstracts were screened. Using the guidance from the Cochrane Rapid Review Group Series, each record was screened by two reviewers independently for 20% of the records. Once agreement was found on the 20%, the rest were screened by one reviewer for assessment against the inclusion criteria for the review. Potentially relevant sources were retrieved in full and assessed in detail against the inclusion criteria and, using the same guidance, dual screening was conducted independently by two reviewers for 20% with the remainder screened by one reviewer after agreement was established. The final step of screening involved all included studies having their reference lists screened for any further relevant studies. Any conflicts were discussed and were mainly due to different reasons for exclusion. The inclusion criteria regarding exclusion reasons were clarified and the remaining screening was complete with regular reviews and discussion with the review team if needed. Reasons for exclusion of sources of evidence at full text were recorded and are reported in the following section. The results of the search and the study inclusion process are reported in full in this review and presented in a Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for scoping review (PRISMA-ScR) flow diagram (Page et al. 2021). Finally, the reference lists

of all included sources of evidence following full text screening were screened for additional studies.

2.5.3 Data Extraction

Data was independently extracted from included records by one reviewer using a data extraction tool developed by the review team (Appendix 3). Following piloting of the extraction tool with 20% of the included reports between two reviewers, one reviewer then went on to extract the data (Cochrane Rapid Review Methods Guidance 2020). Extracted data included specific descriptive details about the participants, concept, context, study methods and key findings relevant to the review question/s. Data extraction was conducted in Covidence first before being transferred to a table created using Microsoft Excel and the information was presented in a table format.

The data extracted included author(s), year of publication, country, setting, aims/purpose, population/sample size and methods/study design. Extracted data relevant to the review questions included type of digital technology, conditions managed by digital technology, and barriers, facilitators, acceptability and feasibility in relation to the use of digital technology.

The extraction form is provided (see Appendix I3*).* The extraction tool was modified and revised as necessary during the process of extraction from each included evidence source.

As per scoping review guidance (Peters et al. 2020), no quality appraisal was conducted for the included reports.

2.5.4 Data Analysis and Presentation

Search results and included records are shown in a PRISMA flow diagram in Figure 3 (Page et al. 2021). Summary data from all the included literature is shown in tabular form in Table 6.

The following sections (Sections 2.6.1-2.6.9) of this rapid scoping review will present the included research studies to address the review questions.

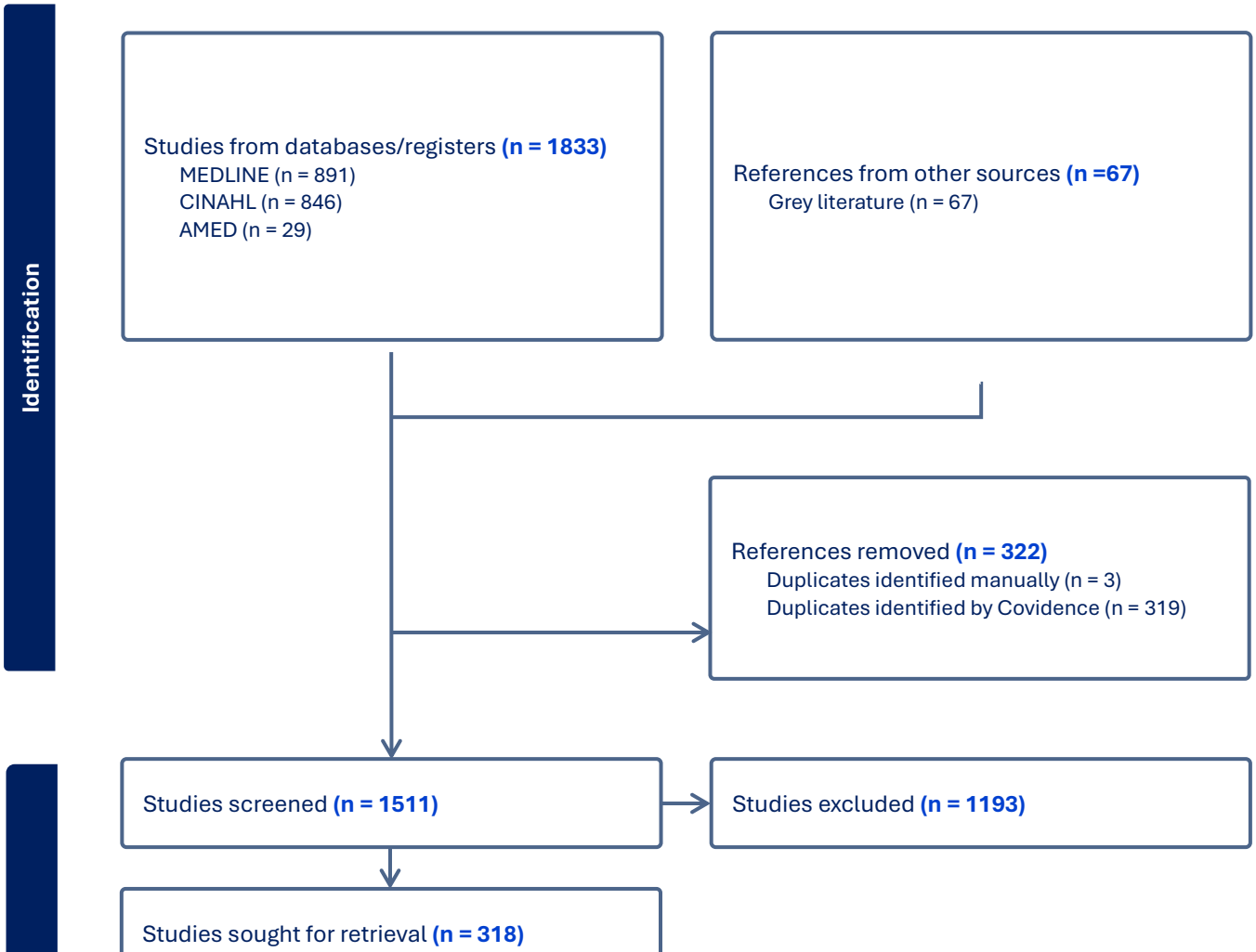


Figure 3. PRISMA Flow Chart (Page et al. 2021)

2.6 Results

2.6.1 Study Inclusion

In the initial search, a total of 1833 articles were retrieved, of which 322 were duplicates. After duplicates were removed 1511 went on to title and abstract screening of which 1193 were excluded at this stage. There were 318 full text articles reviewed and 34 were included in the review. The 284 were excluded for the following reasons: wrong population (n=146), wrong concept (n=13), wrong context (n=46), not available in English (n=3), wrong time-period (n=8), wrong study design (n=54) and Full Text unavailable (n=14). (See Appendix 4 for list of excluded References)

As there are 34 reports, to aid readability in this review the 34 reports are included in Table 6.

Table 6. Summary of literature included in Rapid Scoping Review (displayed in chronological order)

Author Year Country	Study Design Methods	Setting	Aim/Purpose	Population	Digital Technologies	Conditions
Huibers 2013 Netherlands	Cross sectional Questionnaire	NR	to identify whether patients' experiences with nurse telephone triage and organisational characteristics of PCP of cooperatives were associated with the probability of follow up contracts subsequent to contact at a PCP cooperative	Triage Primary Care Nurses 5678 Patients	Telephone consultation	NR
Voncken-Brewster 2014 Netherlands	Triangulation mixed method design Quantitative questionnaires Qualitative semi structured interviews	General Practice	to gauge the feasibility of adding a web-based patient self-management support application, by assessing patients' self-management, patients health status, the impact on	6 Practice Nurses	NR	NR

			organization of care, and the level of application use and appreciation.			
Billington 2014 United Kingdom	Randomised controlled study Single-centred, two arm design	General Practice	compare effect of COPD self-management plan with nurse telephone support (intervention) versus the self-management plan alone (usual care) on patient well-being and symptom severity	Advanced Nurse Practitioners 73 Patients	Telephone consultation	COPD
Odnoletkova 2014 Belgium	Randomised controlled trial Parallel-group	General Practice	1) to assess whether The COACH Program can be offered by a sickness fun and delivered in cooperation with caregivers in Belgium; 2) to investigate whether the COACH Program helps people with type 2 diabetes to achieve better glycaemic control and improved modifiable diabetes risk factors and self-perceived health compared with usual care alone;	Diabetes Specialist Nurse 574 Patients	Telephone consultations	Diabetes

			3) to analyse the cost effectiveness of The COACH Program from the perspective of the health care system based on the trial results extrapolated to a life-long horizon			
Verwey 2014 Netherlands	Feasibility Interactive user-centred design	NR	In the project It's Life!, technology was developed and tested aimed as supporting patients and nurses in Dutch primary care to stimulate physical activity	3 Registered Nurses 20 Patients	Accelerometer Smartphone application Web-based application Self-management	COPD Diabetes Weight management
Verwey 2014 Netherlands	Qualitative Focus groups	NR	To test the performance, acceptance and user satisfaction of a tool to stimulate physical activity	3 Registers Nurses 20 Patients	Accelerometer Smartphone application Web-based platform	COPD Diabetes
Cund 2015 United Kingdom	Evaluation methodology Telehealth satisfaction questionnaire	NR	Described patient and nurses experiences of using Florence Simple Telehealth (Flo)	33 Community Nurses 37 Patients	Telehealth SMS texting Web-based platform	Diabetes COPD Respiratory failure Wound care
L'Esperance 2016 United States	NR Survey with closed and open-ended questions	NR	(a)to utilize the Diffusion of Innovations theory to conduct a comprehensive assessment of	17 Registered Nurses 56 Patients	Web-based platform Application	Diabetes

			advantages and barriers to MyCareTeam use among patients and staff of an adult diabetes clinic and (b) to then utilize the findings to develop recommendations to best support patient and staff needs for improving MyCareTeam adoption and use			
Walker 2016 New Zealand	Qualitative Semi structured interviews and focus groups	Community	to explore the views, expectations, practices and attitudes of registered nurses working in the community concerning electronic health records and the use of mobile devices	26 Nurses 4 Registers Senior Nurses 2 Nurse Managers 8 General Practice Nurses 12 District Nurses	E-health Electronic health records Mobile devices Video consultations	Oncology Palliative Paediatrics Vascular
Stratton 2016 United States	Cross-sectional Online survey	NR	purpose of this pilot study was to survey primary care NP's protentional acceptance of MTD. Specifically, the study elicited new information on the specific factors involved in intention to	62 Nurses 50 Family Nurse Practitioners 5 Advanced Nurse Practitioners 2 General Practice Nurses 1 Advanced Nurse Practitioner 3 Paediatric Nurse	Mobile applications Camera	Dermatology conditions

			use (acceptance of) MTD	1 Women's Health Specialist Nurse Practitioner		
Smith 2017 United Kingdom	Randomised controlled trial Mixed Methods Semi-structured interviews and usage analysis	NR	explore practitioners' usage of POWeR+ and their experiences of providing support to patients using POWeR+	54 Registered Nurses (Intervention) 13 Registered Nurses (Interviewed)	Web-based interface Self-monitoring	Weight management
Frimpong 2017 Ghana	NR Questionnaires with open and close ended questions	Health Centres	to assess the use of ICT in PHC for health promotion	55 Public Health Nurses	Information Communication Technology	NA
Oberg 2017 Sweden	Qualitative Focus groups	Health Centres	to describe Swedish primary healthcare nurses' perceptions of using digital eHealth systems and services to support patient self-management	20 Specialist Nurses	E-health service Self-management	NR
Mallow 2018 United States	Prospective pre/post design One group feasibility mI smart intervention	Primary Care Clinic	to present the initial effectiveness of a web based, structure of sensors and mobile devices designed to overcome the known health determinant of access to care for rural, chronically ill patients by using technology	Advanced Nurse Practitioner 30 Patients	Web-based platform Messaging portal Video conferencing Self-monitoring devices Glucometer Blood pressure monitor Bluetooth devices Self-monitoring	Diabetes Blood pressure management Weight management

Garcia-Ortiz 2018 Spain	Randomised controlled trial 2 parallel arms	Primary Care Centres	to evaluate the long-term effectiveness of adding an app over 3 months to support standardised counselling in increasing PA and adherence to MD, and analysed the effects of the time of app use on lifestyle modifications, as well as the maintenance over time of lifestyle changes achieved	Research Nurse 833 Patients	Smartphone application Self-monitoring	Lifestyle
Pchayapinyo 2019 Thailand	Feasibility/Acceptability Single arm pre-post trial intervention Qualitative Semi-structured exit interview	Primary Care Clinics	study examined the feasibility and acceptability of a self-care assistance programme for poorly controlled type 2 diabetes mellitus. The SukapapNet programme consisted of automated interactive voice response calls to patients and automated follow-up email notifications to their nurses	6 Community Nurses 35 Patients	Cloud based Telecommunication	Diabetes
Johansson 2019	Descriptive Mixed Methods	NR	to elucidate the nurses' experiences	16 Registered Nurses	Telephone consultations	NR

Sweden	Qualitative inductive approach and quantitative questionnaires		with the Nurse Telephone Counselling Service			
Chambers 2019 United Kingdom	NR Workshops and action learning sets	General Practice	Technology enabled care (TEC) country-wide programme was to digitally enable general practice at scale. The programme sought to establish: thirty 'digital champion' practices providing at least two TEC services to patients for at least three months, ten 'digital exemplar' practices providing at least three TEC services to patients for at least six months	40 General Practice Nurses	Technology enabled care Video consultations Applications Web-based platforms Telehealth Mobile health Screening device Online consultations	NA
Beaney 2019 United Kingdom	NR Action learning programme	General Practice	For GPN participants to become digital champions using at least 2 modes of TECS. To champion clinical engagement in the digital delivery of general practice care	24 General Practice Nurses	Technology enabled care Social media Telehealth Video consultations Smartphone applications Mobile health screening SMS texting Video consultations,	NA

Lie 2019 Norway	Qualitative Semi structured interviews	General Practice	to explore how an eHealth intervention based on the Guided Self-Determination program (eGSD) influences the patient-nurse relationship from the perspective of patients participating and the nurses conducting the intervention	4 Registered Nurses 10 Patients	Web-based platform E-consultations Self-monitoring	Diabetes
Young 2020 United States	Randomised controlled trial Two arms	Primary Care Clinics	to evaluate the effectiveness of a nurse coaching program using motivational interviewing paired with mobile health (mHealth) technology on diabetes self-efficacy and self-management for persons with type 2 diabetes	319 Patients	NR	NA
Clarke 2020 United Kingdom	Non-randomised cluster-controlled feasibility study	General Practice	to test the feasibility of undertaking a primary care-based randomised cluster-controlled trial in terms of recruitment, retention, engagement and acceptability of	2 Practice Nurses 2 Practice Nurses/Research Nurses 41 Patients	Online assessment Self-monitoring Web-based platform	Oncology

			the intervention - the online prostate cancer specific holistic needs assessment (sHNA)			
Kes 2021 Turkey	Randomised controlled trial Single-blinded two group pretest and post test experimental design	Health Centres	to evaluate the effect of telephone monitoring in combination with texts, on medication adherence and blood pressure control in primary hypertension	92 Patients	Telephone consultations SMS texting	Blood pressure management
James 2021 Australia	Qualitative Semi-structured telephone interviews	General Practice	to explore the experiences of Australian primary healthcare nurses in the use of Telehealth during COVID 19.	25 Nurses 12 Community Nurses 13 General Practice Nurses	Telehealth	NR
Fernandes 2021 Brazil	Descriptive exploratory Questionnaire	NR	analyse the management actions of nurses in primary healthcare service from the perspective of technologies	42 Primary Care Nurses	NR	NA
Hellzen 2022 Sweden	Qualitative Semi-structured interviews	Health Centres	exploring the concept of digital communication and the often unclear concept of continuity of care from perspective of primary healthcare nurses	12 District Nurses	Video consultations Electronic health records Self-monitoring	NA

Thomas 2022 Sweden	Qualitative Semi structured interviews	Primary Care Centres	To explore behaviour change determinants for implementing a mHealth intervention (MINISTOP 2.0 app) for family nursing practice in primary healthcare	15 Paediatric Nurses	mHealth Smartphone application	Weight management
Berntsson 2022 Sweden	Qualitative Semi structured interviews	Health Centres	to explore district nurses' (telenurses') experiences and perception of patient safety when providing health advice over the phone	12 District Nurses	Telephone consultations Web-based platform Web cameras	NA
Arnaert 2022 Canada	Qualitative Semi-structured interviews	NR	Experiences of COPD patients and the potential benefits for receiving integrated Telehealth services during the lockdown	Community Health Nurse 10 Patients	Telemonitoring Cloud based application Video consultations Self-monitoring Pulse oximeter Remote monitoring	COPD
Jarl 2023 Sweden	Qualitative Focus groups	Health Centres	to explore patient needs after being diagnosed with T2DM, the of DSNs, treating these patients, and the elucidate how these needs identified by patients and DSNs might be met by a DHI for diabetes self-management	22 Diabetes Specialist Nurses 14 Patients	NR	Diabetes

			education and support (DSMES			
Regragui 2023 Canada	Sequential explanatory design Mixed methods Across sectional e-survey Semi structured interviews	Primary Care Clinics	to explore the use and implementation of teleconsultations by primary care nurses in the context of the COVID 19 pandemic 1) to compare the use of teleconsultation modalities before and during the pandemic by clinical nurses (NCs) and nurse practitioners (NPs) and identify factors influencing their use; and 2) to better understand NCs and NPs experiences implementing teleconsultations	34 General Practice Nurses (Survey) 10 Nurse Practitioners (Interviewed)	Teleconsultations	NA
Ekstedt 2023 Sweden	Qualitative Semi structured interviews	Health Centres	to provide a deeper understanding of patients' and healthcare professionals	7 Registered Nurses 20 Patients	Telehealth Telemonitoring devices	Heart failure Blood pressure management

			experiences regarding patients safety and a sense of security when telemonitoring chronic conditions in him healthcare			
Odeh 2023 United Kingdom	Qualitative Semi structured interviews	General Practice	was to elicit practice nurses' perceptions about the Telehealth service provided within this PCT, and to identify barrier to the implementation of the service	7 General Practice Nurses	Telehealth	COPD Heart failure

2.6.2 Characteristics of included studies

The scoping review included 34 reports in which all were primary research studies. Study designs included: 13 qualitative studies, 6 randomised controlled trials (RCTs), 5 mixed methods studies, 4 surveys/questionnaires, 1 non-randomised controlled trial and 5 study designs were NR.

The reports were published between 2013-2023 as per the inclusion criteria. The UK had the highest number of studies (n=8) on digital technology used by nurses in primary care closely followed by Sweden (n=7) and then USA (n=4) and Netherlands (n=4) shown in Figure 4.

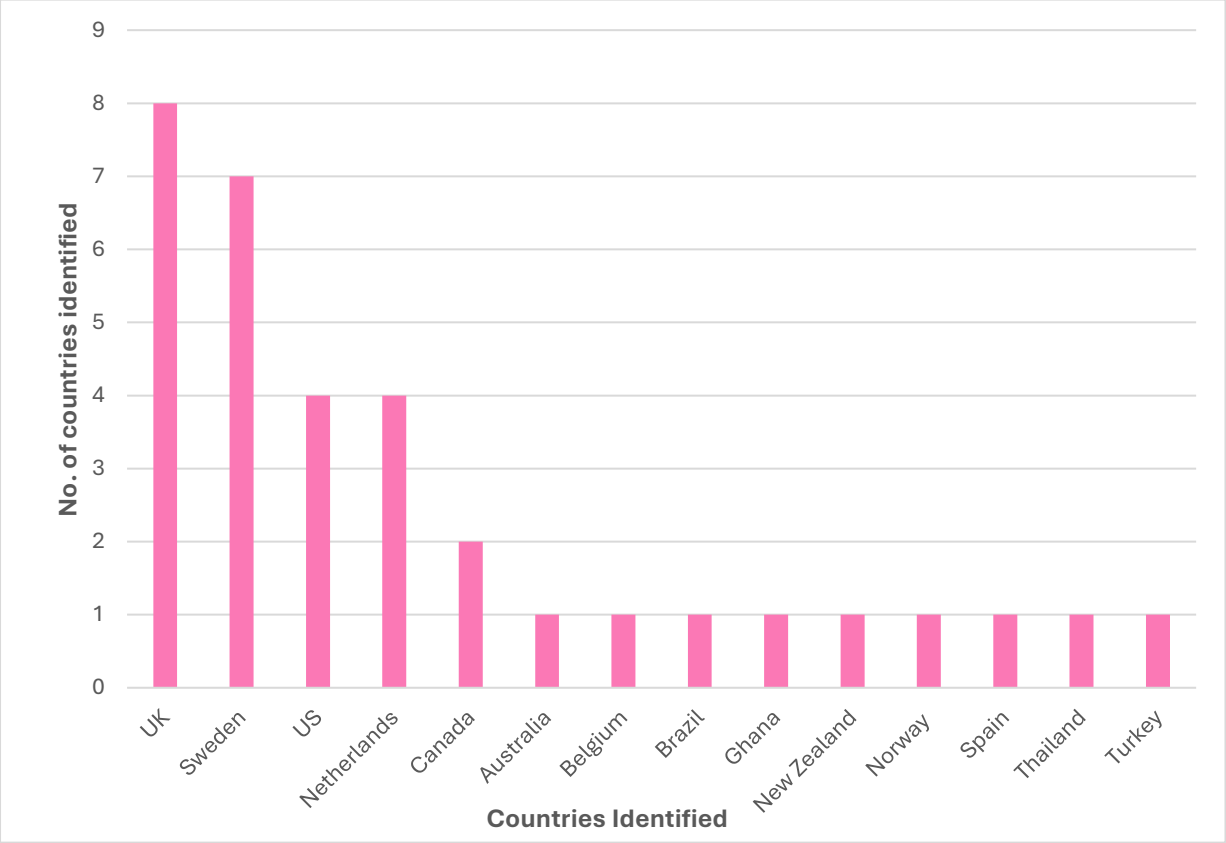


Figure 4. Bar Chart represents countries identified in rapid scoping review

2.6.3 Population

A summary of the populations included in the review is displayed in Table 6. There was a variety of nursing profession titles used across the literature depending on where the research was conducted, which made it challenging to separate into staffing groups for data extraction. General Practice nurses (n=9, 26%) comprised the largest population included in the reports. Eight (24%) studies used Registered nurse (RN) as the nursing profession title. Due to the previously mentioned variety in nursing professions, specialist nursing roles were grouped together during data extraction into Specialist nurses (n=6, 18%). This included: diabetes specialist nurses, women's health specialist nurses, triage primary care nurses. The other nursing populations included in the studies were community nurses (n=4), Advanced Nurse Practitioners (n=4), district nurses (n=3), nurse managers (n=2), research nurses (n=2), paediatric nurses (n=2), public health nurses (n=1), family nurse practitioners (n=1) and primary care nurses (n=1). Of the 34 studies reported, n=6 of them included more than one nursing population.

Over half of the reports (n=18, 53%) discussed patients' perspectives of using digital technologies to manage their LTC or have healthcare delivered. Across the reports that reported on patients' characteristics, there was a majority of female (n=9) participants across those that reported gender and 40-80 years was the age range of reported patients.

Table 7. Nursing population and patient population demographics including nursing role, age and gender.

DEMOGRAPHICS OF NURSING PARTICIPANTS			
NURSING ROLES IN PRIMARY CARE		**AGE RANGE**	
GPN	9	*<30-40*	4
RN	8	*41-50*	3
SPECIALIST NURSE	6	*51-60*	5
COMMUNITY NURSE	4	*NR*	16
ANP	4	*NA*	6
DN	3	**GENDER**	
NURSE MANAGER	2	*All female*	10
RESEARCH NURSE	2	*Majority female*	5
PAEDIATRIC NURSE	2	*NR*	12
NR	2	*NA*	7
PHN	1		
FNH	1		
PCN	1		
DEMOGRAPHIC OF PATIENT PARTICIPANTS			
AGE RANGE		**GENDER**	
<40-50	1	*Majority female*	9
51-60	5	*Majority male*	5
61-70	6	*NR*	4
71+	1	*NA*	16
NR	4		
NA	16		

Key: GPN - General Practice Nurse; RN – Registered Nurse; ANP – Advanced Nurse Practitioner; DN – District Nurse; PHN – Public Health Nurse; FNH – Family Nurse Practitioner; PCN – Primary Care Nurse; NR – Not reported; NA – Not applicable

2.6.4 Settings

Figure 5 shows there was variation in Primary Care settings across the research. Health Centres (n=7), General Practices (n=9) and Primary Care Clinics (n=4) were the most frequent settings recognised in the literature as using digital technologies when delivering or managing care in primary care settings. Around one third of the research stated that it was primary care focused but did not specify which primary care setting (n=11).

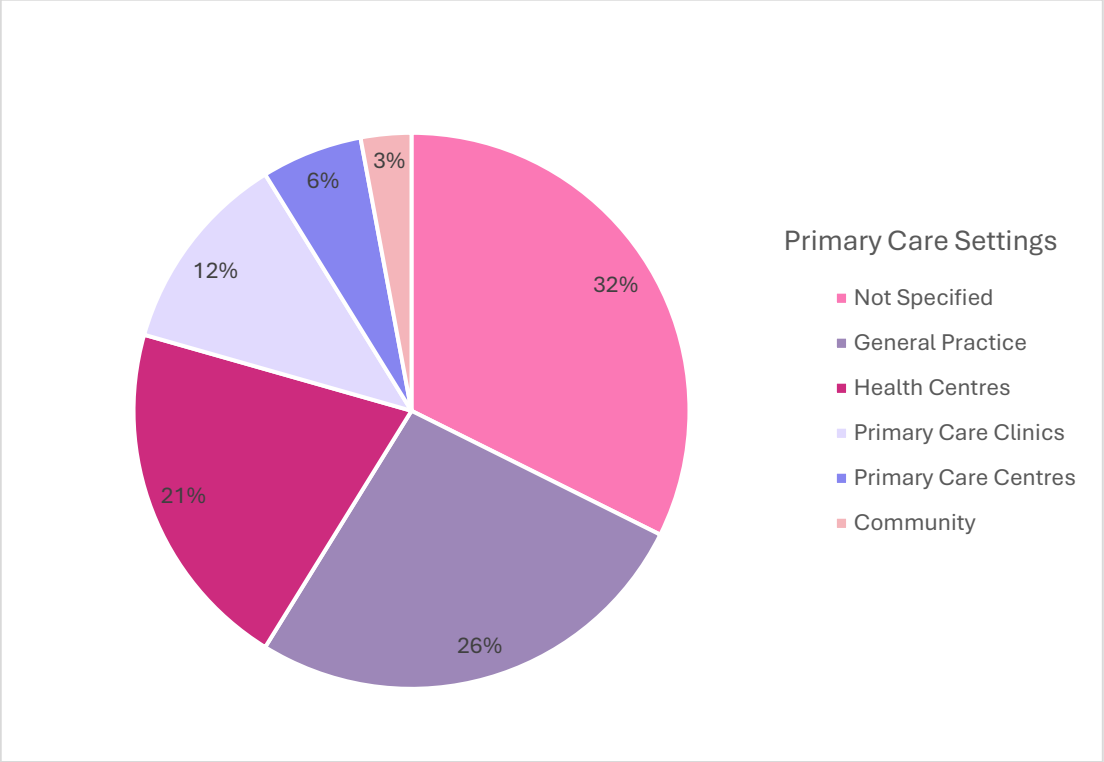


Figure 5. Primary Care Settings identified from included reports in scoping review

2.6.5 Questions Addressed

The aims and objectives of the studies included in the review (n=34) were reviewed and research topics were identified. The topics included 1) Types of digital technologies being used; 2) LTC being managed by DHT; 3) Barriers to DHT and 4) Facilitators to DHT. The findings are summarised in Figure 5 are discussed in detail in the following sections to answer the review questions. As a reminder the review question was:

What evidence exists on digital technologies used by nurses working in primary care settings to deliver healthcare services?

And the sub questions answered were:

1. What digital technologies have been used by nurses working in primary care to deliver healthcare services?
2. What conditions are digital technologies used for treatment and management by nurses in primary care settings?
3. What has been reported in the literature on the barriers and facilitators of using digital technologies by nurses working in primary care?
4. What gaps exist in the evidence-base regarding the use of digital technologies by nurses working in primary care settings?

Figure 6. Showing rapid scoping review findings separated into domains in inner ring and further broken down in outer ring.

KEY: DHT – Digital Health Technologies, LTC – Long term conditions

2.6.6 Type of Digital Technologies

A wide variety of digital technologies were identified in the literature as used in Primary Care to deliver care and manage LTC. The types of digital technologies were subcategorised into four categories by identifying similar types of technologies used and grouping them together: **Telehealth and Telemedicine** (n=29), **eHealth** (n=16), Self-Monitoring (n=14) and **mHealth** (n=11). Within these groups there were different technologies and devices reported. Ten studies reported the use of more than one form of digital technology (n=10 (Beaney et al. 2019)(Berntsson, Eliasson and Beckman 2022); (Billington et al. 2015) (Chambers, Talbot and Hatfield 2019); (Clarke et al. 2020); (Ekstedt et al. 2023); (Hellzén, Kjällman Alm and Holmström Rising 2022); (Jarl et al. 2023); (Walker and Clendon 2016); (Young et al. 2020). **Telephone** consultations (n=7 (Chambers, Talbot and Hatfield 2019); (Huibers et al. 2013); (Odnoletkova et al. 2014); (Osei Frimpong et al. 2017); (Thomas et al. 2022); (Verwey, R. et al. 2014); (Voncken-Brewster et al. 2014)), **video consultations** (n=5 (Beaney et al. 2019); (Billington et al. 2015); (Clarke et al. 2020); (Ekstedt et al. 2023); (Young et al. 2020)) and **e-communications** (n=4 (Chambers, Talbot and Hatfield 2019); (Ekstedt et al. 2023); (Garcia-Ortiz et al. 2018); (L'Esperance and Perry 2016)) were the most common methods reported in the literature for communicating digitally to both patients and other staff members. **Smartphone applications** (n=8 (Beaney et al. 2019); (Ekstedt et al. 2023); (James et al. 2021); (Jarl et al. 2023); (Regragui et al. 2023); (Sharma et al. 2014); (Walker et al. 2016); (Young et al. 2020)), **web-based platforms** (n=9 (Berntsson et al. 2022); (Chambers et al. 2019); (Cund et al. 2015); (Ekstedt at el. 2015) (Garcia-Ortiz et al. 2018); (Hellzen at el. 2022); (Jarl et al. 2022); (Kes et al. 2022); (L'Esperance and Perry 2016)) and a variety of **digital healthcare**

monitoring devices (n=3 (Clarke et al. 2020); (Hellzen at el. 2022); (Lie et al. 2019)) were reported to assist patients with **self-monitoring** (n=9 (Billington et al. 2015); (Clarke at al. 2020); (Garcia-Ortiz et al. 2018); (Hellzen et al. 2022); (Jarl et al. 2023) (Johansson et al. 2019); (Kes and Polat 2022); (L'Esperance and Perry 2016); (Sharma and Clarke 2014)) which was discussed several times as allowing patients to have autonomy over their own health. **E-health records** (n=2 (Beaney et al. 2019);(Billington et al.2015)) were reported as ways of storing health information and data.

2.6.7 LTC identified as managed by DHT

The literature identified what LTC are currently being managed by DHT across Primary Care. Of the 34 reported studies, n=7 studies reported on multiple LTC. This included **Metabolic Conditions** (n=10 Berntsson Hatfield and Hughes 2019); (Cund et al. 2015); (Garcia-Ortiz et al. 2018); (Hellzen et al. 2022); (Jarl et al. 2023); (Mallow et al. 2018); (Odeh et al. 2023); (Odnoletkova et al. 2014); (Verwey et al. 2014); (Young et al. 2020)) **Respiratory Conditions** (n=9 (Berntsson, Hatfield and Hughes et al. 2022); (Clarke et al. 2020); (Jarl et al. 2023); (Odeh et al. 2023); (Stratton and Loescher 2016); (Voncken-Brewster et al. 2014); (Young et al. 2020), **Cardiovascular Conditions** (n=5 (Hellzen at al. 2022); (Huibers et al. 2013); (Lie et al. 2019); (Odeh et al. 2023) (Stratton et al. 2016)), **Weight management** (n=4 (Hellzen et al. 2022); (Jarl et al. 2023); (Kes and Polat 2022); (Regragui et al. 2019)) **Cancers** (n=2 (Beaney et al. 2019); (L'Esperance and Perry 2016)), **Dermatology Conditions** (n=1 (Janes et al. 2021)) and **Wound Care** (n=1 (Berntsson, Eliasson and Beckman 2022)). **Diabetes** (n=10 (Berntsson, Eliasson and Beckman 2022); (Cund et al. 2015); (Garcia-Ortiz et al. 2018); (Hellzen et al. 2022); (Jarl et al. 2023); (Mallow et al. 2018); (Odeh et al. 2023); (Odnoletkova et al. 2014); (Verwey et

al. 2014); (Young et al. 2020)) was the most frequently reported LTC managed by digital technologies. **COPD** (n=7 (Berntsson, Elisasson and Beckman 2022); (Clarke et al. 2020); (Jarl et al. 2023); (Osei et al. 20); (Strattor and Loescher 2016); (Voncken-Brewster et al. 2014); (Young et al. 2020) and **weight management** (n=4(Hellzen et al. 2022); (Jarl et al. 2023); (Kes and Polat 2022); (Regragui et al. 2019))) were also highly reported as LTC managed using digital technologies. Cardiovascular conditions **specifically Blood Pressure Management** (n=3 (Hellzen at al. 2022); (Huibers et al. 2013); (Lie et al. 2019)) was another commonly reported condition using digital technologies for management.

2.6.8 Barriers to DHT

Barriers were reported in eight of the 34 studies included in this review. There were four key barriers identified: Technology issues and lack of support, Access and cost, Training and workload and Patient care/experience.

Technological Issues

Technology issues were identified as a challenge particularly around adequate equipment (Beaney et al. 2019); (Cund, A. et al. 2015); (Walker and Clendon 2016). Specific issues raised were around power and internet supply, equipment being user friendly, IT systems being user friendly, synchronisation of different IT systems and vulnerability to virus attacks (Arnaert et al. 2022); (Beaney et al. 2019); (Verwey, R. et al. 2014). It was also highlighted in the findings that when technology issues arise there was not enough ICT support for staff delivering and patients receiving care via DHT (Garcia-Ortiz et al. 2018); (Johansson and Ivarsson 2019); (L'Esperance and Perry 2016); (Osei Frimpong et al. 2017); (Stratton and Loescher 2016); (Young et al. 2020).

Access and Cost to DHT

Eight findings from five articles identified issues with Access and Cost related to DHT. High costs of purchasing and installation of equipment were reported along with the cost of training staff to use new systems and technologies (Arnaert et al. 2022); (L'Esperance and Perry 2016). A number of issues were identified in relation to access and inequalities for patients (Ekstedt et al. 2023). This finding pertains to whether patients had access to appropriate technology and devices to receive care in the digital age (Beaney et al. 2019); (Stratton and Loescher 2016). This included lack of internet access, power outages and lack of digital literacy (Arnaert et al. 2022); (Beaney et al. 2019); (Young et al. 2020).

Training and Workload

Training and workload issues were identified in eight studies. Challenges were identified regarding the time required for nurses to learn and adapt to new equipment and systems, time that is often limited in the nursing role (Öberg et al. 2018); (Young et al. 2020). In turn, it was also reported that this leads to increased workload and time away from patient care to attend extra training (Beaney et al. 2019); (Cund et al. 2015). It was highlighted that implementation of technologies takes time to get used to and nurses are spending more time explaining how technologies work leading to longer consultations times (Ekstedt et al. 2023); (Odeh et al. 2014); (Young et al. 2020). Double the workload was also reported if they have telephone consultation initially but then still need to have an in person consultation anyway (Öberg et al. 2018); (Thomas et al. 2022).

Patient Care and Experience

Patient care and their experience was reported in 11 studies. It was reported that the rapid implementation of digital care during the COVID-19 pandemic further intensified already existing fragments in patient care (Clarke et al. 2020); (Garcia-Ortiz et al. 2018). Reported areas of concern were around emotional and psychological support, illness and treatment and access to services (L'Esperance and Perry 2016). Telephone consultation had the lowest level of satisfaction amongst contact types particularly among older patients (Öberg et al. 2018); (Thomas et al. 2022). Others reported a perceived risk to patients when it comes to digital technology's and highlighted these risks as lack of digital literacy, equipment, access to care, lack of skills/confidence, consent issues and potential misinterpretation of advice (Osei Frimpong et al. 2017)(Verwey, R. et al. 2014); (Verwey, Renée et al. 2014); (Billington et al. 2015); (Clarke et al. 2020); (Odnoletkova et al. 2014).

2.6.9 Facilitators

Facilitators and benefits of digital health technology were reported in over half of the studies (n=19). The author identified three key benefits of DHT: Convenience and efficiency; Patient empowerment and satisfaction; Improves communication.

Convenience and Efficiency

Convenience and efficiency was identified as a benefit of DHT, in contrast to the previous barrier of increased workload. In terms of nursing staff delivering the care, studies highlighted nurses found the ICT system useful in sending/receiving information, communication, storage of data, triaging and for learning and training (Arnaert et al. 2022); (Beaney et al. 2019); (Osei Frimpong et al. 2017). Convenience of shared patient records across the

multidisciplinary teams, enhanced productivity, decreasing forgetfulness and less handwriting related errors were also reported (Beaney et al. 2019); (Cund et al. 2015); (Ekstedt et al. 2023); (Huibers et al. 2013). For patients, convenience and accessibility were benefits reported across studies (Walker and Clendon 2016); (Beaney et al. 2019).

Patient Empowerment and Satisfaction

Increased patient empowerment and satisfaction was reported in over half of the studies. The impact of health devices on patient empowerment was identified as a benefit of increasing patients ability to self-manage their LTC (Berntsson, Eliasson and Beckman 2022); (Cund et al. 2015); (Ekstedt et al. 2023); (Mallow et al. 2018). Devices used to manage diabetes and BP were reported as giving patient autonomy leading to better disease control (Berntsson, Eliasson and Beckman 2022); (Cund et al. 2015). Satisfaction was identified when participants did not want to return DHT tools at the end of one of the studies and positive feedback by participants who had use DHT (Young et al. 2020) (Verwey, R. et al. 2014); (Billington et al. 2015)

Communication

Finally, improved communication was identified across the studies as a benefit of DHT. Communication was reported improve between staff through direct and secure communication channels, facilitating better interaction with both other medical professionals and patents, particularly in rural areas (Arnaert et al. 2022); (Beaney et al. 2019). It was reported that during Covid patients felt that it was nice knowing someone was there to help when everything else was closed (Clarke et al. 2020). Patients appeared to be satisfied with the improved ways to communicate with healthcare staff and found reminders sent via DHT helpful for

continued monitoring (Garcia-Ortiz et al. 2018); (Hellzén, Kjällman Alm and Holmström Rising 2022); (Huibers et al. 2013); (Verwey, R. et al. 2014).

This rapid scoping review identified key barriers and facilitators for nurses using DHT in primary care. These barriers and facilitators were: technological issues; access and cost; training and workload; patient care and experience; convenience and efficiency; patient empowerment and satisfaction and communication. These will be discussed further in the following section.

2.7 Discussion

2.7.1 Summary of Key Findings

In this rapid scoping review, the evidence available on digital health technologies being used by nurses to deliver or manage care in Primary Care was identified and examined, providing a comprehensive map of the current literature. A focus of the review was on barriers and facilitators of DHT being used by nurses providing care and patients receiving care or using digital devices to manage their LTC. The primary research included a range of positive experiences of using DHT however barriers were still identified when using DHT in healthcare settings.

2.7.2 Research

This rapid scoping review included 34 studies. A wide range of research questions and outcome measures were identified in this rapid scoping review. The aim of this review was to map the evidence base surrounding DHT used in Primary Care to guide the primary research study reported in subsequent chapters. A rapid scoping review was conducted as it provided a broader investigation into DHT in Primary Care than a systematic review. A lack of

homogeneity in the area could make identification of specific review questions challenging.

Qualitative studies with semi structured interviews and/or focus groups were the most common studies and methods found in this rapid scoping review. Despite this, qualitative research is still relatively underused in health service research compared to some quantitative research designs, which commonly involve testing how effective a strategy is to achieve change in clinical practice (commonly using randomised controlled trials) (Busetto, Wick and Gumbinger 2020). Although quantitative studies can measure data numerically, they can't provide an understanding of patient, staff or care givers experiences as qualitative research can (Busetto, Wick and Gumbinger 2020a). Qualitative methods were also used in the mixed methods studies identified by the rapid scoping review.

Nursing and healthcare research has seen a growth in mixed methods research, allowing researchers to investigate various viewpoints of the research questions being asked (Shorten and Smith 2017). However, mixed method studies can add complexities to conducting research and often require more researcher experience, time and resources (Shorten and Smith 2017) (Regnault, Willgoss and Barbic 2018). Mixed method research, involving surveys and questionnaires, may also allow more participants to take part if time constraints prevent them to participating in a full interview (Schofield and Forrester-Knauss 2019). Large amounts of data can be collected in a relatively short period of time and data can be easily entered and analysed (Schofield and Forrester-Knauss 2019). This rapid scoping review identified four mixed method studies (Voncken-Brewster et al. 2014); (Regragui et al. 2023); (Smith et al. 2017); (Johansson and Ivarsson 2019)

This rapid scoping review excluded studies if the nursing population included in the studies was less than 70%. Ekstedt et al. (2023) was one of the studies included in the scoping review, where 22% of participants were physicians, meaning the majority of participants were nurses (78%) meeting the inclusion criteria. Other reviews that did not meeting the inclusion criteria for this review and were therefore excluded, featured a wide population of healthcare professionals, with very few reviews focusing solely on nurses experiences. Walley et al. (2024) conducted a scoping review that examined GPs perceptions of telemedicine in general practice. Longhini et al. (2022) conducted a systematic review that included a broad range of healthcare professionals and findings included nurses, AHP, psychiatrists, physicians and others. Considering nursing is the largest population of healthcare professionals, further research should focus solely on nurses perspectives of DHT.

2.7.3 Comparison with Previous Literature and Implications

Types of DHT and LTC management

Similar to this review, telemedicine, telehealth, telemonitoring, mobile health technologies (mHealth) and electronic medical records (eHealth) have been discussed in other systematic reviews as the most common forms of technologies being used to manage and deliver care in healthcare settings(Borges Do Nascimento et al. 2023); (Beer and Mulder 2020).

As discussed in the introduction, telehealth refers to both clinical and remote clinical services (including training and education for practitioners) whereas telemedicine solely refers to remote clinical services - a concept developed for treating patients located in remote areas. This concept became heavily relied on

during the COVID-19 pandemic, when only healthcare emergencies were being seen in person. In this scoping review, COVID-19 was frequently mentioned in the literature as a significant factor in the acceleration of virtual appointments (Arnaert et al. 2022); (Regragui et al. 2023)(James et al. 2021). Previous systematic reviews show how healthcare providers and patients relied on digital technologies during the pandemic to provide consistent care and support when regular healthcare could not be accessed or provided (Vargo et al. 2020) (Budd et al. 2020). However, there is limited research exploring the ongoing impact of DHT in primary care following the COVID-19 pandemic.

MHealth was identified in the literature as a tool to support patients to manage their LTC through the use of different devices and applications. Diabetes, weight management and cardiovascular conditions are the most common LTC discussed in other systematic reviews not included in this review (Mao et al. 2020); (Sohaib Aslam et al. 2020) (Byambasuren et al 2020). Similar to these reviews, Verwey et al (2014) and Verwey, Renee et al. (2014) were two studies identified in this rapid scoping review as using mHealth for LTC management of diabetes, as well as respiratory conditions such as COPD. Additionally, Thomas et al (2022) and Garcia-Ortiz et al (2018) explored the use of mHealth for weight management. Positive impacts of mHealth were identified in these studies around patient empowerment. Further research is needed to explore the potential of mHealth in managing other LTCs.

Hellzen et al. (2022) and Walker and Clenden (2016) were two studies identified from the rapid scoping review that explored the concept of digital communication and storage of data using electronic health records. EHealth is a much broader term that encompasses healthcare practices supported by electronic processes, including EHRs, patient administration systems, lab systems and other records

stored electronically. This aspect of digital health aligns with the UK Governments 'Plan for digital health and social care' plan which aims to have 100% of NHS Trusts using electronic health records by March 2025 (UK Government 2022). Studies looking into the benefits and challenges of the implementation of eHealth systems are in keeping with this UK Government plan and will hopefully identify strengths and areas of improvement to meet the 2025 aim.

There are gaps in the research in terms of which LTC have been researched. Further research could focus on women's health, chronic pain, sleep disorders, mental health disorders and autoimmune diseases. While these conditions may already be supported via the use of digital technology, no published literature on this was identified in this review, suggesting that research in these areas is either lacking or they are yet to be published.

Barriers and Facilitators

Barriers and facilitators were identified across all included studies in this rapid scoping review and found a range of both challenges and benefits of using DHT in primary care. Other reviews may not have been specific to nurses in primary care but they can still provide insights into the broader barriers and benefits using DHT for LTC management.

A scoping review by Whitelaw et al. (2021) identified barriers and facilitators of DHT specifically in cardiovascular care. Similar facilitator findings to this rapid scoping review included: improved communication, personalisation, empowerment, improved efficiency and increased communication between patients and clinicians. Similar barrier findings included: internet and infrastructure issues, digital exclusions (including: age; language barriers; cost)

and increased workload and pressures. A scoping review by Whitelaw et al. (2021) did identify some barriers and facilitators that were not found in this rapid scoping review. This review included all healthcare professionals and was not specific to primary care. Improved sense of security and support for family and care givers were two benefits found that were not identified in the current review. As well as this, fear of using technology, lack of integration with other digital technologies and negative attitudes from management were barriers identified that differed from the current review.

2.7.4 Strengths and Limitations

This rapid scoping review methodology provided a broad overview of the available evidence and helped to identify gaps in the existing literature. Due to the rapid nature of the review there were some limitations. For instance, following the Cochrane Rapid Review Guidance only 20% of included studies were reviewed by two reviewers which could have led to some bias. To keep the review narrow and focused only three databases were searched, which could have led to incomplete coverage of the literature. Furthermore, as there were time constraints studies were excluded that were not published in English to reduce time for translation (however, non-English speaking countries were represented in the included studies). Additionally, the study had a restricted time period to the last 10 years (2013-2023) to focus on the peak time of the digital advancements. Therefore, additional in-depth research on specific research topics may be required. Despite the limitations, using a librarian to consult with on database searches and the search strategy reduced the impact and supported a sensitive and specific search. The Cochrane Rapid Review Guidance also allowed the limitations to be minimal and enabled a robust and rigorous review to be conducted.

2.8 Conclusion

Based on the findings of this scoping review digital technologies have been introduced rapidly into the Primary Healthcare setting, particularly following the COVID-19 pandemic. The use of digital technologies is multifaceted within the nursing role, ranging from being used for communication and documentation, to delivering and managing care. Digital technologies are improving and growing rapidly in the digital age and may be the answer to address preventative care and support people with LTC. However, there is a need for further research to be explored to identify how this is being managed in practice and to address the remaining gaps in the literature.

This rapid scoping review formed the first steps of research on digital technologies being used by nurses in primary care. Due to the gaps identified from this rapid scoping review, the following research addressed the specific DHT being used by nurses working in the general practice setting to manage and support patients with LTC. This research will then investigate the specific DHT that nurses are using to communicate, manage and support people with LTC and identify their experiences with using these DHT.

3 Study Aims and Objectives

The overall aim of this study was to explore digital technologies (such as but not limited to E-consultations, video consultations (NearMe), digital devices to monitor conditions, electronic notes) used by nurses to deliver care and how people with long term conditions experience digitally delivered care from nurses within the GP setting. The project aimed to identify strengths and limitations of

existing digital technology in practice, including barriers and facilitators to their use, and any training needs for nurses as well as the experience of patients.

3.1 Research Questions

The research questions for this project were:

1. What are the experiences and perspectives of nurses (based in GP practices) in using DHT to deliver care for people with long term conditions?
2. What are the experiences and perspectives of people with long term conditions receiving care delivered via DHT by nurses in GP practices?

In order to answer the two questions, the project objectives were:

1. Conduct a mixed methods study to understand and explore:
    a. The experiences and perspectives of nurses (based in General Practice) using DHT to deliver care for people with long term conditions (survey and qualitative interviews/Focus groups)
    b. The experiences and perspectives of people with long term conditions receiving care from nurses (based in General Practice) for their condition (qualitative interviews)

The design, methods and methodology used to address the above objectives are detailed in the following chapter.

4 Methodology and Methods

4.1 Introduction

This chapter will introduce, justify and discuss the methodology and methods used to address the aims and objectives of this study.

4.2 Philosophical and Methodology Justification

To realise this aim, a world view of pragmatism has been adopted. This is due to the aim of this research being open ended to find out 'what will work best/what has been working best' for patients and nurses using digital health technologies (Creswell 2014). Pragmatism originally comes from the work of Charles Peirce, William James, John Dewey (Cherryholmes 1992) and pragmatics understand that the world can be viewed in multiple ways. Meaning there is different ways to undertake research and there is no one view and there may be multiple realities (Saunders, Lewis and Thornhill 2012). As shown in Table 8, Positivism (Quantitative) and interpretivism (Qualitative) only have one research approach unlike Pragmatism which can integrate the use of multiple research methods (Quantitative/ Qualitative/Mixed) (Dudovskiy 2022).

As a worldview, pragmatism arises from actions, situations and consequences unlike postpositivism which arises from a preceding event, condition or cause (Cresswell, 2014). Pragmatist research supports action and aims to advise and contribute solutions to inform practice. The research may start with a problem, and pragmatists aim to contribute practical solutions that informs practice for the future. Due to the previous points mentioned and the nature of this research, looking at how digital technology is being used in general practice, the

worldview of pragmatism was identified as the best philosophical view to adopt.

Table 8. Comparison of some of the philosophical positions (adapted from (Saunders et al. 2019))

Ontology	**Research Approach**	**Epistemology**	**Axiology**	**Typical Methods/Research Strategy**
		Positivism		
OBJECTIVE Real, external, independent One true reality (universalism) Granular (things) Ordered	Deductive	Scientific method Observable and measurable facts Law-like generalisations Numbers Casual explanation and prediction as contribution	Value-free research Researcher is detached, neutral and independent of what is researched Researcher maintains objective stance	Typically deductive, highly structured, large samples, measurement, typically quantitative methods of analysis, but a range of data can be analysed
		Interpretivism		
SUBJECTIVE Complex, rich Socially constructed through culture and language Multiple meanings, interpretations, realities Flux of processes, experiences, practice	Inductive	Theories and concepts too simplistic Focus on narratives, stories, perceptions and interpretations New understanding and worldviews as a contribution	Biased research Researchers are part of what is researched, subjective Researcher interpretations key to contribution Researcher reflexive	Typically inductive Small samples, in-depth investigations, qualitative methods of analysis, but a range of data can be interpreted
		Pragmatism		
OBJECTIVE OR SUBJECTIVE Complex, rich, external 'Reality' is the practical consequences of ideas Flux of processes, experiences and practices	Deductive/ Inductive	Practical meaning of knowledge in specific contexts 'True' theories and knowledge are those that enable successful action Focus on problems, practices and relevance Problem solving and informed practice as contribution	Value-free/biased research Research initiated and sustained by researchers doubts and beliefs Researcher reflexive	Following research problem and research question Range of methods: mixed, multiples, qualitative, quantitative, action research Emphasis on practical solutions and outcomes

4.3 Mixed Methodology

Mixed methods research is an approach in research where both quantitative and qualitative data is collected by researchers within in the same study (Creswell, 2011). Mixed methods research encompasses different research designs and Table 9 summarises the characteristics of each design and the integration of data (Halcomb and Hickman 2015) (Schoonenboom and Johnson 2017).

Originally for this study, an explanatory sequential approach was proposed. This would have involved beginning with a survey followed by interviews (Creswell, 2011). This design process would have used the data collected from the survey to help inform a topic guide for the interviews. However, due to time constraints of the MRes a convergent parallel approach was taken (Creswell, 2011). The advantage of this being that it reduced the duration of the data collection but the disadvantages being that this design method can be resource intensive and the quantitative data cannot inform the qualitative data.

Table 9. Types of Mixed Method Designs (Adapted from (Halcomb and Hickman 2015))

Mixed Method Type	Research Processes	Priority
Explanatory Sequential	Quantitative data is collected and analysed first Qualitative data is then collected and analysed to help explain quantitative data QUAN -> QUAL	Quantitative domain
Exploratory Sequential	Qualitative data is collected and analysed first Quantitative data is collected after and used to test findings empirically QUAL -> QUAN	Qualitative domain
Convergent Parallel	Qualitative and quantitative data collected and analysed at the same time QUAL + QUAN	Equal
Nested/ Embedded	Either quantitative or qualitative main design with alternative paradigm embedded within the study to answer complementary question QUAN + qual OR QUAL + quan	Either Quantitative or Qualitative domain

4.4 Ethical Process

4.4.1 Ethical Considerations

Ethical approval had been granted prior to recruitment starting. Research ethics are taken into consideration to ensure that the study is conducted morally, is well-justified, safeguards both the researcher and the participants and upholds the integrity of the research process (Mirza, Bellalem and Mirza 2023). The main ethical considerations for this study were on recruitment, consent, confidentiality and data protection.

4.4.2 Ethical Approval

When seeking ethical approval, the earlier discussed ethical considerations were detailed, and all actions taken to ensure the safety and security of the researchers and participants were recorded. Ethical approval was initially given from RGU School of Health Sciences ethics committee. Approval was granted on 03/07/2023 by Yorkshire & The Humber – Bradford Leeds Research Ethics Committee (IRAS: 323622) (Appendix 5). Permission to conduct the study locally was granted by NHS Grampian Research and Development (R&D) on the 19/07/2024 (Appendix 6).

4.4.3 Informed Consent and Potential Harm

Informed consent is a fundamental ethical principle in research studies (Oliver 2010). Participants must be given sufficient information about the study before deciding to volunteer (Oliver 2010). The informed consent process helps reduce the likelihood of participants feeling coerced into taking part in the research (Oliver 2010).

The participants were provided with a Participant Information Sheet (Appendix 7&8) describing the aims and objectives of the research and what their participation would involve. The research involved participants discussing their experiences; therefore, there was a risk of emotional discomfort. To help avoid this, a distress policy was adopted to mitigate for this (Appendix 9).

4.4.4 Confidentiality and Data Protection

Participants are entitled to confidentiality and anonymity. To minimise risks associated with personal data, only the necessary identifiable information is recorded (Nichols-Casebolt 2012). It is crucial that participants cannot be directly associated with identifiable data collected (Nichols-Casebolt 2012). In this study, each participant was assigned an anonymised study identification number, which was used for all data collection and analysis. Measures are also needed to ensure the safe storage of data after it was collected (Nichols-Casebolt 2012). In this study, any personal or identifiable data was stored in a password protected file on a secure university network folder. Additionally, any paper data was kept in a locked cabinet on university premises.

4.5 Recruitment

4.5.1 Recruitment Process

After gaining ethical approval, the first part of the recruitment process was to prepare and identify the sample that was going to be involved in the study. The study was based in the North East of Scotland within the area that NHS Grampian covered; including Aberdeen City, Aberdeenshire and Moray. As discussed in the introduction chapter, within NHS Grampian there are 69 General

Practices and approximately 392 nurses working in them in a range of different roles covering Practice Nurses, Advanced Nurse Practitioners and other specialist nurses. Therefore, the potential sample size for this project is approximately 392.

Within this preparing stage the researcher made contact with people and organisations to help disseminate the participant information as part of the recruitment and to try and identify a gatekeeper. A gatekeeper in research is described as someone who controls access to an organisation (Singh 2016).The NRS Primary Care Network was initially identified as a key contact for recruiting both nurses and patients. However, due to limited funds for this MRes project and the costs required to use its service, the NHS Research Scotland (NRS) Primary Care Network was abandoned as a recruitment option. The researcher then gained approval from the Lead Nurse of Primary Care within Aberdeenshire to help with the recruitment process who became the gatekeeper. The lead nurse was the principal route of recruitment by forwarding an invitation email to relevant staff that the study participant information sheet and link to the online survey attached. The study team also utilised their social media and used word of mouth recruitment. This way of recruiting, through the gatekeeper and through social media, allowed for participants to enquire and take part in the study without feeling coerced into participation. Service user recruitment was done through the nurses working in General Practice handing out study packs to potential participants.

4.5.2 Participant Populations

Nurses working in General Practice and patients receiving care or managing LTC via DHT were the chosen populations for this study. The plan was to capture the views of nurses who have been delivering digital healthcare to patients with LTC within General Practice. The nurses had to be fully qualified nurses and predominantly practice within the General Practice settings.

We also wanted to capture the views of people living with a LTC who have received healthcare from a nurse based in General Practice via digital technology and those who were unable to access care due to it being delivered digitally.

4.5.3 Inclusion and Exclusion Criteria

Inclusion and exclusion criteria are specified in Table 10. Student nurses were excluded due to this research being exploratory. Students may not have the same level of experiences with using DHT to manage or support patients with LTC compared to qualified staff nurses. This study was specifically looking at nurses who worked in General Practice; therefore nurses working in secondary care were excluded from this study.

Table 10 shows that patients lacking capacity were excluded from this research. The number of patients without capacity can vary, and a patients capacity may fluctuate. Although these patients could have been included with consent gained from their next of kin, it was deemed unethical to involve them as they might not fully comprehend the purpose of the research or be able to use DHT to manage their LTC.

Table 10. Inclusion and Exclusion criteria for both participant groups.

	Inclusion	*Exclusion*
Nurses	- Nurses who are delivering care via digital technology in General Practice - Practice related nurses who deliver care within general practice settings (including but not limited to Practice Nurses, Advanced Nurse Practitioners and Specialist Nurses)	- Nurses providing community-based care who do not provide digital care from within practice - Nurses providing digital health in secondary care - Student Nurses
Patients	- 18+ - receiving care delivered by a nurse via digital technology to manage their long-term health condition - Able to read and understand spoken English - Willing to take part in study	- Aged <18 - Unable to consent

4.5.4 Nursing Participant Sampling

Identification and the recruitment of nursing research participants is summarised in Figure 7. The participants had to consent in order to continue with the survey and once the participant had completed the survey there was an option for them to leave their contact details if they were interested in taking part in a further interview. If the participant agreed to an interview, the researcher would answer any additional questions the potential participant had. If the participants decided to continue, they signed a consent form, which was countersigned by the researcher (Appendix 10). Participants were informed they could withdraw at any point without needing to give a reason. Each participant was assigned a unique study ID, which was used for all data collection, processing, and analysis ensuring anonymity throughout the data gathering and analysis process.

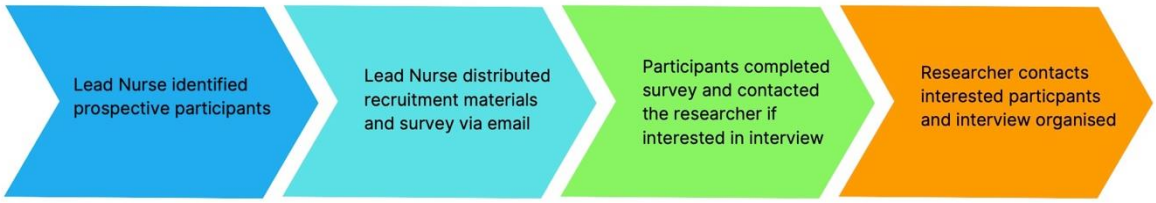


Figure 7. Identification and communication with potential nursing participants

We aimed to recruit 15 interview participants (nurses) and 30 survey participants (nurses) from across NHS Grampian, with additional recruitment to achieve data saturation as required. Recruitment aims were based on other similar research outcomes (Banks et al. 2018) (Slevin et al. 2019).

Fifteen people who completed the survey expressed interest in taking part in the interview. After follow-up emails were sent, three participants were subsequently

interviewed and due to one Team Lead expressing interest for their staff to participant in a focus group this was set up to allow for more nurses to take part taking up less clinical time.

4.5.5 Service User Participant Sampling

The plan for service user recruitment is summarised in Figure 8. This was for nurses working in general practice to identify potential participants which included: (1) people who have accessed healthcare via digital technologies (e consults, NearMe, telephone consultations), (2) people who use digital technology to manage a health condition and (3) people who are unable to receive healthcare via digital technology and feel excluded due to this, and send them a study pack (letter of invitation, consent form and Patient Information Sheet (PIS) (Appendix 12, 11, 7)) electronically or by mail.

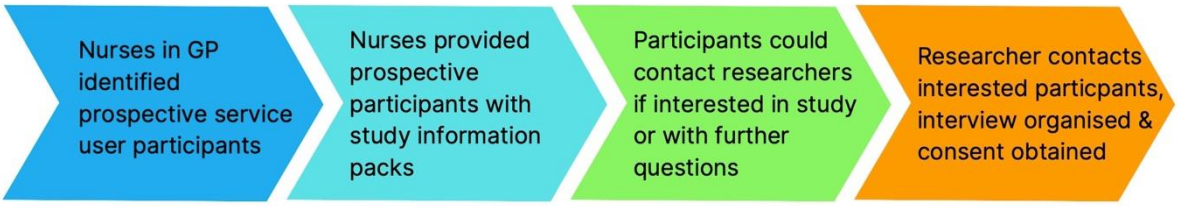


Figure 8. Identification and communication with potential service user participants

Service User study packs were given to two general practices in NHS Grampian for nurses to hand out to patients. Unfortunately, despite reminders sent by NHS Grampian nurses, no service user participants expressed interested to take part in the study; therefore, it was decided to change the study to focus solely on nurses experiences and perspectives of delivering care digitally to patients with LTC. Therefore, the rest of the methods will focus on only nurses.

4.6 Methods

The following section will describe the methods used to collect data during each stage of data collection. The methods used for the analysis of data will then be discussed.

4.6.1 Mixed Methods

Mixed methods research can be defined as combining both quantitative and qualitative forms of research in a single study (Creswell 2011). The growth of using mixed methods in nursing and healthcare research has occurred during a time of increasing complexity of healthcare delivery (Schoonenboom and Johnson 2017). The importance and purpose that both qualitative and quantitative research have within nursing research has been recognised and how it allows nurses to identify different perspectives of the same topic (Maltby et al. 2010). As stated previously, a convergent parallel mixed methods approach was conducted to answer the research questions and meet the objectives. Initially, the online survey was sent via email to General Practice Nurses and secondly nurses delivering digital care were invited to take part in an interview.

Mixed method researchers look at multiple ways of collecting and analysing data, much like pragmatists seeing the world in many different ways they are not committed to a sole system of philosophy and reality (Creswell 2011). This gives the researcher freedom of choice to choose the methods that best meet the needs to answer the research question. For mixed methods research a pragmatist approach allows for multiple methods, different worldviews and assumptions whilst using different forms of data collection and analysis (Creswell 2011).

4.6.2 Quantitative Research

Quantitative research can provide a description of trends, attitudes and opinions (Cresswell 2011). There are several approaches to conducting quantitative research which typically fall into two categories, nonexperimental and experimental research designs (Verschuren and Doorewaard 2010).

Survey research falls under the nonexperimental research and is a descriptive research design. The purpose of nonexperimental descriptive research being to describe and interpret a situation as it exists with no attempt to manipulate the situation. Whereas experimental research establishes different treatments and conditions and studies the changes and effects on participants (Verschuren and Doorewaard 2010). This study aimed to gain the experiences and perspectives of nurses so therefore survey data collection appeared to be the best quantitative approach.

4.6.2.1 Strengths and Weaknesses

One of the strengths of survey data collection being that it can be made a suitable length and having the survey online allowed the survey to be easily accessible (Siva, Nayak and Narayan 2019). Other strengths of survey data collection are: low costs, easily distributed, allows participants to fill out survey at own time and time saving for both the researcher and participants (Siva, Nayak and Narayan 2019) (Buchanan and Hvizdak 2009). Survey data collection can be less time consuming for the participant making it easier to collect data. From experience, nurses may not have time to participate in an hour-long interview, but they are more likely to have 15 minutes to complete a survey.

There are also some disadvantages associated with online survey data collection. Risks of potential spamming and fraudulent participants can be a risk associated

with online surveys (Siva, Nayak and Narayan 2019). Compared to paper surveys, online response rates can be low due to bounce back of emails, spam folders and survey fatigue (Roberts and Allen 2015). Other weaknesses found for online survey data collection were minimal and the use of online survey was decided as the best option for the chosen population of participants.

4.6.3 Qualitative Research

The most used qualitative methods of data collection in health research are document study, observations, semi-structured interviews and focus groups (Ritchie et al. 2014). The two methods considered for this study were semi-structured individual interviews and focus groups. In comparison to the survey, the qualitative interviews give the ability of probing for answers to questions and allow for unexpecting topics to emerge and be discussed (Busetto, Wick and Gumbinger 2020).

Interviews can be described as 'a conversation with a goal' (Hijmans and Kuyper 2007). Interviews are used to gain participants subjective experiences and opinions and can be determined by the degree in which the interview is structured (questionnaire), open (free conversation interview) or semi-structured (open-ended questions) (Busetto, Wick and Gumbinger 2020). Semi-structured interviews are in-depth one to one interviews using open-ended questions and are popular in healthcare professional research (Jamshed 2014).

Focus groups are formed by multiple individuals and capitalise on the dynamics of the group to stimulate the conversation (Guest et al. 2017). Some researchers have noted that the interactive nature of focus groups may allow the participants to bounce ideas off each other and produce more data than from a single one-to-one interview (Guest et al. 2017).

When the data collected between focus groups and individual interviews were compared the data was very similar in the response (Guest et al. 2017). Interviews and focus groups can be audio-recorded and/or field notes can be taken (Busetto, Wick and Gumbinger 2020). For this study the researcher chose to include both semi-structured interviews and focus groups throughout the study for inclusivity and to fit around the nurses' schedules.

4.6.3.1 *Strengths and weaknesses*

Qualitative research has many strengths when properly conducted. Interviews allow the researcher to have more clarification on answers with follow up questions and not being restricted with specific questions (Choy 2014). This can also help avoid any research-centred biases that can sometimes be found in surveys which can only measure what is already known (Busetto, Wick and Gumbinger 2020). Finally, the data gathered from human experiences can be more impactful than some quantitate data and issues can be examined in more detail and depth (Anderson 2010).

Qualitative research can be criticised as biased, small scale and lacking rigor and is sometimes not as well understood and accepted in the scientific research community as quantitative research (Anderson 2010). Other weaknesses of qualitative research can be that it is heavily dependent on researchers' skills and researcher bias can come through in the interview (Choy 2014). Finally, the large volume of data collected can make analysis and interpretation time consuming (Anderson 2010).

4.7 Survey and Interview Development

By using both approaches of data collection in parallel the overall study increases in strength rather than if the study was just either quantitative or

qualitative (Creswell and Clark 2007). Given the varied perspectives, experiences and time constraints of nurses delivering and managing DHT and patients receiving DHT a mixed methods approach was considered the best way to collect as much data as possible. The development of each phase is discussed next.

4.7.1 Survey

4.7.1.1 *Survey Development*

A survey approach was the first method used in this study. The survey was shared widely via the Lead Nurse to target and reach the 392 nurses based within NHS Grampian General Practices. The survey was launched at the same time as launching interview recruitment to allow participants to express interest in interviews straight after survey completion. Given that nurses are busy healthcare professionals, we wanted the opportunity for them to take part in the study even if they did not have the time to take part in an interview.

4.7.1.2 *Survey Design*

The online electronic survey was developed based on published literature on the topic. The survey was piloted among three healthcare professionals with experience of delivering care via digital technology and was amended before recruitment began.

The survey was created on JISC online surveys due to this was easily accessible (available via RGU), free to use and being General Data Protection Regulation (GDPR) compliant. The survey explored nurses' perceptions and experiences of digital technology used within general practice which included questions on the delivery of care, opinions on delivering care this way, its impact and how they

think patients perceive the care being delivered. Barriers and facilitators were also explored throughout the survey using attitudinal questions.

A Likert rating scale approach was used throughout some of the survey. Renis Likert developed the Likert Scale to measure attitudes and are often used within medical education research (Sullivan and Artino 2013). The usual Likert scale is a 5- or 7-point scale in order to rate how much participants agree or disagree with a point or statement (Sullivan and Artino 2013). Survey questions can be found in Appendix 13.

4.7.2 Semi-Structured Interviews and Focus Groups

4.7.2.1 *Semi-structured interviews and Focus Groups Development*

Following on from the nurses completing the survey, they could opt in for taking part in an interview. Following convenience sampling, the aim was to recruit 15 interview participants or until data saturation was achieved (Banks et al. 2018) (Slevin et al. 2019) The interviews allowed the researcher to expand on some of the survey questions and get more in-depth responses.

4.7.2.2 *Topic Guide Design*

Semi-structured interviews and focus groups are formed by topic guides which make up the questions that are used throughout the interview. In order to optimise time during the interview, the topic guide serves as a tool in allowing the participant to respond systematically and comprehensively whilst also keeping the interview focused on the topic being discussed (Jamshed 2014). The topic guide was developed from previous literature and research on the topic and once developed the topic guide was piloted prior to interviews. The sequence of these questions may vary and additional questions can be asked depending on which direction the interview takes (Tausch and Manold 2016). The questions

included in the topic guide are open-ended to avoid yes/no answers and allows participants to offer different perspectives that the researcher may not have considered (Tausch and Menold 2016). The Topic Guide can be found in Appendix 14.

5 Data Analysis

5.1 Survey Analysis Process

Once the surveys were completed by participants, responses were then downloaded into an excel spreadsheet for processing and analysis. The survey responses were then analysed using descriptive analysis to present the data as frequencies and a content analysis process was used for the open text responses (Creswell 2014).

5.2 Qualitative Data Analysis Process

5.2.1 Introduction to Analysis

Data collection for interviews and focus groups were recorded using an encrypted audio recording MP3 device. Recordings were then downloaded and saved onto secure servers at the university (R-Drive) which were only accessible to the researchers involved in the study.

Interviews were then analysed using a thematic analysis method (Ritchie and Spencer 1994). Transcripts were coded using a Thematic analysis approach and was developed and applied across the data (Ritchie and Spencer 1994). Having prior experience of using the Thematic analysis approach is one of the reasons why this was chosen by the researcher. NVivo software was considered to assist

with coding and analysis but given time constraints of the MRes timeframe the process of becoming confident using a new type of software was not available. Thematic analysis is theoretically flexible allowing us to draw on peoples' experiences, views and perceptions to address the research question (Ritchie and Spencer 1994). Data and quotes were arranged and conceptualised to make links between the themes coming out from the interviews. The aim of the analysis was to identify and explore experiences, barriers, challenges, advantages, disadvantages and mechanisms of delivering care digitally and the core themes coming through from the data.

The framework analysis process is outlined below.

5.2.2 Framework Analysis Process

Stage 1: Transcription and Stage 2: Familiarisation with Interview

Transcription was outsourced to an external professional transcription service and the interviews and focus group were transcribed verbatim. The author read the transcripts along with the field notes to re-familiarise themselves with the content of the interviews and focus group to obtain a broad overview of the responses from the participants. Notes were taken on each transcript of any ideas or topics that emerged that were significant or interesting to the research questions.

Stage 3: Coding and Stage 4: Developing a working analytical framework

One transcript was independently read by the researcher and principal supervisor, with annotations made to identify initial themes and concepts. These were then discussed, and an initial coding framework agreed (Figure 9).

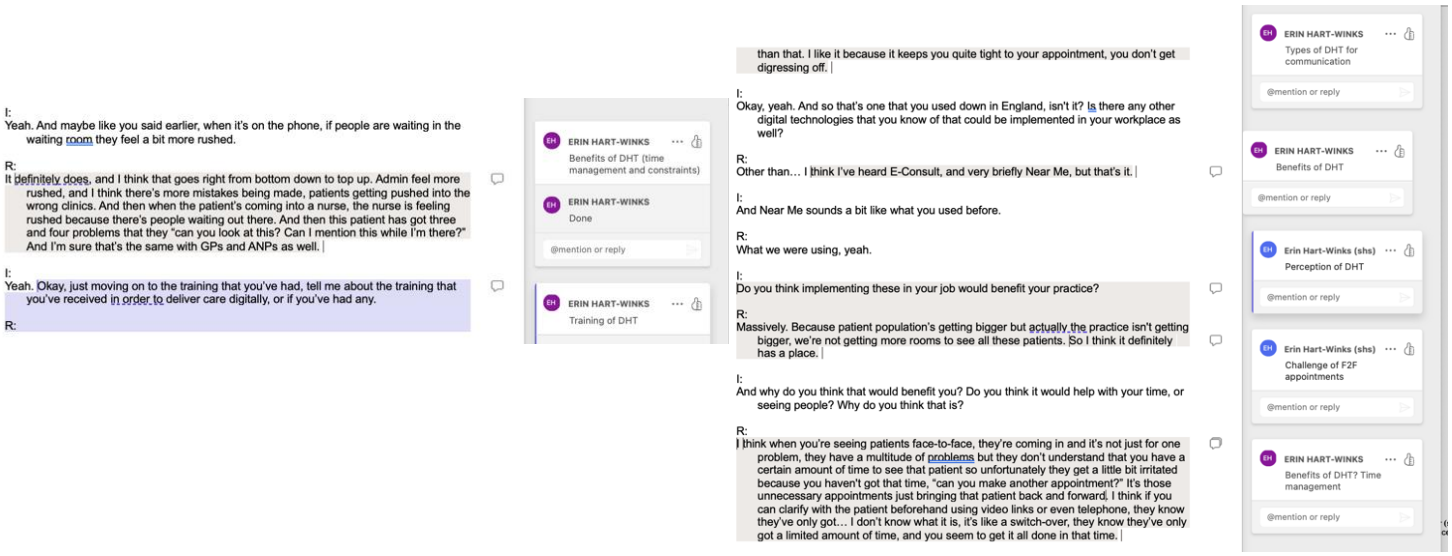


Figure 9. Examples of initial Framework process

Stage 5: Applying the analytical framework

These initial codes were then applied to the other transcript using the same technique as before and the codes were applied to each of the transcripts. If new topics emerged a new note was taken, and the topic was added to the coding index and previous transcripts were checked for the added topics. Commonalities in the data were identified throughout this process and the codes began to develop further into the first version of themes and subthemes (Table 11).

Table 11. Version 1 of Themes and Sub-themes

V1. Themes and Sub-themes
Types of DHT used in General Practice - *Communication* - *LTC management* - *Other types of DHT*
Covid and DHT

Experience and Confidence using DHT - *Fitness/limits for practice using DHT* - *Training* - *Guidance/criteria for DHT use*
Benefit of using DHT - *Convenience and time saving* - *Quality of care and patient autonomy* - *Engaging with hard-to-reach families* - *Reducing infection risk*
Challenges of using DHT - *Equipment access and infrastructure issues* - *Time constraints and increased workload* - *Perceived reduction in quality of care* - *Digital literacy and exclusion*
Perceptions of DHT - *Perceptions of the role of DHT* - *Perceptions of blended/hybrid systems* - *Perceived patient preference of DHT* - *Perceived future for DHT*

Stage 6: Charting data into the framework matrix

The working analytical framework was then charted. A spreadsheet was created on Excel to generate a matrix using these initial themes and the data was charted into the excel spreadsheet. Ritchie et al (2010) recommends that when creating thematic charts for initial themes, it is crucial to document information

from each participant and include a column to record any quotes. Verbatim quotes were charted on the spreadsheet using the participant ID for anonymisation under the relevant theme/sub theme.

Following completion of charting the data using the initial themes, the next stage was to develop these themes further. This required further interpretation of the data and going backwards and forwards through the transcripts to obtain further clarity of the collected data.

At this stage, five themes and 21 subthemes (Table 12) were identified.

Table 12. Version 2 of Themes and Sub-themes

V.2 Working Themes	**V.2 Working Subthemes**
Types of DHT use in General Practice	- Communication - LTC Management - Other DHT
Experience and Confidence using DHT	- Fitness/limits/scope of practice using DHT - Training - Previous experience using DHT - Guidance/criteria for DHT use
Benefits of using DHT	- Convenience and time saving - Quality of care and patient autonomy - Engaging with hard-to-reach families - Reducing infection risk

Challenges of using DHT	- Equipment access and infrastructure issues - Time constraints/increased workload - Perceived reduction in quality of care - Disjointed systems - Digital literacy and exclusion
Perceptions of DHT	- Perceptions of the role of DHT - Perceptions of blended/hybrid systems - Perceived patient preferences of DHT - Perceived future for DHT - Perceptions of covid on DHT

Stage 7: Interpreting the data

Once the main frameworks were formed the subthemes were re-examined and grouped in with similar subthemes. Collapsing these subthemes together allowed for more concise analysis of the data and the entire process allowed the researcher to become more immersed in the data (Ritchie and Lewis 2003). The process of merging and integrating the final themes was based on a similarity of findings where recuring ideas were categorised and collapsed into final themes. The similar findings led to the formation of 3 themes which were informed by the 11 subthemes. The thematic charting into Excel allowed the themes to be visible and provided an audit trail to show how the data had been interpretated.

After collapsing the initial findings down, Figure 10 visually demonstrates the final 3 themes and 11 subthemes found through the framework analysis process.

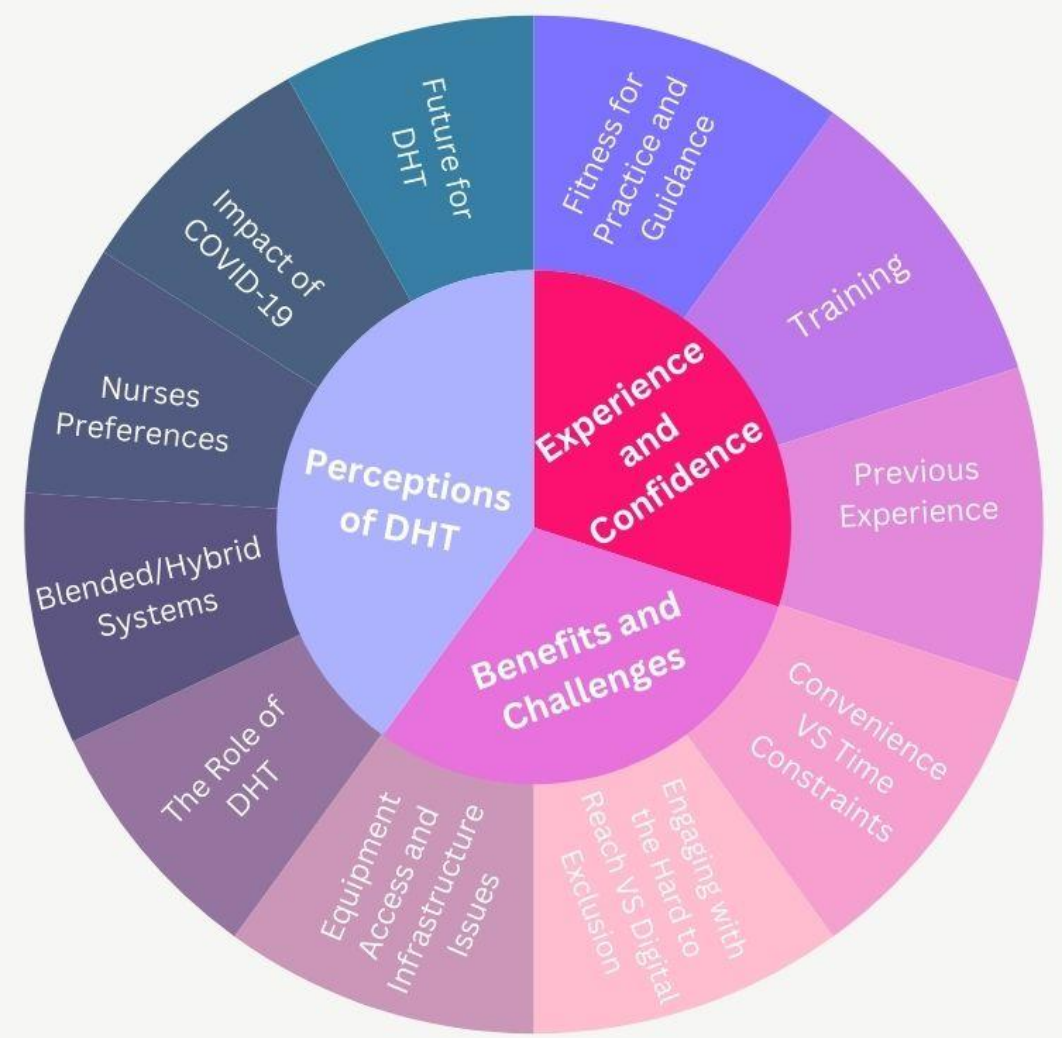


Figure 10. Visually demonstrates the 3 themes and 11 subthemes

6 Survey Results

6.1 Introduction

This chapter will discuss the results of the survey using graphics and figures to highlight key results and findings.

6.2 Sample Size

112 nurses viewed the survey with a total of 24 participants completing the survey. There are approximately 392 nurses working across the 69 General Practices in NHS Grampian and approximately 7% of the nurses working across 13 of these General Practices completed the survey. Table 13 illustrates participants demographic details. Most participants were female (n =23, 96%) with one male (n=1, 4%) and over half were aged over 45 (n=16, 67%). Majority of participants had nursing roles as Advanced Nurse Practitioners/Nurse Practitioner and Practice Nurses (n=22, 92%). Ninety six percent (n=25) of participants were experienced nurses with over 10 years of experience as qualified nurses and over half of them were Nurse Prescribers (n=14, 58%).

Table 13. Survey demographics of participants.

Demographic Information	***N (%)***
Gender	
Female	23 (96%)
Male	1 (4%)
Age	
25-34	1 (4%)
35-44	7 (29%)

45-54	7 (29%)
55-64	9 (38%)
Employment	
Working full-time	13 (54%)
Working part-time	11 (46%)
Role	
Advanced Nurse Practitioner	11 (46%)
Practice Nurse	10 (42%)
Nurse Practitioner	1 (4%)
Treatment Room Nurse	1 (4%)
Nursing Assistant	1 (4%)
Years Qualified	
0-10	1 (4%)
11-20	9 (38%)
21-30	5 (21%)
31-40	6 (25%)
41-45	3 (12%)
Nurse Prescriber	
Yes	14 (58%)
No	10 (42%)

6.3 Conditions and Digital Technologies

Several questions were asked in the survey about current practice and how digital technology had been implemented into practice.

Firstly, nurses were asked what conditions they were currently managing in General Practice (not necessarily via digital technology) and what digital technologies they were using to deliver and manage care. See Figures 11 and 12.

Long term conditions (Cardiovascular conditions (n=23, 96%) respiratory conditions (n=22, 92%) and then diabetes (n=16, 67%) were reported as the most common conditions managed by nurses in General Practice. Other roles such as health promotion (n=19, 79%) and wound care (n=19, 79%) were other commonly managed conditions reported to be managed by nurses in General Practice. In terms of appointments, participants reported they carry out routine appointments (n=19, 79%) more commonly than emergency appointments (n=15, 63%). The main forms of digital technologies used for communication were telephone (n=22, 92%) and video consultations (n=11, 46%). Other digital technologies that were commonly reported to be used by nurses were digital devices (n=17, 71%) that assist with monitoring LTC remotely (ie. Mobile apps, BP monitoring, wearable health trackers, continuous glucose monitors, smart inhalers).

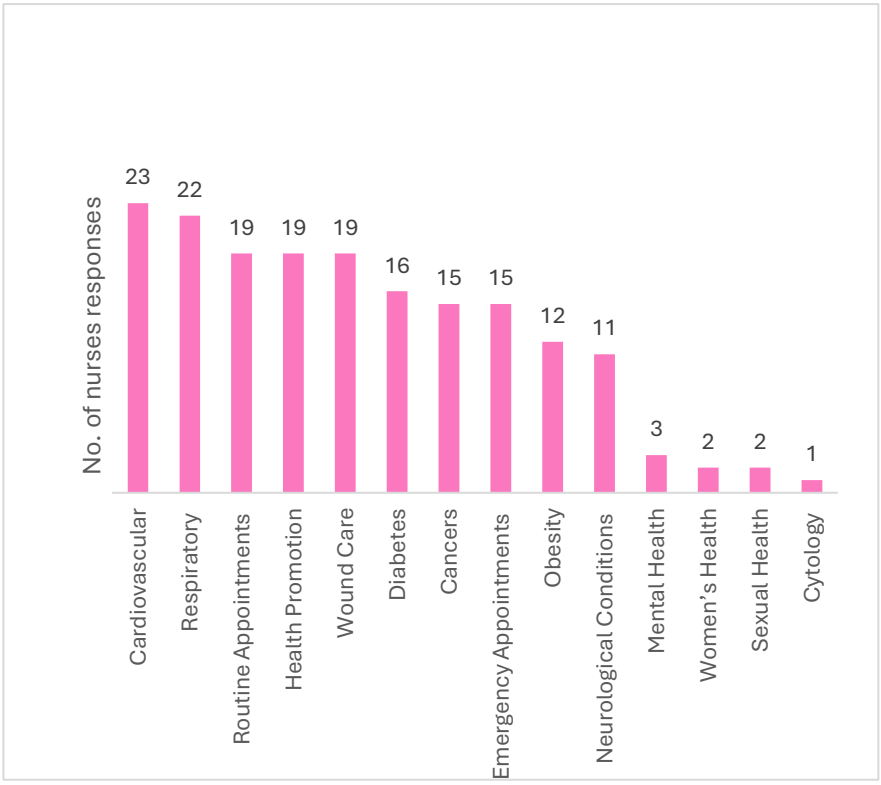


Figure 11. Conditions managed by nurses using DHT.

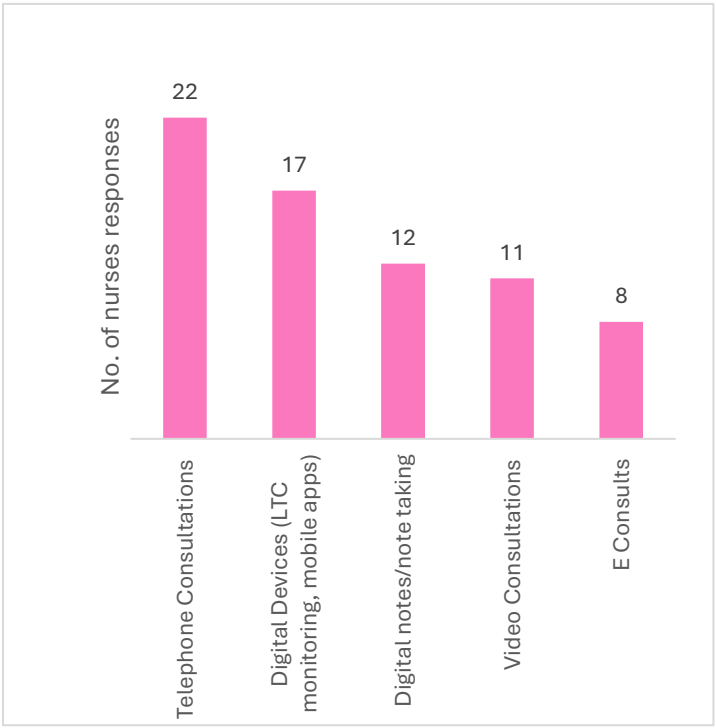


Figure 12. DHT used to provide and manage care remotely.

KEY: LTC – Long Term Conditions

6.4 Changes since COVID -19

The participants were asked how the COVID-19 pandemic changed the way that services were provided and if any of the changes remained in place post pandemic. The characteristics of this are displayed in Table 14. Most of the participants are still providing services both face-to-face and remotely (Table 14). Twenty-two of the 24 participants are providing clinical assessments and routine appointments both face-to-face and remotely. Hybrid diagnosis is provided by 20 of the 24 of the participants with the remaining four providing it face-to-face. Emergency appointments, health promotion and medication prescription remain hybrid services for 21 of the 24 participants across the 13 practices that participated in the survey. Referrals to other services (n=18) and teaching and training (n=17) are also mainly being carried out both face-to-face and remotely but both services had participants solely providing them face-to-face (n=6) or remotely (n=3).

Table 14. Reponses to changes made since the COVID-19 pandemic

	Yes, we still provide it face-to-face and remotely	Yes, we provide it face – to - face	Yes, we provide it only remotely	No, we do not usually provide it	Not Answered
Clinical/Assessment/Routine Appointments	22	2	0	0	0
Diagnosis	20	4	0	0	0
Referral to other services	18	2	2	1	1
Emergency appointments	21	2	1	0	0
Teaching/training other clinicians, students, patients and carers	17	4	1	2	0
Health promotion and wellbeing	21	2	0	0	1
Prescribing medications	21	0	1	2	0

Eleven participants reported that they had made changes to how they monitor patients with LTC since the pandemic with nine reporting that they had not. See Figure 13. Reasons provided included open written comments on how chronic condition follow ups are now done via telephone consultations and that hybrid consultations are always an option. Responses from this included: 'diabetes care is now hybrid'; 'chronic disease follow ups are now by phone consultation'.; 'results are discussed on the phone'; 'hybrid appointments (phone/in person or video call)'; 'more telephone consultations and eConsults'.

Following on from that, 12 responses reported that they had made changes to routine appointments and health checks since the pandemic in relation to using digital technologies and nine reporting they had not. See figure 14. Again, changes to chronic condition management was discussed in the explanations which are as follows. Annual reviews for condition management were reported as conducted via eConsult or telephone consultations, with patients being seen in

person if they report any issues. Responses related to eConuslts were ' LTC appointments, contraception, other annual appointments are now done via eConsults and are only seen in person if they report issues'. Participants also reported that patients are now being encouraged to manage their own care by encouraging self-testing for glucose monitoring, blood pressure monitoring and weight management with readings being submitted remotely using apps and websites such as 'inhealthcare.com'. Comments such as 'encourage self testing for BMs, BP and weight management' with other responses stating 'apps advised for patients to monitor LTC'; 'BP home readings submitted remotely (previous would have been seen in person' and finally 'inhealth used for BP monitoring'.

Finally, 13 participants reported they had to make changes to how they work to enable them to address patients' symptoms, diagnosis and reporting concerns when treating patients remotely using digital technology. See Figure 15. A video consultation system called 'NearMe' was highlighted by three of the participants as being implemented to help with being able to visually see patients instead of relying on telephone consultations. An email address had also been set up at one of the participants practices for patients to send pictures to be reviewed by medical professionals instead of having to see them in person. One participant also reported that they feel they need to ask more questions as they may not be able to physically see them and are worried about missing something 'ask a lot more questions as concerned to miss anything'. Another reported the cost implementation for patients stating 'unable to obtain observations and may have to ask patients to purchase their own equipment to provide this information'.

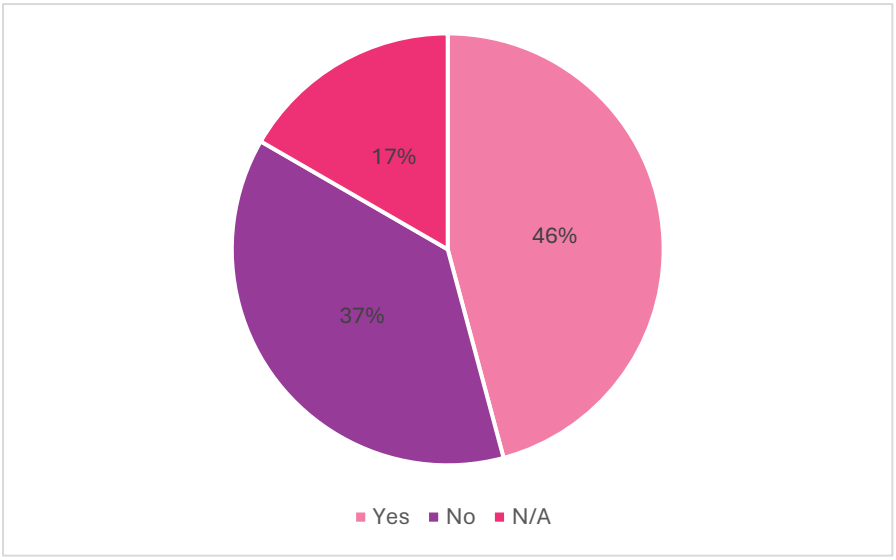


Figure 13. Have you made any changes to how you monitor patients with LTC due to COVID-19?

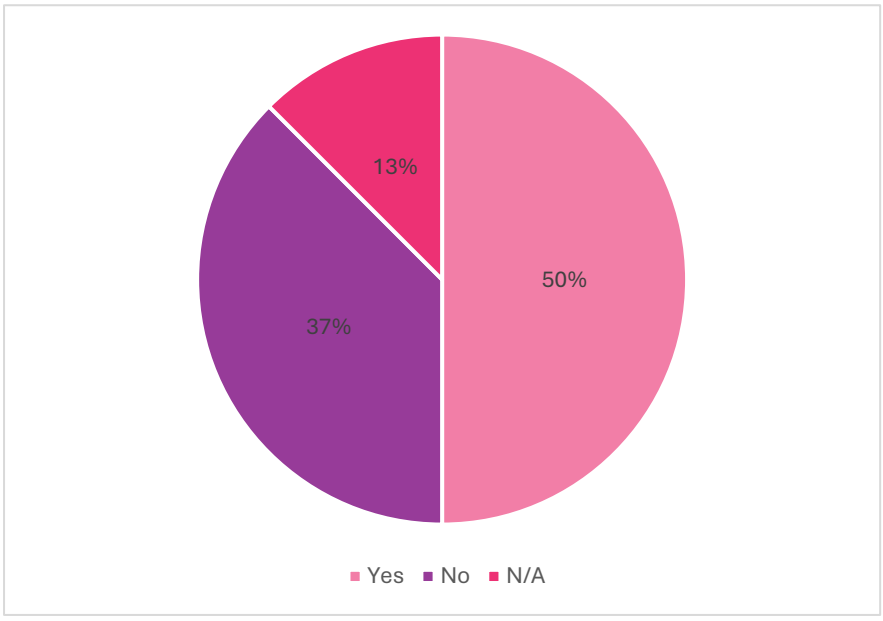


Figure 14. Have you made any changes to routine appointments and health checks for patients due to COVID-19 in relation to using DT?

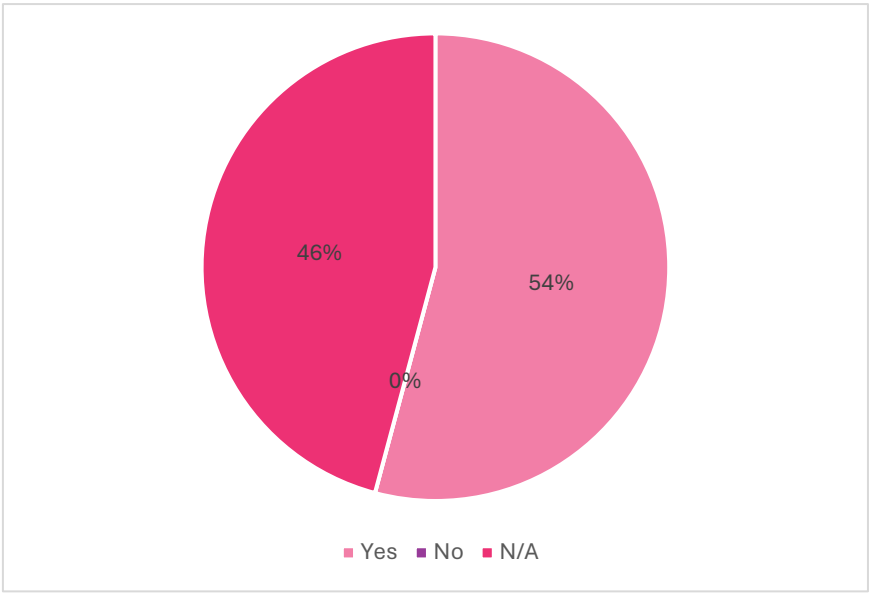


Figure 15. If patients are being treated remotely using DT, have you had to make any changes to how you work to enable you to address patients symptoms, diagnosis, reporting or concerns.

6.5 Perceptions of Digital Technology

Participants were asked about their perceptions of digital technologies with a number of statements shown in Figure 16. The participants were asked to indicate how much they agree or disagree using a Likert scale from 'strongly agree' to 'strongly disagree'. The majority of nurses 'agreed' with the statements provided in terms of patient needs being met (n=15, 63%), patient concerns (n=19, 79%) and patients requiring support to use DHT (n=22, 92%). All participants (n=24, 100%) agreed that some patients are unable to use DHT as part of their care with the majority 'strongly agreeing' to this statement (n=14, 58%). Half of the participants (n=12, 50%) were 'unsure' if their time is better managed since the implementation of DHT and more than half (n=14, 58%) agreed that they have had enough training to deliver care digitally in the GP setting.

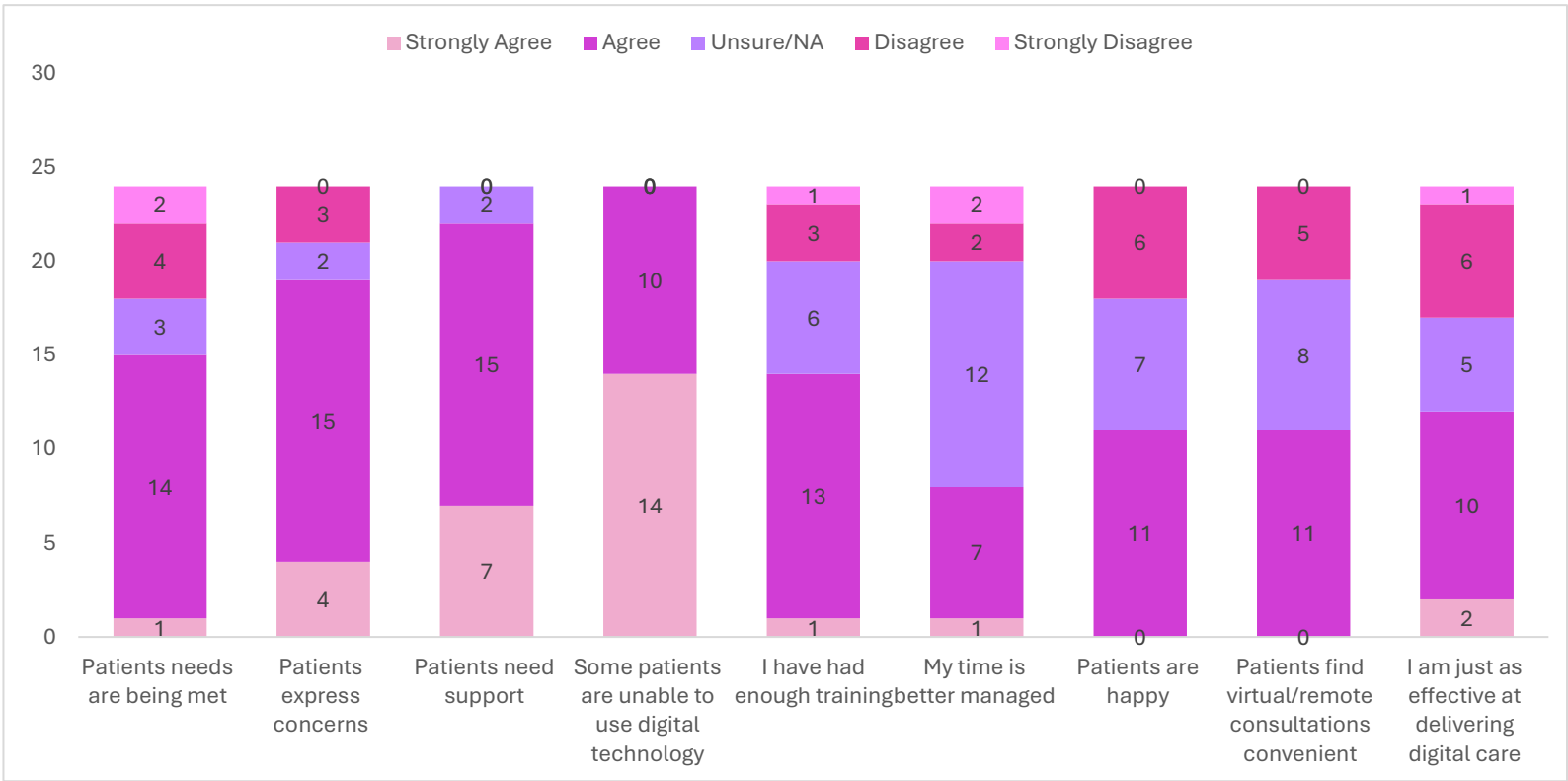


Figure 16. Perceptions of Digital Health Technologies

6.6 Forms of Digital Technology

The participants were asked about forms of digital technology being used by nurses to communicate and support patients when they are delivering care. It can be seen that telephone consultations (n=19, 79%), sending media to be reviewed (n=18, 75%), referring patients to online resources (n=19, 79%) and emailing resources to patients (n=18, 75%) were the most commonly reported ways of communicating to patients via digital technologies. The table (Table 15.) shows fourteen (58%) participants reported they are using digital devices and smartphone apps to assist with managing and delivering care. Over half (n=14, 58%) of the participants reported they are not using eConsults and 10 (42%) of the participants reported that they are not using video consultations.

Table 15. Forms of Digital technology being used to communicate and support patients when delivering care digitally

	Yes, we offer both	Yes, we offer it only face-to-face	Yes, we offer it remotely	NA	Not Answered
Telephone consultations	19	0	4	1	0
E Consults	8	0	0	14	2
Video Consultations	10	0	4	10	0
Sending Photos/Videos for review	18	0	4	2	0
Online resources for patients to view/download	19	1	2	1	1
Emailing resources for support	18	0	2	3	1
Digital devices (to track health trends/monitoring)	14	1	1	7	1
Smartphone apps (activity log, health tracker, health monitoring apps)	14	0	1	8	1

6.7 Barriers

Fourteen (58%) participants reported that they had experienced barriers to using DHT. When asked if they had ever had to convert back to face-to-face consultations after having virtual consultations, fourteen (58%) reported that they had (Table 16.).

Participants were asked to select the barriers they had encountered when delivering care digitally. Safety concerns (n=18, 75%), patient preferring face-to-face appointments (n=22, 92%) and patients not having the knowledge (n=22, 92%) or skills to use digital technologies (n=13, 54%) were all barriers that more than half of the participants agreed with. All 24 (100%) participants agreed a barrier to DHT was patients not having the technology to receive the care remotely. Additional barriers suggested in the 'Other' open text response by participants were management support and IT and infrastructure problems.

The participants were then asked to specify any further barriers they have experienced using DHT in open text responses. Content analysis identified four areas around the barriers reported, including: IT issues, equipment access, time constraints and patients' digital skills/literacy or patients being digitally excluded. 'issues with inhealth.com monitoring service being blocked by service providers'; 'we no longer have access to EConsults as this is no longer required following COVID'; 'poor connections and time constraints'; 'I work in a deprived area and some patients don't have the equipment required, wifi and can be of low level reading to illiterate'.

Participants were given another open text response section and asked what they think would be needed in order to provide care effectively. A further content analysis identified five reported, including: government investment, staff

training, patient education, appropriate equipment and management support. ‘more investment from government in digital support’; ‘better retraining on technology and training specific to assessing and diagnosing remotely’; ‘time to sit and go through with patient’; ‘easier access to equipment possibly tablets as well as vision’; ‘right attitude of manager’.

Table 16. Barriers to delivering care digitally

Barriers to digital delivery	**No. of participants who agreed**
Patients do not have the technology to receive care remotely	24
Patients prefer face to face appointment	22
Some patients don’t have the knowledge on how to use digital technology	22
Patient safety concerns	18
Takes time to teach patients to use digital devices as part of their care	13
Lack of training on how to use technology	11
Lack of perceived clinical usefulness/effectiveness	10
Lack of equipment/technology for secure and private delivery	10
Lack of training in how to treat and deliver care to patient remotely	9
Perceived increase in workload	7
Lack of Support	6
Staff shortages	3
Lack of privacy to conduct appointment	0

6.8 Benefits

Similarly to the barriers, the participants were then asked to choose the benefits they have found to using DHT in healthcare to deliver care remotely (Table 17.). The participants were asked to select all that apply. Majority of nurses agreed that convenience (n=22, 92%), time efficient (n=21, 86%) flexibility (n=20, 83%) were the most beneficial aspects of digital technologies in healthcare. Less than 50% of participants reported that patient engagement (n=11, 46%) and satisfaction (n=9, 38%) was a benefit of digital technology. Participants were able to provide free text response on any other benefits they could think of and one participant quoted 'Infection Control'. None of the participants reported there were no benefits to digital healthcare.

Table 17. Benefits of digital healthcare and delivering care remotely

Benefits to digital delivery	**No. of participants who agreed**
Convenience	22
Time efficient	21
Flexibility	20
Accessible for patients	19
Cost-effective	17
Personalisation	13
Accessible for staff	13
Patient engagement	11
Patient satisfaction	9
Infection control	1
No benefits	0

6.9 Satisfaction

The majority of the participants (n=15, 63%) reported they were satisfied with the current way of delivering/monitoring care remotely using DHT and all the participants provided further comments on their response.

Content analysis of open text statements identified the following five areas: positive response to hybrid consultations, education, access and technology issues, person centred, safety concerns and preferences.

There were many positive responses in relation to being able to have hybrid consultation with one participant commenting 'Best of both worlds, integrate both', 'Can be convenient if patients happy to use' and another stating, 'the use of digital healthcare provides flexibility in patient treatment'. Other positive responses were related to being able to be patient specific and allowing patients to decide what works best for them with comments such as 'it gives choice to patients' with another responded saying 'yes for some patients but no for others'. This is backed up by a final response 'it is there to provide efficiency for the patient if they are happy to do so but have the option to be seen face-to-face if they would like to'.

Although the percentage of satisfaction was higher, there were additional comments about what needs to be improved in relation to delivering/monitoring care using DHT. Education was a recurring comment made by participants, for patients and staff, with comments such as 'I think we need more education for patients so they are more confident with the service' and 'I think patients and staff need more education and information around this'. Issues with access and technology was another common theme with comments like ' too difficult to access', 'always room for improvements, disappointing that some patient are unable to engage and benefit from due to financial/educational constraints' and 'its too much and technology is not working – there is not enough phone lines'. Safety issues were brought up by one of the participants also stating 'I do not think it is safe'.

7 Interview Findings and Discussion

7.1 Introduction

This chapter presents the findings from the three semi-structured interviews and one focus group (n=11).

7.2 Interview Participant Demographics

To maximise recruitment, the opportunity of conducting a focus group at a GP practice was taken up. Two student nurses and one administrator were present and took part in the discussion (at their request) but were excluded from analysis as they did not meet the criteria for the study participant. Finally, 11 of the participants responses went on to be analysed using the Framework Analysis Method (Ritchie and Spencer 1994). See Table 18 for demographic details.

All of the nurses interviewed were female and all were nurses with Agenda for Change bands of 6 and above. Practice nurses (n=3), Advanced Nurse Practitioners (n=2) and a Nurse Practitioner (n=1) made up just over half of included participants throughout the interviews and focus groups. One lead nurse was interviewed using the semi-structure interview guide and the other was included in the focus group. The qualitative data was gathered between two different General Practices (GP1 and GP2). One was an urban practice (GP1) and the other was a more rural practice (GP2).

Table 18: Demographics of nurses included in interviews

Demographic Information	**N (%)**
Gender	
Female	11 (100%)
Agenda for Change Band	
6	5 (45.5%)
7	5 (45.5%)
8	1 (9%)
Role	
Practice Nurse	3 (28%)
Advanced Nurse Practitioner	2 (18%)
Health Visitor	2 (18%)
Lead Nurse	2 (18%)
Community Nurse	1 (9%)
Nurse Practitioner	1 (9%)

7.3 Content Analysis Results

7.3.1 Types of DHT identified from Interviews and Focus Groups

As well as the framework analysis, a content analysis was carried out highlighting the types of technologies discussed by the nurses throughout the semi-structured interviews and focus group and what they are using in General Practice. The types of DHT identified could be divided into two groups: Types of DHT for communication, and Types of DHT for LTC management and are shown in Figure 17.

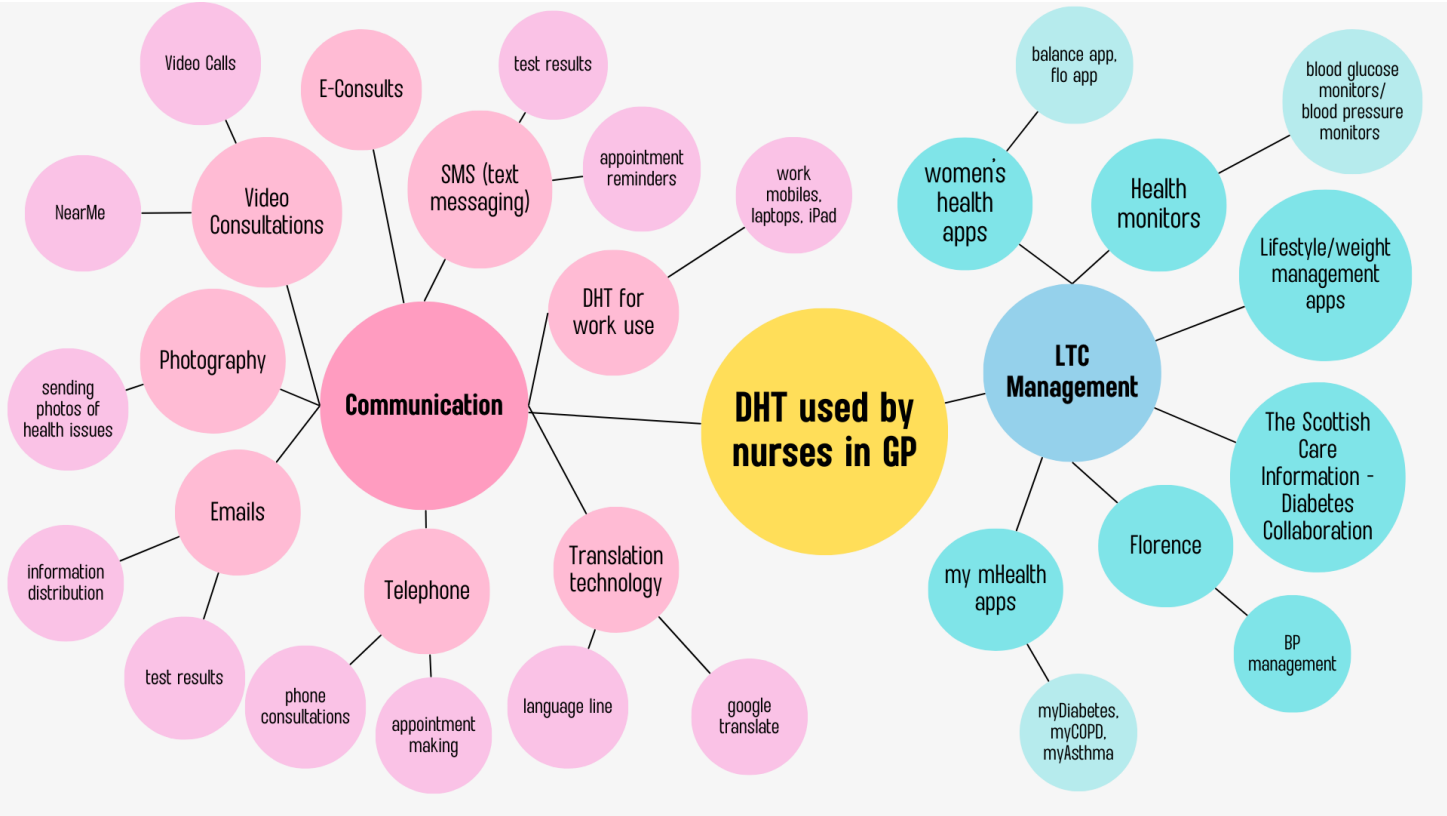


Figure 17. DHT identified by nurses working in General Practice

Key: DHT – Digital Health Technologies; LTC – Long term conditions; COPD – Chronic Pulmonary Disorder, BP – Blood pressure

As seen in Figure 17 participants reported their experiences and perceptions of DHT and how they are used for communication and to assist patients to manage their LTC. The findings identified the scale of the role that DHT have for nurses working in General Practice with all participants reporting high usage of technologies in the day-to-day job. For example, one of the nurses described how much digital technologies are being used to deliver care in general practice:

> *'I would say it's probably 50-50'*
>
> (GPN10, SSI)

Another nurse working in a different location, with a similar job role, described their use of digital technologies and further emphasised the scale that DHT are being used in General Practice:

> *'the majority of my role is probably digital, to be honest'*
>
> (GPN07, SSI)

The next section will discuss some of the ways nurses are employing DHT to communicate with patients, how DHT are assisting patients to manage their LTC and what DHT are currently being used in NHS Grampian by nurses in General Practice.

7.3.2 Communication and DHT

7.3.2.1 Telephone Consultations

Using the telephone (phone) for communication was discussed frequently by the participants. Nurses having restricted time was identified as one of the reasons for increasingly using the phone to save the time involved in a face-to-face consultation.

> *'we are needing more different ways of seeing people because we're restricted to how much we can go out. So I'd say I'm using the phone a lot'*
>
> (GPNFG06, FG)

Participants reported that phone consultations could be particularly useful for triaging patients and identifying whether they needed to come into the surgery or not.

'I would usually start off phoning the patient first and to see what it is that was required.'

(GPN07, SSI)

*"phone calls, yeah. The Nurse Practitioners would triage everything before it came in. Doctors do have face-to-face appointments in their list, but I would say maybe 70% is telephone consultations, triage firs*t,"

(GPN04, SSI)

Notably, participants identified that telephone consultations were not a new concept, but had become more common since the COVID-19 pandemic.

'We do have the odd phone call, but that hasn't changed. I wouldn't say we have many more phone calls than we used to have. A lot are inquiries. But with the chronic disease we might have a bit more phone calls now.'

(GPN04, SSI)

7.3.2.2 SMS Texting and Email

Texting and emailing were other forms of communication that were discussed frequently as a convenient form of communication. This form of communication was identified as being used for appointment reminders, sending information, test results, follow up appointments and sending photographs for reviewing:

'..emailing, using the SMS messaging and sending out the links for healthy lifestyles or if they need to ring back to make an appointment face-to-face'

(GPN10, SSI)

'We use text messages a lot. We've also got a photo email address'

(GPN07, SSI)

Participants went on to explain more about the photo email address and how this was beneficial in their practice:

'*patients that have got obviously anything visible. We've had tonsils, we've had skin wounds, tick bites, everything that can be seen… they will send a photo into the photo email. And it just saves you phoning them, getting them to send a photo or whatever. It's all done in the time you're phoning them, so that's really good, we use that a lot*.'

(GPN07, SSI)

It was then identified that patients respond well to the use of photo emails and saved them from coming to the surgery if they didn't need to:

'What we use a lot is photos which are brilliant, and patients seem to really like sending in the photo instead of having to come in and show whatever it is.. we can do it by photo, so that's been a real asset'

(GPNFG02, FG)

7.3.2.3 Other forms of DHT for Communication

Other forms of DHT for communication included: work mobiles, ipads, laptops, E-consults, video consultations and language translators. The participants discussed the use of video consultations and E-consults as forms of communication that were more widely used during the COVID-19 pandemic.

'we used to have it (eConsults). It was free during COVID, but now you have to sign up to pay for it and it is quite expensive'

(GPNFG03, FG)

Other forms of digital communication were identified to have a positive impact on reducing non-attendance rates:

> *'Reminders about their appointment to make sure they turn up, it helps to keep the non-attendance rate down if you can send them a text message just reminding them all that kind of information'*

One of the practices included in the study was situated within a densely populated non English speaking community. Language translators were discussed as a tool to communicate with non-English speaking patients:

> *'We also use Language Line quite a fair bit, there's quite a lot of Polish, Nigerian and other kind of ethnicities in (AREA). So, we use Language Line quite a lot.'*
>
> (GPN07, SSI)

7.3.3 LTC management and DHT

Different types of DHT to manage LTC were discussed during the interviews and focus groups. These ranged from health management apps, health monitoring devices and remote monitoring services. The LTC that were identified by the interviews/focus groups as being managed by nurses in General Practice included: hypertension management, diabetes management, respiratory condition management, cardiovascular condition management, weight loss/lifestyle management and women's health management.

7.3.3.1 mHealth Apps

Smartphone applications were discussed as a way to assist patients to manage their LTC. The participants discussed how they would direct patients to specific ones that would benefit them:

> *'quite a few apps. Even if I've rang them I've directed them with apps as well. Lifestyle apps to make healthy options... Some heart (apps), as I say, British Heart Foundation, they're doing some really good apps where they can actually speak to a health professional as well if they can't get the answers within the practice, they can actually go online and get an appointment. It's not like an appointment where you're going to get a diagnosis, but a health professional like a heart nurse can speak to these patients and just give them a little bit of extra support on top of what we've done'*
>
> (GPN10, SSI)

A health application that appeared to be a common one being advised among the nurses were the 'my mHealth' apps. The 'my mHealth' website describes the platform as a 'multi-morbidity digital health platform that is a population-scale solution for the long-term conditions that have the most impact on patients, clinicians and healthcare providers' (mymhealth 2024) . On my mHealth there are four specific LTC management apps to choose from: MyDiabetes, myCOPD, myHeart and myAsthma.

> '*And similar with SCI-DC, so patients that have signed up to My Diabetes My Way, they come in, get their bloods done, they might go to retinal screening, get their eyes checked, but everything, all that data is on that*

system that they can access as well. So, it reduces the amount of unnecessary appointments coming into the practice'

(GPN10, SSI)

Another app discussed was The Balance app. The Balance app website states 'with some women attending up to 10 appointments before receiving a correct menopause diagnosis and treatment, balance app aims to help reduce this avoidable stress on our practitioners and patients in need'. One of the nurses from the focus group explained that she encourages patients to use these apps:

'I think it's easier. There's loads of apps now. Some we encourage patients to use, like the Balance app for menopausal or perimenopausal women. There's the diabetes ones My Diabetes My Way. There's ones for COPD and asthma'

(GPNFG02, FG)

'Florence' or 'Flo' is a blood pressure monitoring platform that was explored in all of the semi-structured interview and the focus group. One of the nurses from a semi-structured interview explains the use of 'Florence':

'Florence for the blood pressure monitoring, their hypertension...Florence, it's patients that have signed up to… it's almost like a little contract between the GP practice, where they would do their blood pressure at home, and then those figures are uploaded into the Florence system and then we can collect that data, review it, and decide a plan of action '

(GPN10, SSI)

The above account explains the process of 'Florence' and how it works for both the nurse and the patient. The benefits and practical uses of the BP system was further explained:

> *'if you've arrived at the surgery, or some people have their own monitors, and they thought their blood pressure was high, then obviously some people coming into the surgery puts their blood pressure up. Or if the bus hasn't turned up and you're twenty minutes late and you're coming running along the road, it's not a true reflection of your blood pressure. So if it's a new diagnosis, they would give you… used to give you a machine home with you, and the patients would then write all their blood pressure results out, send it back in, and then get the mean average to work out whether you have hypertension or not. Whereas now, using the Florence app and program, it does, it helps log it all through and then it's all done electronically, so it's a much better system.'*
>
> (GPNFG04, FG)

7.3.4 Communication and LTC management Discussion

Communication via digital technology first emerged as a solution to give access to care in remote areas (Neves and Burgers 2022). Previous research has reported that healthcare systems across the world have adopted virtual solutions to complement face-to-face care in primary care (Mcgrail, Ahuja and Leaver 2017)(Greenhalgh et al. 2016b). Up until recent years the uptake of widespread virtual primary care systems has grown slowly (Tossaint-Schoenmakers et al. 2021) (Mcgrail, Ahuja and Leaver 2017). However, since the COVID-19 pandemic virtual communication with patients has grown rapidly with a focus on triaging and continuity of care for patients with LTC which was identified through

the interviews in this study (Digital Health and Care Scotland 2018)(National Health Service 2019)

In this study, phone consultations and triaging over the phone was identified as a convenient way of communicating with patients without them having to come to the practice. NHS England (2024) released guidelines on remote consultations and shows how to navigate the different forms of consultations and get the best out of remote consulting and communication. Video consultations were found to not be frequently used post COVID-19 in the practices included in this study. The abandonment of video consultations in general practice was echoed in other literature due to minimal advantages, financial barriers and the majority of consultations being able to be done safely via telephone or in-person if needed (Greenhalgh et al. 2021).

The findings of the positive use of SMS texting and email to communicate with patients was in keeping with previous literature. Email consultations were only discussed in terms of sending photos for review; however, other literature identified emails being used for other forms of clinical consultations with successful outcomes and minimal transfers to face-to-face appointments (Atherton et al. 2020) (Huygens et al. 2018). Previous literature reported SMS texting being used for appointment reminders (reducing the amount of 'no show' appointments), sending test results and text message based support interventions (Ulloa-Pérez et al. 2022) (Leahy et al. 2017)(Butler et al. 2023).

The Scottish Government (2019) announced their 'Scale-Up BP' initiative in 2019 aiming to reduce the need for GP consultations. With Blood pressure monitoring accumulating 1.2 million appointments every year, it is the third most common reason for attending primary care appointments in Scotland every year (The

Scottish Government 2019) study by Cund et al. (2015) introduced 'Florence'/'Flo' across the UK involving both patients and staff monitoring a variety of conditions in primary care. Figure 18 shows the exchange of messages that are received by the patient from 'Flo' and shows examples of how the system works. The results from this study echo the findings from our participants, highlighting the potential of the system in reducing consultation time and introducing innovative ways to assess, support and monitor LTC.

Application of Flo in hypertension Dialog

I. Default parameters: systolic pressure (80–134 mmHg); diastolic pressure (60–84 mmHg)

II. Daily reminder at 8 am (service message)

8 am: *"Hi. Don't forget to take your blood pressure this morning and again this evening, and text it in. Text BP, then your reading, eg, BP 140 80. Thanks, Flo."*

12 hours later, if the patient has not replied to the first message:

"Hi. I've noticed you haven't sent in your readings today. Could you please text in BP, then the readings. Thanks Flo."

III. Within normal range

"Your BP reading is normal. Flo."

IV. Systolic and diastolic pressures above desirable range

"Your blood pressure is high today. Follow the advice in your management plan, and take the readings again at your usual time. Thanks, Flo."

V. Systolic and diastolic pressures below desirable range

"Your blood pressure is low today. Take it again and follow the advice in your management plan. Take care, Flo."

VI. Breach message: triggered when the readings reach either 200 mmHg (systolic) or 105 mmHg (diastolic) or if the BP is below 70 mmHg (systolic) or 50 mmHg (diastolic)

"Your BP is outside the safe range – so contact a doctor today, as agreed in your shared management plan. Take care, Flo.

Figure 18. Dialog of Application of Flo in BP management (Cund et al. 2015)

This study also identified uses for mobile phones and the use of mHealth apps assisting with LTC management. Figure 19. shows how mHealth apps work, how the data is gathered and then combined into the health app to provide support, guidance and advice to the individual using it and to provide data to healthcare professionals to assist with diagnosis and care (Deniz-Garcia et al. 2023)(Deniz-Garcia et al. 2023). Due to the increase in the accessibility of smartphones, patients have the ability to have autonomy of their health and implement healthy behaviours with the support of mHealth apps such as the ones that were identified through the interviews (Li et al. 2019)(Martínez-Pérez, De La Torre-Díez and López-Coronado 2013). The increase of health apps is shown by The NHS APP which had registrations increase from 2 millions people in 2021 to 30 millions people in 2023 (NHS England, 2023). The features on smartphones, such as highly developed cameras and sensor technology, make them ideal tools to assist clinical collaborations and diagnosis (Kraushaar and Bohnet-Joschko 2023). The use of apps to support healthcare has increased rapidly in recent years but is still in its infancy and will continue to grow (Kraushaar and Bohnet-Joschko 2023). mHealth has the ability to support healthcare staff and play an important role in the digitisation process across the NHS (Kraushaar and Bohnet-Joschko 2023)

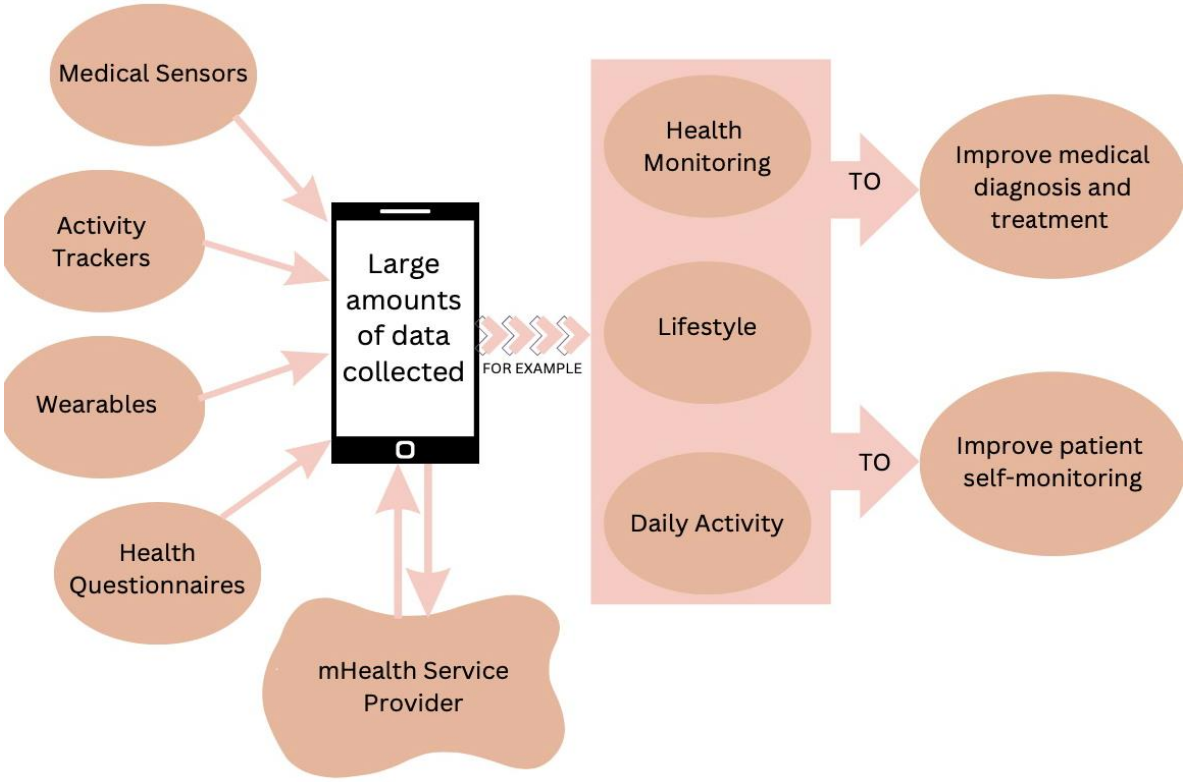


Figure 19. How mHealth Apps work (adapted from (Deniz-Garcia et al. 2023))

7.4 Framework Analysis Findings

The next section will discuss the themes found through the framework analysis process discussed in Chapter 5 in further detail to answer the research question:

- What are the experiences and perspectives of nurses (based in GP settings) of using digital technology to deliver care for people with long term conditions.

The framework analysis process, discussed previously (Chapter 5, Figure 10), resulted in three main themes: (i) Experience and Confidence using DHT; (ii) Benefits and Challenges of using DHT, and (iii) Perceptions of using DHT. Each of the themes comprised a number of subthemes as shown in table 19. Each theme is presented and discussed below.

Table 19. Themes and sub themes identified from Framework Analysis

Theme	Sub-Themes
Experience and Confidence of using DHT	- Fitness for practice and Guidance for using DHT - Training for DHT use - Previous experience of using DHT
Benefits and Challenges of using DHT	- Convenience and time saving VS time constraints and increased workload - Engaging with hard to reach people VS digital exclusion - Equipment access and infrastructure issues
Perceptions of using DHT	- Perceptions of the role of DHT - Perceptions of blended/hybrid systems - Nurses perceived preferences of DHT - Perceptions of the impact of COVID-19 on DHT - Perceived future for DHT

7.4.1 Theme One: Experience and Confidence using DHT

Feeling confident in your role and being experienced enough to provide appropriate care is an important aspect of working in healthcare. Therefore, it was not surprising that this was a theme that emerged when using DHT to provide care. This theme revealed three further sub themes: (i) Fitness to practice and guidance for using DHT; (ii) Training and DHT and (iii) Previous Experience using DHT.

7.4.1.1 Subtheme One: Fitness to practice and guidance for using DHT

The sub-theme of 'fitness to practice and guidance for using DHT' was described by participants as 'staying within their scope of practice' when it comes to using DHT to provide and manage care. A trainee Nurse practitioner described her challenges and cautions when using technology to provide care:

> *'Because I'm obviously still very new, I'm probably taking more patients in than what other ANPs, GPs especially, but I think that's just because more of an exposure thing as well, a learning thing. Which is maybe not so fair on the patient, but, yeah, so I'm probably taking in more than what more experienced staff would be. But, yeah, as I say, if I can justify why I've taken them in and not just triaged them over the phone, and vice-versa.'*
>
> (GPN07, SSI)

However, this contrasted with other participants who believe that they can give the same level of care remotely as in person providing the patient has a high enough level of health literacy it should not matter whether they are being consulted face-to-face or remotely:

'I think you can give a good level of care over the phone. It's a two-way street at the end of the day, isn't it? What that patient's saying to you. You could have that patient sat in front of you and they're saying the same thing as what they would on a video call.'

(GPN10, SSI)

The previous quote identifies that this confidence when it comes to using DHT comes with experience and that working within their limits was more important that delivering care remotely. This was then complemented by other participants:

'I think it comes with experience, you get that feeling this isn't making sense or they have said something that really worries you, so you bring them down. But the way that we work our system here, if we phone them we tend to see them the same day. So if I phone you and I think there's something not happy with, I want to see you, then they come the same day'

(GPNFG01, FG)

'within my remit, if I don't know something that doesn't necessarily mean that that's a flaw in technology, it means there's a flaw in my knowledge. And I would obviously need to go and ask something, that doesn't necessarily mean it's not working'

(GPN07, SSI)

Finally, one of the participants discussed their use of healthcare apps to assist them with their own fitness to practice to keep on top of guidelines and policies:

'I've downloaded a couple of apps for my own clinical use that have been really, really helpful because they've got all the information and guidelines and things like that. So, BNF and Scottish Antimicrobial Guidelines, and you can filter your settings so they go to the NHS Grampian settings so it's all your proper protocol. And there's things like Poly Pharmacy app that are just really helpful. But it's your own phone, but it works for me.'

(GPNFG07, FG)

7.4.1.2 Subtheme Two: Training and DHT

Training and constant learning is a requirement of the UK Nursing and Midwifery Council (NMC) but when asked about what training the nurses had received on delivering care digitally this was some of their responses:

'absolutely nothing. Not a sausage. Just went along and winged it.'

(GPN10, SSI)

'I haven't had any training yet for delivering care electronically. It was the ANPs and the GPS. We weren't involved in that. '

(GPN04, SSI)

'didn't really get much training for Near To Me, did we? guesswork, "how does this work?" I think it was written instructions, if I remember'

(GPNFG06, FG)

However, a more newly qualified nurse (≤5 years) described her experience with the training of using DHT and how the use of the technologies is now being taught within the remit of the role:

'obviously I'm new to the role, I was kind of taught that within, so I think I'm kind of in a different… this has not just been sprung upon me, this is how you do a consultation now. I've kind of gone into it and this is the way that we do it, so learning that way.'

(GPN07, SSI)

Many of the nurses reflected on their training and how technologies were not a focus throughout their course and are now trying to keep up with a new digital world and change the way they treat patients:

'I think it's probably a different world, isn't it? Like when I see what my kids can do on computers and stuff compared to me, it's a different world. And when you're an older nurse or a GP, we didn't do IT. It wasn't part of your course. So you're self-taught, or you're taught by someone who was taught by someone who was taught by someone. And even now, I'm like "how did you do that?" So there's lots of different ways to do it. There's always a training need'

(GPNFG08, FG)

There was a common discussion around being self-taught in DHT and the feeling of a lack of support around training to use the DHT. This led on to the participants discussing the training they feel is needed to be confident using DHT in their role:

'I think you only get out of it what you invest in it yourself, so most of the stuff I've done, using something like My Diabetes My Way and the Sky DC, I've stayed back and I've looked into that myself, and I've looked at all the help online and that, but I've done that in my own time. So I do

feel equipped for it. And I did have to find it out myself. Didn't have anybody to help us. Things like Vision, using Vision, that's a nightmare…'I definitely see it as part of the role in supporting them how to use. But I think I need to get maybe some proper training myself first. '

(GPN10, SSI)

'Just how to set up things. How we can guide patients to it, help them. Just initial guidance of just how to implement it. I don't think it would be difficult. It's just the unknown, until you know what to do, it's the unknown'

(GPN04, SSI)

The nurses reflected on the training that they had experienced but it was highlighted that the training was not being done by clinicians with previous experience of caring for patients and how the training provided was not considerate of the nurses time:

'A lot of resources came out. I don't know if the rest of you agree, they're usually run by trainers, not clinicians. So, setting it at like half past ten in the morning, you can't come. We can't come. And tell us on a Monday it's going to happen on a Wednesday, clinics are booked. So again it's about doing it at the right time in the right format so that we can actually attend it'

(GPNFG03, FG)

The data provided has shown that correct and appropriate training for the use DHT is an important aspect for the growth of DHT use in General Practice. If the clinicians have the correct training and support in delivering DH they can support

patients to feel more comfortable and confident to manage their own health via DHT.

7.4.1.3 Subtheme Three: Previous Experience using DHT

This subtheme was identified from participants having experience of using DHT in other locations throughout their career. One of the participants who had previously worked in NHS England discussed a different digital system that they used for note taking, contacting patients and other kinds of consultations:

> *'At the time I was in England, we did video and it was linked up through a system called EMIS, and it was called Flurry. So, you had everything built into the system, where you did all your email messaging from there, you would do your video consult'*
>
> *(GPN10, SSI)*

The digital system currently being used by the majority of General Practices in NHS Grampian is 'Vision' but some are using the 'EMIS' system. It was highlighted that it would be beneficial to be on the same universal system to avoid any mistakes, allow better and safer care and assist locum GPs or nurses who travel between practices know how the system works:

> *'With locum GPs and stuff it's better if we're all on the same system because, for example, if I was to go to a practice with EMIS I wouldn't even know how to log in. Whereas everyone on the same system, again it's patient safety, it makes it a lot safer and a lot quicker. And it's slightly different looking maybe, but it's the exact same thing, and you know what you're doing'*
>
> *(GPNFG04, FG)*

Even though 'Vision' is the more used system in NHS Grampian a participant with experience in both explained why she preferred 'EMIS':

> *'Definitely. EMIS, we used EMIS in England and I absolutely love it, and I'm so pushing it, but everything marries up in EMIS. You can see what every part of the multidisciplinary team, everybody's involvement is actually on there. So it's like one huge record for that patient.*
>
> *(GPN10, SSI)*

7.4.2 Discussion of Theme One

Experiences and Confidence of using DHT

The NMC (2018) states that nurses should 'recognise and work within the limits of your competence' and to achieve this nurses must 'complete the necessary training before carrying out a new role'. Fitness for practice was identified throughout this study and feelings of needing to be equipped to deliver care digitally were acknowledged. These findings were concurrent with a scoping review by Isidori et al (2022) that identified key areas of development for the future of DT and nursing in terms of technology, organisations and skills training. The review also identified the majority of included papers referred to experimental trials or possible future training initiatives that are not being used in practice yet (Isidori et al. 2022). It concludes by highlighting the need for the role out of these initiatives and trials to improve capacity and flexibility for nurses in the digital era (Isidori et al. 2022). One study identified the role of a 'digital champion' nurse whose role was to lead and support colleagues who were less confident in digital technologies (Johns et al. 2023). Although this role was not identified in this study, the role could be beneficial to the nurses who feel less experienced with technologies.

In this study, one of the participants who is newer to the Nurse Practitioner role, identified that DHT had been introduced throughout her training and it had not been 'sprung on' her the way that it had been on some of the other nurses who had been working in GP for longer. This finding agrees with a study identifying the perceptions that nursing students have on telehealth and telenursing (Glinkowski, Pawłowska and Kozłowska 2013). The study identified that due to the increase of telehealth services in the national healthcare system the nursing students would appreciate 'telenursing classes' being introduced into the curriculum (Glinkowski, Pawłowska and Kozłowska 2013).

Therefore, the overall consensus found when discussing the nurses confidence of using DHT comes with experiences. Experiences with using DHT is now being introduced into the initial training of nurses working in GP however, initial and on going training, should be introduced to nurses who are already working and using the DHT so they feel prepared and equipped to treat and manage patients with LTC.

7.4.3 Theme Two: Benefits and Challenges of using DHT

Like most changes to practice, DHT encompasses both advantages and disadvantages. Although there appeared to be an overarching feeling of benefits to DHT being used in General Practice (GPNFG02: *'Personally, technology has made a huge improvement to our life. I think it has made it a lot easier'),* it was noted to come with a lot of challenges which were expressed throughout the interviews. The sub-themes identified were: (i) Convenience and Time Saving V Time Constraints and Increased Workload; (ii) Engaging with Hard to Reach People V Digital Exclusion and (iii) Equipment Access and Infrastructure Issues.

7.4.3.1 Subtheme One: Convenience and Time Saving V Time constraints/Increased workload

Many participants highlighted the convenience of remote consultations for patients and recognised that not having to come to the practice to be seen is saving patients a lot of time:

> *'I think it's pretty instant as well, so the pro for the patient is they're not having to get up, get ready, come into the surgery, they're not having to try and rearrange their working day to come into the surgery. I think it benefits both sides.'*
>
> (GPN10, SSI)

As the patient population grows it was acknowledged that remote consultations through DHT allowed for access to more appointments while allowing working people to have access to care without having to take time off work.

> *'As I say, it is a bigger patient population and it is just getting bigger. So we can offer more appointments in a sense that are much tighter, as opposed to the patient coming into the practice.'*
>
> (GPN10, SSI)
>
> *'it makes it much easier, or as a patient myself, if I can put something in E-Consult or if I can just have a quite phone call, it saves me having to take a half-day off my work, whereas before if you had to be seen face-to-face and you were given a time of quarter to eleven, you'd have to use a half-day holiday'*
>
> (GPNFG07, FG)

When discussing E-consults the majority of benefits were perceived from a patient's perspective. In contrast to those benefits, the participants noted how much of an impact on workload the introduction of E Consults had:

> *' I think you'll maybe agree with me, it (E-Consults) did improve access to healthcare, but it caused absolute mayhem'.*
>
> (GPNFG05, FG)

Many of the participants felt that this increased workload was not an effective use of time. Some participants highlighted that E-Consults were introduced as a way to deal with increased demand but instead ended up causing further staff shortage issues and increased time pressures.

> *'Just you don't have the staff to deal with it, so you're dealing with the E-Consult and then you're taking a clinician away from seeing patients, and then it gets referred back that that person that's filled in the E-Consult needs seen face-to-face, so effectively you're dealing with it twice instead of just dealing with it once. And when you've got staff shortages, it doesn't work'*
>
> (GPNFG02, FG)

7.4.3.2 Subtheme Two: Engaging with Hard to Reach People VS Digital Exclusion

The data was collected across two GP practices in NHS Grampian with very different socioeconomic patient demographics.

> *'There's a low literacy level in [AREA] so it's really difficult sometimes to get them connected and to get into the waiting room and how to work out what you were doing'*
>
> (GPNFG01, FG)

Interestingly, it was identified that SMS texting was favoured for the more marginalised or underrepresented families as this was a way to keep them engaged with healthcare staff and interested in looking after their health.

> *'we do find it's the hard to reach families that really tap into the text, so it's really great'*
>
> (GPNFG01, FG)

The nurses reported a high level of non-English speakers in the area who rely on translators and other forms of technology to communicate. They suggested that having a variety of ways to communicate with patients was important to reach all care needs and highlighted the positives of having multiple forms of DHT.

> *' think we have quite a language barrier here as well, we have a really big Nigerian community, Eastern European community, and we have our learning difficulties patients, so it is good to have a variety of stuff'*
>
> (GPNFG07, FG)

Digital exclusion challenges included language barriers, financial challenges, loneliness and age-related challenges. However, one participant did highlight the older population is not necessarily a concern when it comes to DHT:

> *'Other people… and it's not age, I know some 'silver surfers' or whatever, some older adults are better at it than I am. So, it's not an age barrier. Sometimes it's a language barrier. Or it's a lot of our patients just don't have the money'*
>
> (GPN10, SSI)

The majority of participants however did identify the elderly as a cause for concern with the implementation of digital technologies and described these challenges as contributing to loneliness and health decline:

> *'the elderly is my concern, they don't have the ability to do it, some of them don't have a laptop or a phone that can do it. And they like to see somebody. And sometimes it's the only time they'll see a person in a week is coming in for something to the surgery. And I would worry that they wouldn't contact the surgery because they couldn't do the technology side of things, so they would leave things, rather than make an appointment to come and see. Because sometimes your appointments are "while I'm here", and it raises something. I can't see that happening the same'*
>
> (GPN04, SSI)

7.4.3.3 Subtheme Three: Equipment Access and Infrastructure issues

Despite the increase of DHT across General Practice in Scotland, equipment access and infrastructure issues was commonly recognised by nearly all participants. The sudden increase in technology implementation at the beginning of the COVID-19 pandemic was the beginning of highlighting infrastructure issues that were present.

> *'I was working here a few months before COVID hit, and then ever since. I suppose we had to change our working ways and do that quite quickly, lots of new technology came out but the infrastructure wasn't there, and the equipment to use the technology wasn't always there'*
>
> *(GPNFG08, FG)*

One of the practices included in this study is based in a rural area within NHS Grampian. Remote areas come with their own connection issues when trying to

implement remote care and as a result can lead to increased work-load and time constraints for staff:

> *'The cons of it is up here in [name of area], it's pretty rural, not everybody has a really good source of internet providers. I know we don't, it's very glitchy. Freezes, losses. Your calls could end up being a little bit longer because there's a lot of interruptions'*
>
> *(GPN10, SSI)*

Disjointed system-related challenges highlighted that a lot of the systems within the NHS don't 'talk' or link up to each other leading to a reduction of continuity of care. The nurses described these system related challenges as being ineffective and unhelpful. Practice nurses were unable to see notes from the District Nurses and therefore couldn't identify what care they were receiving.

> *'Yeah, it's all different systems, which is not really effective in some sense because you've got nothing links to anything, and you've got a patient in and you're having to log into a different system just to see a hospital letter. And it doesn't flow. You should just have it there to see their documents'*
>
> (GPN07, SSI)
>
> *'it's so disjointed because you can't link up into District Nurses' notes there, they're on something completely separate. '*
>
> (GPN10, SSI)

7.4.4 Theme Two Discussion

Benefits and Challenges of using DHT

The results from this theme indicate that there were conflicting feelings towards the implementation of DHT in GP. When discussing benefits of DHT communication, convenience, access and patients being more engaged in their health were commonly discussed. This agrees with previous literature with very similar findings (Foley et al. 2020) (Slevin et al. 2018) (Johns et al. 2023). Particularly, a study by John et al. (2023) identified concurrent findings with this study in terms of DHT being a benefit of access for the 'hard to reach' families. They highlight DT remove the challenges of transport issues and lack of engagement issues similar to the quotes from participants included in this study (Johns et al. 2023).

Although many benefits were discussed and all nurses identified the improvements DHT have, and will continue to make, on their practice these do not come without their challenges. The implementation of DHT interventions were introduced to relieve some of the burden placed on healthcare staff but this does not seem to be the case in practice for some forms of DHT introduced, notably eConsults.

According to the eConsult website, eConults are being used across 25% of NHS GP practices across the UK (eConsult Health Limited 2024). EConsults were being used across both practices included in this study until recently. Reasons for stopping using eConsults were time constraints and the financial burden not being worth it. The findings in this study concur with earlier systematic review evidence (Osman et al. 2019) that identified barriers that included increased workload and the facilitators identified improved access to care. A more recent systematic review identified that eConults were able to replace 55-88% of face-to-face consultations and took the same time to respond to than telephone consultations (Leighton et al. 2024). Therefore, not increasing workload

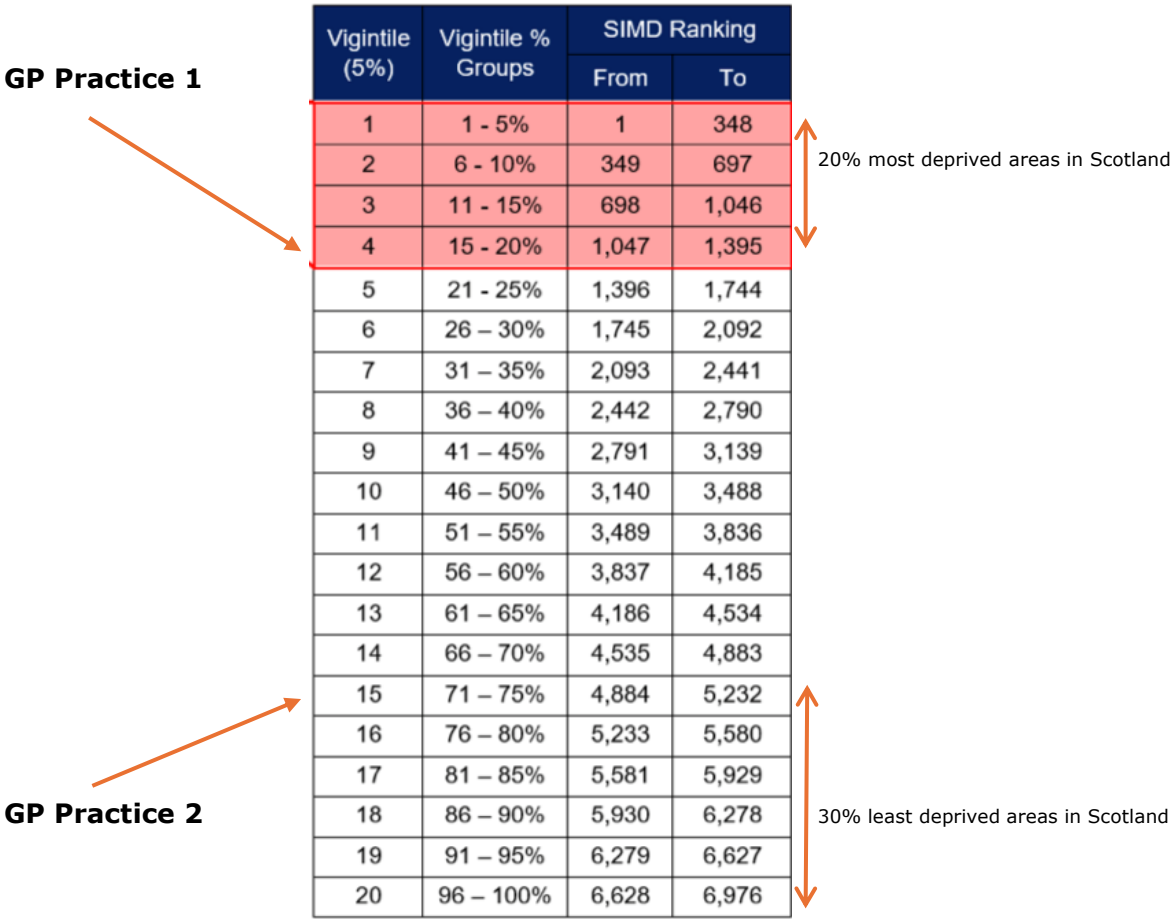
disagreeing with findings previously identified in this study and other systematic reviews.

The systematic review by Leighton et al. (2024) also identified that socioeconomically disadvantaged patients tended not to engage with eConsults. Digital exclusion particularly in terms of deprivation was identified particularly during the focus group with GP Practice 1, a challenge that was not as heavily identified in the interviews with the nurses from GP Practice 2. The Scottish Index of Multiple Deprivation (SIMD) is a tool used by the Scottish Government for identifying concentrated areas of deprivation across Scotland (Public Health Scotland 2024). There are 6976 data zones in Scotland and 340 data zones across Aberdeenshire (Aberdeenshire Council 2020). These are ranked from 1, the most deprived area to 6976, the least deprived area and are ranked across seven domains: income, employment, education, health, access to services, crime, and housing. Instead of number ranking (1-6976), vigintiles split the data zones into 20 groups, each containing 5% of Scotland's data zones, to make the ranking easier. Figure 20 shows the ranking system (Aberdeenshire Council 2020). GP Practice 1 scores '4' on the SIMD which is within the 20% of the most deprived areas of Scotland and GP Practice 2 scores 15 on the SIMD which is within the 30% of least deprived areas of Scotland. Out of the 340 data zones in Aberdeenshire 9 are within the 20% more deprived in Scotland, one of those being GP Practice 1 included in this study. This shows the stark difference in deprivation between both GP practices included in this study and a better understanding of how the benefits and challenges of the use of DHT in each area differ.

Other infrastructure related challenges identified were related to linking up of systems, failure of WIFI networks and equipment access. These challenges were

discussed in Johns et al. (2023) study but go on to highlight that these challenges are relatively easy to fix and that the benefits will soon outweigh these challenges once improvements are made.

These findings show that there are benefits and challenges with the implementation of DHT in GP for nurses and patients. By addressing some of the challenges (infrastructure issues, access issues and digital exclusion issues) DHT have the potential to be very successful in the delivery of care to patients with LTC.



Vigintile (5%)	Vigintile % Groups	SIMD Ranking	
		From	To
1	1 - 5%	1	348
2	6 - 10%	349	697
3	11 - 15%	698	1,046
4	15 - 20%	1,047	1,395
5	21 - 25%	1,396	1,744
6	26 – 30%	1,745	2,092
7	31 – 35%	2,093	2,441
8	36 – 40%	2,442	2,790
9	41 – 45%	2,791	3,139
10	46 – 50%	3,140	3,488
11	51 – 55%	3,489	3,836
12	56 – 60%	3,837	4,185
13	61 – 65%	4,186	4,534
14	66 – 70%	4,535	4,883
15	71 – 75%	4,884	5,232
16	76 – 80%	5,233	5,580
17	81 – 85%	5,581	5,929
18	86 – 90%	5,930	6,278
19	91 – 95%	6,279	6,627
20	96 – 100%	6,628	6,976

Figure 20. Vigintile splitting data zones across Scotland into 20 groups each containing 5% of Scotland data zones showing where GP Practice

1 and GP Practice 2 fit on scale - Adapted from the Scottish Index of Multiple Deprivation Scale (Aberdeenshire Council 2020)

7.4.5 Theme Three: Perceptions of DHT

There were many perceptions identified throughout the interviews that showed participants views and feelings towards DHT. These perceptions were grouped into five subthemes: (i) Perceptions of the role of DHT; (ii) Perceptions of blended/hybrid systems; (iii) Nurses perceived perceptions of DHT; (iiii) Perceptions of the impact of COVID-19 on DHT and (iiiii) Perceived Future of DHT.

7.4.5.1 Perceptions of the Role of DHT

There was a perception throughout the interviews that the role of DHT is to help with managing an increase in patient population and to help with giving patients more options for care:

> *'Massively. Because patient population's getting bigger but actually the practice isn't getting bigger, we're not getting more rooms to see all these patients. So I think it definitely has a place.'*
>
> (GPN10, SSI)

There is a perception that patients do not feel satisfied with their level of care if they are not being seen in person:

'But the patient thinks they're not physically seeing you, that you can't make that judgement about their care, or it's not the correct level of judgement. I think they feel like they've got to be in and be seen physically.'

(GPN10, SSI)

The nurses perceptions on patients views was then expanded on and discussions around remote consultations leading to waiting rooms being quieter make it seem like the nurses aren't working.

'suppose one thing that I've noticed that we get a lot of grief about is because we use a lot more technology now a lot of the work's hidden. So you'll hear patients say "there was only one person in the waiting room, they're doing nothing."

(GPNFG03, FG)

These perceptions can then lead to negative views of the nursing staff and patients feeling further dissatisfied or frustrated with their level of care:

'So, the public perception has totally changed. Personally I'd rather there was one person than fifty coughing all round about me when I'm just in for something. It's like "oh, no." So, there's been a lot of negative, I think anyway, perception that we're doing nothing. Which "kept me waiting ten minutes." Ten minutes late'

(GPNFG05, FG)

7.4.5.2 Perceptions of blended/hybrid systems

The nurses were asked about their views on hybrid consultation options and what they are currently offering in their practice:

'think we would have to have both in the surgery, like you couldn't have just all Near Me in a clinic, but, no, I think if patients wanted it, it could suit some patients.'

(GPN04, SSI)

One of the Practice Nurses identified that many aspects of their role cannot currently be done remotely but there was perceptions that using DT for triaging has eased their role so that only conditions or treatments that need to be seen in person are coming to the practice:

'I think because we deal with more face-to-face in the treatment room like wound care, cytology. There's a lot of things you can't do digitally, but they can triage digitally before they bring in. And a lot of things, they're not needed to brought in, so it's dealt with quickly. But I think a lot of the treatment room stuff we need to see them.'

(GPN04, SSI)

The perceptions of the benefits of telephone triage was further explored but the need for face-to-face consultations was still very much echoed throughout the interviews:

'if I was wanting to see somebody… if it could be dealt with over the phone, fine, but if I was having to see somebody then I would rather they just came in. And obviously we're quite lucky we're a practice and it's all quite close-knit. I can understand when there's patients from miles away, and the hospital obviously, these things work. But being in one community, we don't really need to do that. We'd do a home visit if the patient couldn't come to the surgery, we would just go out and see them'

(GPN07, SSI)

7.4.5.3 Nurses perceived preferences of DHT

Nurses identified how they think patients perceive DHT and the majority of the impressions were positive. However, they again highlighted that DHT isn't suitable for everyone and some patients do prefer to be seen face-to-face:

'You do get the odd patient who just wants to come in and see a face-to-face, but I would say the majority of folk prefer it'

(GPN04, SSI)

'Some folk like it, some like coming in to the surgery, just to have a check over. But the majority are quite happy.'

(GPN07, SSI)

One of the reasons for patients still wanting to be seen in persons was identified as them missing the human interaction and complete implementation of DHT could lead to an increase in loneliness:

'I found that parents were quite happy using it but they missed the interaction with you'

(GPNFG08, FG)

The idea of patients wanting to see nurses face-to-face was not just a unique feeling for patients. Some of the nurses wished to return to traditional ways of face-to-face delivery:

'The problem is, you see, I'm an older nurse, I like to see patients. That's what's kind of difficult. But once you got used to it, that would be a con

for me is you like to see everybody, other nurses are used to doing these things. But no, I think it would be a barrier. (for older nurses) They just don't want to try.'

(GPN04, SSI)

Overall, the perceptions of hybrid consultations being used in General Practice are positive but face-to-face options need to be offered and both nurses and patients have to be receptive to them for them to work well:

'Obviously it has its boundaries, but, yeah, I think it's working well. I think it's effective. And as long as the patients and clinicians are receptive then, yeah, I think it's the way to go.'

(GPN07, SSI)

7.4.5.4 Perceptions of the Impact of COVID-19 on DHT

Perceptions of the impact that COVID-19 had on the fast implementation of DHT through General Practice were identified frequently throughout the interviews:

''it was obviously going back to as COVID hit your doors were shutting and you weren't seeing any patients, but then having to use a lot more technology, so ringing patients, emailing patients, video talking with patients '

(GPN10, SSI)

'through COVID, it was a bit of a nightmare, we were the technology, we were issued iPads just to prevent GPs from going out .'

(GPNFG06, FG)

There was an almost overnight shift to using DHT there was perceptions of having expectations of still having to deliver the same level care whilst learning new ways of working:

> *''Especially as COVID hit, we were expected to change how we practised overnight, and that was a bit of a difficult move. Not seeing patients, and suddenly being expected to still deliver the same level of care '*
>
> *(GPN07, SSI)*
>
> *'We had to FaceTime our COVID patients with a GP on the other end, and Macmillan nurses, although nobody went to visit, we were their face.'*
>
> *(GPNFG07, FG)*

7.4.5.5 Perceived Future for DHT

The participants were asked to share their perceptions on the future of DHT in General Practice and what they think this will look like for their role:

> *'I just think that there is a place for it, this is the future, and we should be moving forward. And I think really practices need to start getting their nurses more involved in it and it shouldn't just be GPs or ANPs. It's not just a diagnosing sort of link, it can be used for a lot more than just that'*
>
> (GPN10, SSI)

It was also identified that further training around DHT is starting to be rolled out and that the future of DHT in General Practice was one of the big topics discussed:

'I think definitely, we had a training day last Monday and that was one of the big topics (future of DHT) of how we see the practice going forward was using more online stuff or patient care'

(GPN04, SSI)

The majority of participants agreed with the idea of DHT being the way forward to General Practice and a combined approach would ensure that patients were getting the best possible care:

'I just think it's the way forward. Yeah, it's the way we're going to move forward so you've got to go with it. I think it would be fine.'

(GPNFG08, FG)

'Yeah, I do. I think it's just the way that healthcare is going, and I think folk have actually been quite adapted to that. There's not been too much pushback from it '

(GPN07, SSI)

7.4.6 Theme Three Discussion

Perceptions of DHT

The perceptions of the role of DHT in GP were mainly positive ones. However, there were some negative perceptions that were identified. The nurses discussed the perceptions they believed that patients had towards the care they received with DHT. These views consisted of less patient satisfaction from not being seen in person and doubts in care and nurses work ethic when being done digitally. This perceived breakdown in patient and nurse relationship agrees with findings

from a study by Caton et al. (2024). This study found that DT increased patient autonomy, but the barriers lead to erosion in the nurse-to-patient relationship.

There were discussions in this study around the rapid implementation of DHT in General Practice which is concurrent with other literature. To keep care accessible during the COVID-19 pandemic there was a shift from face-to-face care to remote consultations to keep services accessible during this time (Isidori et al. 2022).

Although difficult to find silver linings amongst a global pandemic, studies found that the unprecedented adoption of virtual care allowed a unique opportunity to identify the benefits and challenges of using DHT in primary care to implement into future development (Neves and Burgers 2022). This highlights the importance of evaluating the impact on quality of care and safety through further studies and trials to determine the sustainable use of DHT for communication and LTC management in the future (Neves et al. 2021). Greenhalgh et al (2016) explains that although trial studies are useful, they are not the study design of choice for identifying the experiences and interactions occurring between patients and nurses when using DHT for communication. In-depth qualitative studies, such as this current study, reveal these experiences, benefits and challenges to shape and identify future implementation and change (Greenhalgh et al. 2016).

Hybrid or a blended approach to consultations seems to be the new normal of delivering care in general practice. However, giving the patient choice was identified as being fundamental for the future of DH. This feeling is concurrent with Johns et al (2023) who identifies the idea that this focus on patients' needs links to the focus that nurses have on patient-centred care.

8 Mixed Methods Integration

In this section, the process of integrating the data from both stages of the mixed method study will be presented.

8.1 Integration Process

A common key challenge within mixed method research is how the data sets are synthesised and brought together (Åkerblad, Seppänen-Järvelä and Haapakoski 2020). This integration process is the central characteristics of the mixed method research and reflects how quantitative and qualitative methods are intertwined (Skamagki et al. 2022). However, minimum time and effort with the integration process is common when conducting mixed method research (Fetters et al. 2013) (Creswell, 2013).

For this study, a matrix was made to form a joint display of both data sets. Skamagki et al (2022) defined a joint display as on which 'provides a visual representation of how the qualitative and quantitative findings in a MMR study can be integrated'. The mixed method integration process for this study followed the step-by-step guide of Skamagki et al. (2022): (i) creating a joint display; (ii) linking activity; (iii) establishing relationships and (iiii) interpreting and reporting. Tables 22-24. show examples of step (i) and (ii) creating the linking activity involved in the integration of both data sets after following these steps.

8.1.1 Integration Definitions

Once the relevant data was organised into the display, step (iii) of the integration process of looking for relationships between the qualitative and quantitative data began. This process continued into the narrative aspect of the process. The labels 'converge', 'complementarity', 'expansion' and 'divergence' were used to structure the interpretation of the link between the findings (Table 20.) (Fetters et al. 2019).

Table 20. Narrative linking labels and descriptions (Skamagki et al. 2022)(Fetters et al, 2019)

Narrative Linking Labels	Descriptions
Convergence	The agreement between the two sets of findings
Complementarity	When the findings illustrate different but non-contradictory interpretations
Expansion	When some findings overlap but also provide space for further interpretation
Divergence	When the two data set findings demonstrate conflicting interpretation

8.2 Results of Integration Process

The final stage of the integration process is to report on the findings. The next section will present the narrative findings and show the synthesisation of the quantitative and qualitative methods.

8.2.1 Integration of Types of DHT

Areas of complementarity and expansion occurred across the types of DHT being used in GP settings between the two methods (Table 21).

In the survey, 92% of the nurses identified telephone use as their main form of communication with patients. This agrees with the qualitative data. The

interviews expanded on this finding and highlighted that telephone consultations are frequently used as the first form of triage for patients, used for follow-up appointments and to save patients time that is involved with having a face-to-face appointment.

The use of SMS texting and emailing for communication was mistakenly left out of survey questions but was identified frequently throughout the qualitative data being used for appointment reminders, sending information, test results, follow up appointments and sending photographs for review. This was an area of expansion as this was new data found from the interviews. Other DHT identified from the interviews are shown in Table 21 and were: translation technologies, DHTs for work use (laptops, word phones, ipads), emails and photography.

Areas of convergence were found across the integration with video consultations, eConsults and digital note taking systems being identified in both phases of data collection. EConsults were shown as being used by around one-third of survey participants showing convergence with the qualitative responses related to eConsults being phased out post COVID-19 due to the time constraints and increased workload these were causing (reasons also identified in the survey). Areas of expansion were then identified across the integration process with the qualitative data expanding on the issues around funding with eConsults. The qualitative data went on to identify that the GP surgeries now had to pay to use eConsults (eConsults were free during the COVID-19 pandemic) post pandemic and neither of the practices included in this study decided to keep funding them

Table 21. Links between Quantitative and Qualitative findings of type of DHT identified across both data sets.

Quantitative Findings	Qualitative Findings
- Telephone consultations - Digital Devices (LTC monitoring devices, mobile apps) - Video Consultations - eConsults	- Telephone - Health apps - Health monitors (LTC monitoring) - Video Consultations - eConsults **Expansion from Interview Findings** - Translation technology - SMS text messaging - DHT for work use - Emails - Photography

8.2.2 Integration of Conditions Managed by LTC and the DHT used for Monitoring

Areas of convergence occurred with cardiovascular, metabolic, respiratory, and women's health conditions all identified as being managed by DHT across both data sets. Cardiovascular conditions (96%) were identified as the most common LTC with the 'Florence' system being discussed in every interview as a common DHT used as a form of blood pressure management. The 'mymHealth' mHealth apps were other forms of monitoring applications that were identified across both stages of data collection.

Digital devices and mHealth were other areas of convergence that were shown across the data. From the survey, 71% of participants evidenced they had used digital devices (LTC monitoring and mobile apps) to communicate, manage and assist patients with monitoring their LTC. The interviews agreed with these findings identifying similar health monitoring devices, health management apps

and remote monitoring systems as being used to monitor, communication and assist patient with monitoring their LTC.

Areas of expansion did occur through the interviews with different mHealth apps being identified that were not identified in the surveys. Although women's health apps were identified through the survey they were not expanded on until the interviews. The Balance App was highlighted as assisting women with peri-menopause and menopause symptom management and treatment.

Table 21. Links between Quantitative and Qualitative findings of type of LTC being managed by DHT and specific digital devices and apps identified across both data sets.

	Quantitative Findings	**Qualitative Findings**
LTC Managed Using DHT	- Cardiovascular - Respiratory - Routine Appointments - Health Promotion - Wound Care - Diabetes - Cancers - Emergency Appointments - Obesity - Neurological Conditions - Mental Health - Women's Health - Sexual Health - Cytology	- Cardiovascular - Respiratory - Diabetes - Womens Health - Routine Appointments - Weight management - Cytology
Digital Devices and mHealth apps used to managed LTC	- 71% use digital devices or apps to help patients manage LTC	- Florence (BP Management System) - myHealth apps - Balance app

8.2.3 Integration of the Experience and Confidence using DHT

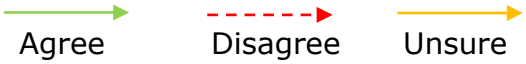
Areas of divergence occurred between the two phases when discussing training for using DHT. Over half (58%) of the survey participants agreed that they had had enough training regarding DHT use compared to many of interview participants highlighting their lack of training.

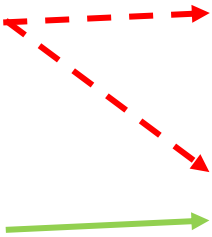
One survey participant did highlight that they believe patients and staff need more education and information around using DHT. Areas of expansion were identified when some interview participants expanded on this and identified that although they feel confident in delivering care, a lot of DHT use has been self-taught. The need for further and continuous training were discussed to help with delivering DHT and assisting patients with using DHT.

An areas of divergence was identified when one survey participant stated ‘I do not think it is safe’ in one of the comment boxes when asked about the challenges they faced using DHT. This feeling was not identified during the qualitative interviews. The interviews did highlight that if they did not feel safe delivering care remotely, they see the patient face-to-face. They also identified that confidence to delivering care using DHT comes with experience.

Table 22. Display matrix of linking activity showing the integration of both mixed method data sets on Experiences and Confidence of using DHT.

Linking activity key:



Overarching Themes	**Subthemes**	**Quantitative Findings**	***Linking Activity***	**Qualitative Finding**
Experience and Confidence using DHT	Fitness for practice and Guidance for using DHT	'I do not think it is safe'.		*'I think it comes with experience, you get that feeling this isn't making sense or they have said something that really worries you, so you bring them down. But the way that we work our system here, if we phone them we tend to see them the same day. So if I phone you and I think there's something not happy with, I want to see you, then they come the same day'*
	Training for DHT use	Had enough training (58%=AGREE) 'I think patients and staff need more education and information around this'		*'absolutely nothing. Not a sausage. Just went along and winged it.'* *'I haven't had any training yet for delivering care electronically. It was the ANPs and the GPS. We weren't involved in that.'*

8.2.4 Integration of Benefits and Challenges of Using DHT

Areas of convergence and divergence occurred between the two phases which highlight the benefits and challenges using DHT.

Areas of convergence occurred with 83% of survey participants agreeing that DHT allowed flexibility and convenience for patients with further comments stating, 'can be convenient if patients happy to use'. This agrees with findings from the qualitative data highlighting the ease and convenience of 'eConsults' or phone consultations for patients. However, areas of divergence were identified with quantitative findings demonstrating high levels of agreement with convenience (92%) and time efficiency (86%) for nurses using DHT but in contrast qualitative findings highlighted time constraints and increased workloads using some forms of DHT (especially eConsults).

Areas of complementarity were identified as more than half of the survey participants (55%) highlighted it takes time to teach patients to use DHT. This response was complimented by multiple quotes from interview participants explaining that nurses needed assistance on how to guide and support patients using DHT

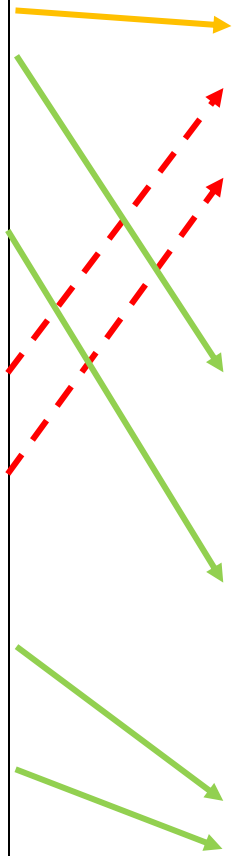
All survey participants (100%) agreed or strongly agreed that some patients were unable to use DHT and this is supported by quotes from the qualitative data around patients requiring guidance and support when using technologies to manage their care or seek support. Other areas of convergence occurred when discussing patients' safety. Patient safety concerns were identified by 75% of survey participants and which was further highlighted through the qualitative interviews when DHT was linked with patients not seeking medical advice due to lacking ability to use DHT.

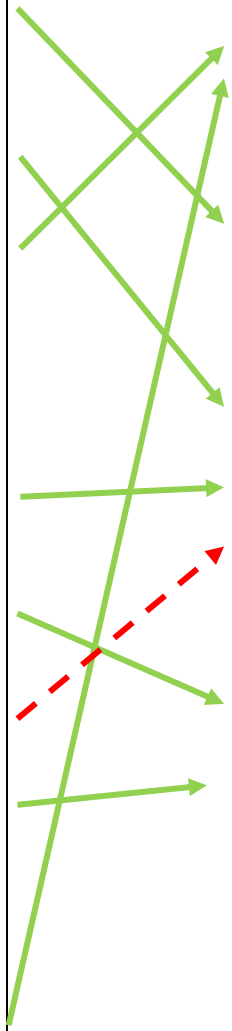
One area of divergence was identified when survey data showed 79% of nursing participants being in agreement that DHT were accessible for patients contrasting with quotes from the qualitative data discussing the digital exclusion issues. They were identified as exclusion for elderly people, non-English speaking people and socioeconomic issues relating to the financial burden of owning or having access to technologies.

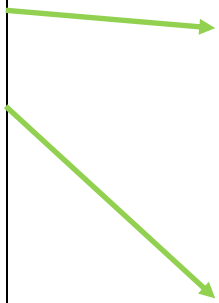
Finally for benefits and challenges, areas of complementarity occurred for equipment and infrastructure issues with comments from the survey discussing the technology issues and remote access infrastructure problems. These comments were complemented by qualitative quotes discussing remote wifi problems, technology break downs and systems not linking up.

Table 23: Display matrix of linking activity showing the integration of both mixed method data sets on Benefits and Challenges of using DHT.

Linking activity key:

Overarching Themes	**Subthemes**	**Quantitative Findings**	***Linking Activity***	**Qualitative Finding**
Benefits and Challenges of Using DHT	Convenience and time saving VS Time constraints and increased workload	Time is better managed (50%= UNSURE) Takes time to teach patients to use DHT (55% =AGREE) Convenience (92% =AGREE) Time efficient (86% =AGREE) Flexibility (83% = AGREE) 'Can be convenient if patients happy to use'		*'Just you don't have the staff to deal with it, so you're dealing with the E-Consult and then you're taking a clinician away from seeing patients, and then it gets referred back that that person that's filled in the E-Consult needs seen face-to-face, so effectively you're dealing with it twice instead of just dealing with it once. And when you've got staff shortages, it doesn't work'* *'As I say, it is a bigger patient population and it is just getting bigger. So we can offer more appointments in a sense that are much tighter, as opposed to the patient coming into the practice.'* *'Just how to set up things. How we can guide patients to it, help them. Just initial guidance of just how to implement it. I don't think it would be difficult. It's just the unknown, until you know what to do, it's the unknown'* *it makes it much easier, or as a patient myself, if I can put something in E-Consult or if I can just have a quite phone call, it saves me having to take a half-day off my work, whereas before if you had to be seen face-to-face and you were given a time of quarter to eleven, you'd have to use a half-day holiday'*

	Engaging with hard to reach people VS Digital Exclusion	Patients need support (63%= AGREE) Some patients unable to use DHT (100% =AGREE/STRONGLY AGREE) Patients do not have the technology to receive care remotely (100% AGREE) Some patients don't have the knowledge on how to use DHT (92%= AGREE) Patient safety concerns (75% =AGREE) Accessible for patients (79% =AGREE) 'I do not think it is safe'. 'always room for improvements, disappointing that some patient are unable to engage and benefit from due to financial/ educational constraints'		*'There's a low literacy level in [AREA] so it's really difficult sometimes to get them connected and to get into the waiting room and how to work out what you were doing'* *'Just how to set up things. How we can guide patients to it, help them. Just initial guidance of just how to implement it. I don't think it would be difficult. It's just the unknown, until you know what to do, it's the unknown'±!* *'Other people… and it's not age, I know some 'silver surfers' or whatever, some older adults are better at it than I am. So, it's not an age barrier. Sometimes it's a language barrier. Or it's a lot of our patients just don't have the money'* *'the elderly is my concern, they don't have the ability to do it, some of them don't have a laptop or a phone that can do it. And they like to see somebody. And sometimes it's the only time they'll see a person in a week is coming in for something to the surgery'*

	Equipment access and infrastructure issues	` too difficult to access’ ‘its too much and technology is not working – there is not enough phone lines’.		*'The cons of it is up here in Aberdeenshire, it’s pretty rural, not everybody has a really good source of internet providers. I know we don’t, it’s very glitchy. Freezes, losses. Your calls could end up being a little bit longer because there’s a lot of interruptions'* *‘Yeah, it’s all different systems, which is not really effective in some sense because you’ve got nothing links to anything, and you’ve got a patient in and you’re having to log into a different system just to see a hospital letter. And it doesn’t flow. You should just have it there to see their documents’*

8.2.5 Integration of the Perceptions of Using DHT

Areas of expansion were identified across both phases when perceptions of using DHT was discussed. Perceptions of a blended/hybrid system showed expansion with 63% of survey participants being satisfied with the way DHT are currently being implemented and qualitative data identifying patients' possible perceptions with quotes such as 'its pretty instant as well, so the pro for the patients is they're not having to get up, get ready and come into the surgery or rearrange their working day. I think it benefits both sides' (GPN10).

Following on from this, areas of divergence occurred with only 45% of nurses believing that patients are happy with DHT being used in their care. This disagrees with the majority of nurses commenting on positive feelings from patients around using DHT. Areas of expansion then occurred from the interviews when nurses used their own experiences as patients to complement this stating 'it makes it much easier, as a patient myself'.

COVID-19 changes showed areas of convergence across both phases. More than half of survey participants agreed that changes had occurred since the COVID 19 pandemic across monitoring LTC, routine appointments and symptoms management, diagnosis and reporting concerns. These responses were further identified when interview participants discussed 'big changes' that occurred pre and post COVID-19 with the rapid introduction of DHT when the pandemic hit and the remaining use of some DHT today.

When looking into the future of DHT for nurses working in GP settings, areas of convergence occurred with 50% of survey participants agreeing/strongly agreeing that their care is just as effective being delivered face-to-face or

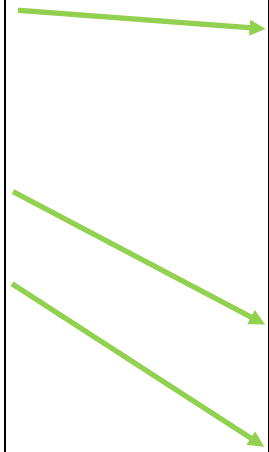
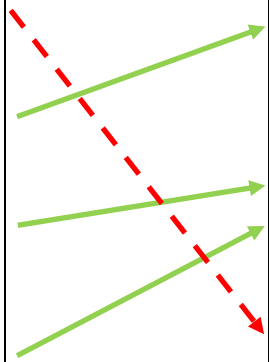
digitally and further comments stating 'the use of digital healthcare provides flexibility in patient treatment'. These findings matched quotes from the qualitative data highlighting how much technology had improved their way of practice and that healthcare professionals have been adaptable to the change

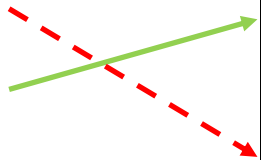
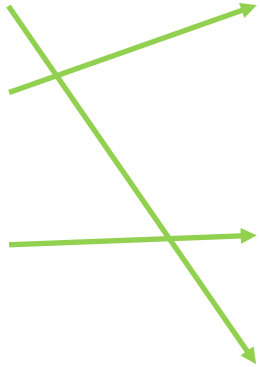
This chapter has integrated the findings from the survey and the interviews and revealed areas of 'converge', 'complementarity', 'expansion' and 'divergence' across both data sets. The findings will now be discussed further in the next chapter (Chapter 9).

Table 24: Display of matrix of linking activity showing the integration of both mixed method data sets on Perceptions of using DHT

Linking activity key:

Agreed **Disagreed** **Unsure**

Overarching Themes	**Subthemes**	**Quantitative Findings**	***Linking Activity***	**Qualitative Finding**
Perceptions of Using DHT	Perception of the role of DHT	Patients needs are being met (63%=AGREE) Patient concerns (79%=AGREE) Patients prefer face-to-face appointments (92%=AGREE)		*'I think you can give a good level of care over the phone. It's a two-way street at the end of the day, isn't it? What that patient's saying to you. You could have that patient sat in front of you and they're saying the same thing as what they would on a video call.'* *'they like to see somebody. And sometimes it's the only time they'll see a person in a week is coming in for something to the surgery And I would worry that they wouldn't contact the surgery because they couldn't do the technology side of things, so they would leave things, rather than make an appointment to come and see. Because sometimes your appointments are "while I'm here", and it raises something. I can't see that happening the same'*
	Perception of blended/hybrid systems	Patients find hybrid consultations convenient (45%=AGREE) Satisfaction with current ways of using DHT (63% =AGREE) 'Best of both worlds, integrate both' it is there to provide efficiency for the patient if they are happy to do so but have the option to be seen face-to-face if they would like to'		*'we are needing more different ways of seeing people because we're restricted to how much we can go out. So I'd say I'm using the phone a lot'* *'think we would have to have both in the surgery, like you couldn't have just all Near Me in a clinic, but, no, I think if patients wanted it, it could suit some patients.'* *'I think it's pretty instant as well, so the pro for the patient is they're not having to get up, get ready, come into the surgery, they're not having to try and rearrange their working day to come into the surgery. I think it benefits both sides.'*

	Nurses perceived preferences of DHT	Patients are happy (45%=AGREE) Just as effective at delivering digital care (50%=AGREE/STRONGLY AGREE)		*'Personally, technology has made a huge improvement to our life. I think it has made it a lot easier, '* *'it makes it much easier, or as a patient myself, if I can put something in E-Consult or if I can just have a quite phone call, it saves me having to take a half-day off my work, whereas before if you had to be seen face-to-face and you were given a time of quarter to eleven, you'd have to use a half-day holiday'*
	Perceptions of the impact of COVID-19 on DHT	Changes to monitoring LTC since COVID (46% =YES) Changes to routine appointments since COVID (50% =YES) Changes to addressing patients symptoms, diagnosis, reporting concerns (54% =YES)		*''Especially as COVID hit, we were expected to change how we practised overnight, and that was a bit of a difficult move. Not seeing patients, and suddenly being expected to still deliver the same level of car '* *'again big changes from pre-COVID to post-COVID, it all went from face-to-face to telephone, Near Me, and then I've recently joined here, my previous surgery we used a lot of E-Consult '* *'We had to FaceTime our COVID patients with a GP on the other end, and Macmillan nurses, although nobody went to visit, we were their face.'*
	Perceived future for DHT	'the use of digital healthcare provides flexibility in patient treatment'		*'Yeah, I do. I think it's just the way that healthcare is going and I think folk have actually been quite adapted to that. There's not been too much pushback from it. '*

9 Discussion

9.1 Introduction

This chapter will discuss the findings presented throughout the integration of Chapters 6-8 and will identify the strengths and limitations and highlights some reflections the researcher has on the research carried out for this thesis.

9.2 Discussion of Main Findings from Mixed Methods Integration

The aim of this thesis was to identify the experiences and perspectives of nurses and people with LTC on using DHT to inform practice. A convergent parallel mixed method approach was taken to achieve these aims and the findings identified three main themes across both data sets: (i) Experience and Confidence using DHT; (ii) Benefits and Challenges of using DHT; and (iii) Perceptions of using DHT.

9.2.1 Experiences and Confidence of Using DHT

The findings from the integration of both data sets revealed notable areas of divergence and expansion regarding training and experiences, particularly around training adequacy and safety of DHT use between survey and interview participants.

Adequacy of training on DHT use was shown across the two phases with a discrepancy between survey participants and interview participants. The two samples had different experiences, suggesting variability with the training received, which could be due to the sampling, with survey participants feeling

more confident in their training than the interview participants. Furthermore, some interview participants highlighted that much of their DHT knowledge had been self-taught, despite feeling overall confidence in delivering care digitally. They expressed a desire for ongoing training to enhance their skills to better assist patients.

Training and education for healthcare professionals on DHT across practice is a focus of the Scottish Government and was highlighted in Scotlands National Digital Health and Care Strategy (2018). The strategy includes workforce development as a key theme in their recommendations for employers to upskill and ensure their clinical professionals are prepared for the growing digital world (Digital Health and Care Scotland 2018).

Although some survey participants acknowledged the need for more education for both nurses and patients, the interviews provided a deeper understanding of these needs. Participants identified a desire for continuous training and more formal education to allow them to feel more competent in their roles and felt it could enhance their ability to deliver care using DHT.

Locally, NHS Grampian's '*Service Transformation through Digital: a strategy 2020-2025'* (2020) states that 'some staff will need additional support to adapt and become suitably skilled'. Their strategy to deliver a digital competent workforce in Grampian included:

- 'Promotion of digital skills through the learning management system and ensuring that staff can access the development relevant to their role'
- 'working with partner universities and colleges to embed digital health into the available education, including undergraduate curricula.'

(NHS Grampian 2020)

They gave an example of this as some clinicians in Grampian already receiving specialist training in areas of digital health and that Aberdeen university was one of the first universities to have an eHealth medical education lead (NHS Grampian 2020).

One of the survey participants indicated safety concerns around DHT use. This sentiment was not specifically echoed in the qualitative interviews. The interview participants instead emphasised that if they felt more comfortable delivering care face-to-face, they would do that instead of delivering care remotely. It was also noted form the interviews that confidence in using DHT comes with experience, suggesting that perceived safety might increase with further familiarity and competence in using DHT.

The NHS England (2019) report the *'Topol Review Tool: Preparing the healthcare workforce to deliver the digital future'* acknowledges the safety concerns and identify that patient safety should be the forefront of the integration of new DHT across healthcare settings. They identify ways of mitigating safety concerns by addressing patient safety training and developing critical appraisal skills through knowledge of the standards and the regulatory environment (NHS England 2019).

The above strategy's and tools, discussed throughout this section, show that steps are being made across the UK and the NHS to ensure patient safety is at the forefront of the implementation and growth of DHT in care delivery. The aims are to ensure education and training is implemented to meet patient safety standards but findings from this study show they have not funnelled down to the included study participants yet.

9.2.2 Benefits and Challenges of using DHT

The findings of the integration of survey and interview data showed both convergence and divergence regarding benefits and challenges of using DHT.

Between the survey and interview participants there was a strong consensus on the benefits of DHT for patient care. A significant majority of survey participants agreed that DHT offers flexibility and convenience which was echoed by qualitative data who emphasised the ease of eConsults and phone consultations. This shows a shared recognition of DHT potential to enhance patient care by making healthcare more accessible and adaptable to patients individual needs.

A mixed methods longitudinal study but Murphy et al. (2021) assessed the implementation of remote consultations across primary care in the UK during and after the COVID-19 pandemic. The findings from Murphy et al. (2021) echoed the benefits found in this thesis and emphasised that phone consultations and eConsults provided flexibility and convenience or both patients and primary care healthcare professionals (Murphy et al. 2021).

Despite the general agreement on the benefits of DHT, areas of divergence regarding its impact on time efficiency and workload were noted. Survey data showed high levels of agreement among nurses on convenience and time efficiency, while qualitative findings highlighted challenged such as increased workloads and time constraints associated with some forms of DHT, particularly eConsults. This could be because when the survey participants were asked they generally agreed that DHT is time-efficient however in the interviews there was more opportunity to explore challenges in more detail, indicating that while DHT may offer time saving in some areas, it may also add to workload and work related pressures.

The Health Foundation (2021) echoed these findings and discussed the challenges faced by healthcare providers when adopting DHT. A study by Greenhalgh et al. (2020) looked at the advantages and limitations of virtual consultations. The study examined the use of virtual consultations in primary care and highlighted serval challenges. These challenges included increase workload for healthcare staff, time management issues and digital exclusion for some patient groups(Greenhalgh et al. 2016a).

Digital exclusion and access was also highlighted across the mixed method integration findings of this thesis. Divergence emerged in perception of patient accessibility to DHT. High percentage of survey participants agreed that DHT is accessible in contrast with qualitative data revealing issues of digital exclusion, particularly for elderly individuals, non-English speakers and those facing socioeconomic challenges. This discrepancy suggest that while healthcare providers may generally believe DHT is accessible, there remains significant barriers for certain populations that need to be address to ensure equitable access to healthcare being provided digitally.

UK Government produced a report on *'Levelling up the UK'* which included a section on 'Addressing digital inequalities in healthcare' (2022). This part of the report addressed digital inequalities that are apart in the UK healthcare system and highlighted these challenges of digital exclusion being socioeconomic factors as well as age and language barriers (UK Government 2022). The report also commented on infrastructure limitations lead to a lot of issues surrounding access (UK Government 2022). These infrastructure issues were also discussed through the integration of data.

Finally, both data sets complement each other in highlighting equipment and infrastructure challenges related to DHT use and implementation. Survey participants noted problems with technology and remote access infrastructure which were further discussed in the interviews describing the challenges such as Wi-Fi problems, technology breakdowns and incompatible systems. This emphasises the need for robust infrastructure and reliable technology to support effective use of DHT in GP.

To try and tackle the infrastructure and connectivity issues Scotland faces, the governments Digital Strategy titled 'A Changing Nation: How Scotland Will Thrive in a Digital World' identified Scotland's plans for DHT transformations across health and social care. It sets out a framework to improve digital infrastructure and connectivity highlighting a commitment to providing high-quality digital infrastructure (The Scottish Government 2021). Key features included providing high-quality digital infrastructure including fast WIFI and mobile connectivity, especially in remote and regular areas across Scotland (The Scottish Government 2021). These features could improve the access and reliability of using DHT.

9.2.3 Perceptions of using DHT

The findings from the final theme highlighted areas of expansion, divergence and convergence regarding the perceptions of using DHT among nurses in the GP setting.

Majority of survey participants expressed satisfaction with the current implantation of blended/hybrid system which aligns with the qualitative data suggesting that patients find it convenient. This suggests an overall positive

reception of DHT, particularly when used in a blended system offering both digital consultations and face-to-face consultations.

Despite the areas of satisfaction with DHT, there was disagreements in perceptions regarding patient satisfaction. While many nurses commented on the positive feedback from DHT, less than half of the survey participants believe that patients are happy with the DHT that are being used. This discrepancy may indicate that while some patients appreciate the convenience of DHT, other may have reservations or face challenges that impact their satisfaction.

A report by the Royal College of General Practitioners called '*RCGP calls for more in-person GP appointments post COVID'* (2021) highlights the need to bring back more frequent face-to-face consultations. The report identity's that in person consultations are an essential element of GP healthcare and that although remote consultations should be there as an option, they should not be the automatic default to providing care (Royal College of General Practitioners 2021). This further highlights the need for the incorporation of blended or hybrid healthcare and healthcare professionals still want to see patients in person.

The impact of COVID-19 pandemic on the use of DHT was noted across both quantitative and qualitative data. More than half of the survey participants noted that the pandemic brought about significant changes in how LTC, routine appointments, symptoms managed and diagnosis and reporting are handled. This was also discussed in the qualitative data describing the rapid adoption of DHT during the pandemic and its continued use in GP. Both sets of data highlight the accelerated integration of DHT into GP as a direct response to the pandemic indicated a lasting shift in how care will be delivered.

Unfortunately, as discussed throughout this thesis, limited literature exists around nurses experiences of DHT in GP. However, studies examined the experiences of UK GPs with the implementation of DHT during the COVID-19 pandemic (Grut et al. 2023) (Murphy et al. 2021). The studies highlight the GPs adaption to using remote consultation options and how this impacted their workload and patient care. The findings from these studies show that DHT led to significant changes in how GPs operate with a rapid shift towards remote consultations, impacting patient interactions and requiring adjustments to workload and time management (Grut et al. 2023)(Murphy et al. 2021). These findings are similar to ones the nurses reported throughout this thesis and shows the massive impact that DHT had during the COVID-19 pandemic. Moving on from the COVID-19 pandemic, the participants looked at the future of DHT use in GP by nurses.

The future of DHT in the GP setting was identified in the belief that DHT can be as effective as face-to-face interactions. Half of the survey participants agreed or strongly agreed that care is equally effective whether deliver digitally or in person. Qualitative data support this view with participants noting that DHT provides flexibility and has improved their practice. This agreement suggests a growing acceptance and adaptability among nurses towards incorporating DHT into routine care, recognising the benefits, flexibility and enhanced patient management.

The International Council of Nurses (ICN) (2023) released a positive statement around the future of DHT and the nursing profession. The ICN stated ‘digital technologies have the potential to support equitable and universal access to health services, increase the efficiency and reliability of health systems, improve patient and health worker safety, respond to health workforce shortages, reduce

costs and ultimately improve people's health outcomes' (ICN 2023). This statement may be possible for the future of DHT and nursing if the issues addressed throughout this thesis such as, workload challenges, infrastructure issues and digital exclusion problems are addressed.

9.3 Strengths and Limitations

9.3.1 Strengths

This study explored the experiences and perceptions of nurses using DHT to deliver and manage care in General Practice and the strengths of the study are identified here. Two practices in different geographical areas were included in the study. This helped to identify different ways DHT are being used by different practices in the different rurality's across NHS Grampian (GP 1 being in a urban area and GP practice 2 being in a rural area). Two practices being involved in the research reduced the risk of bias that may arise from specific practices, accounting for variations in practice and patient demographic.

There was a range of experiences and nursing roles of participants included in the study. This allowed for different viewpoints and insights and led to a more comprehensive understanding of the data collected. Delivering care in any context is complex and multifaceted and involving nurses from different aspects of GP (ANPs, Practice Nurses, Community Nurses etc) helped to capture the complexities that can arise from delivering care using DHT. To ensure consistency, one researcher (EHW) conducted all the interviews with the help of LA to conduct the focus group and all interviews were conducted face-to-face.

Having two people involved in the focus group allowed for one person to focus on the discussion and the other to take notes and manage voice recorders.

Having LA assist with the focus group also allowed for a different professional perspective and helped to challenge any biased interpretations that may have occurred.

The researcher had experience in the framework analysis process from a previous study which meant they could bring the experience and learning from that study into this one saving the time involved in learning a new process. During data analysis, the supervisory team were all involved in the initial analysis and interpretation of the data and discussions were had to ensure consistency. Once agreement had been made on initial themes the researcher (EHW) went on to complete the rest of the analysis but sought feedback and further assistance as needed. Involving multiple researchers in the analysis process allowed for alternative, but consistent viewpoints which helped to enhance rigour, critically assess and refine the analysis process (Gale et al. 2013) (Ritchie and Lewis 2003).

9.3.2 Limitations

One of the limitations of this study was that recruitment numbers were relatively small across both areas of the study and recruitment targets were not reached despite attempts to enhance. The main limitation was the survey numbers only achieving a response rate of n=24 (7%). An integrative review of response rates in nursing research utilising surveys (L'Ecuyer et al. 2023) found that out of 51 published studies the response rate for nurses completing surveys ranged from between 3.4%-98%. This highlights the response rate was on the lower side of the average rate of survey responses and is not representative of the total

sample available. Despite this limitation the survey responses do add value to research as this is the first of its kind in Scottish Nursing Practice.

To gain deeper insights from the responses, three nurses participated in one-on-one interviews, allowing for in-depth exploration of individual experiences. Additionally, a focus group of 11 nurses particpated in an interactive discussion highlighting shared and contrasting viewpoints on the topic.

While the sample size may be considered relatively small, it is acceptable within qualitative research where the emphasis is on depth rather than breadth of data (Creswell and Both 2018). The combination of methods (survey, interviews and focus groups) ensured a rich dataset, capturing both individual narratives and group discussion and dynamics. However, the findings should be interpreted with the recognition that they are not generalisable to all nurses in General Practice. Future research with a more diverse sample would help to further expand on these findings.

The participants for this study were recruited from only one Scottish health board. Health boards often operate under specific local guidelines or policies which may have influenced the findings if they differed from other health boards. Different health boards may also use different systems and technologies and the opportunity to explore these were missed by only including one health board. Unfortunately, due to the time constraints of a Master of Research Study it would have been difficult to open the scope of this study to include more health boards. It was therefore decided, amongst the supervisory team, to keep the study as solely NHS Grampian with the aim to improve practice locally with the implications being that generalisation of the findings are limited.

Other limitations related to recruitment may have included work related pressures leading to nurses not having time to participate in research. Recruitment of healthcare professions continues to be an issue in health research, and this study is no exception (Browne et al. 2022) (Bruneau et al. 2021). A rapid review of the evidence base of UK based NHS staff involvement in research was carried out by Dimova et al. (2018) which identified some of the challenges involved with including NHS healthcare professionals in research. Some of these challenges included: lack of dedicated time to be involved in research; negative perceptions around research by healthcare staff; a perceived inability to influence practice through research; insufficient management support and lack of awareness around research involvement (Dimova et al. 2018). To try and mitigate these work-related pressures on the participation in research, the survey was kept concise and focused to minimise time required to complete and the research team offered flexible times to carry out qualitative data to accommodate their schedules and shifts to try and reduce burden. Participants were also provided information on what being involved in the study entailed in the PIS and an email address was provided for any further questions.

Although every avenue was attempted to recruit patients for this study, we were unsuccessful. For patient recruitment we relied on the nurses involved in the interviews and focus group to distribute information packs and also the use of social media. Both mechanisms had the potential to reach many people with LTC but relied on the patients opting into the research by emailing or telephoning the research team. Despite follow up and reminders with gate keepers. Future research should focus on exploring the perspectives of patients and with sole focus on patient recruitment more time could be used to explore other methods of recruitment.

Recruitment challenges may have been alleviated if funding was available to access networks such as the NRS Primary Care Network which had been a successful form of recruitment in previous studies the researcher had been involved in. Although it cannot be claimed that data saturation was reached, the data collected does reflect some key findings in relation to the delivery of care using DHT and may be used to inform practice, at least in the participating Health Board.

9.4 Reflexivity

This section provides a reflection on the role of the researcher. The influences, such as, the researcher's personal background, assumptions, and decisions throughout the mixed methods research process may have had an impact on how the research was explored. By highlighting these factor it shows how potential biases may have shaped the study and interpretation of findings.

Reflexivity is a process of self-awareness and reflection on how the researcher's personal and professional background and experiences may influence the research (Creswell and Poth 2018) and (Berger 2015). Acknowledging these influences is crucial for ensuring rigor and credibility of the research (Creswell and Poth 2018). The researcher understands that her background and perspectives as both a researcher and a registered nurse have inevitably shaped the direction and interpretation of the research and could have possibly influenced both the questions asked and the conclusion that were drawn.

The researcher has witnessed first-hand the integration of DHT into nursing care which provides them with valuable insights into their practical applications and challenges. The researcher's experience as a nurse may have caused them to emphasise questions around certain aspects of DHT, such as training and

experiences, patient outcomes and interactions and nurses' experiences and challenges. Additionally, the researcher also has experience of using DHT as a patient which could have been a bias that came through in the research. To mitigate these biases the researcher used evidence available and used the results from the rapid scoping review to help develop survey questions and topic guides.

The selection of participants, who were nurses working in general practice, were recruited through word of mouth and snowballing which may have caused bias in participant selection. To counterbalance this potential bias, all nurses working across NHS Grampian were sent the recruitment details via email to try and capture a broad range of perspectives. Additionally, by incorporating the interviews as well as the survey the researcher was able to ask open-ended interview questions to encourage participants to share their experiences without being constrained by preconceptions. In addition, having regular debriefs after data collection with supervisors, who have a different professional background, provided an external perspective and helped challenge any of the researcher's interpretations or biases of data collected.

In summary, reflexivity has been a crucial component of this research. By openly reflecting on the researcher's background, biases and the steps taken to try and address them, the researcher hoped to provide a transparent account of the research process. This reflexivity only enhanced the credibility of the study but also contributes to a more nuanced understanding of DHT used by nurses in GP.

10 Conclusion

10.1 Introduction

In this final chapter the main conclusions from this thesis are presented and further opportunities for research and practice are recommended.

As a reminder, the research questions and objectives for this thesis were:

Rapid Scoping Review

1. What evidence exists on digital technologies used by nurses working in primary care settings to deliver healthcare services?

Mixed Methods Study

1. What are the experiences and perspectives of nurses (based in GP practices) in using DHT to deliver care for people with LTC?
2. What are the experiences and perspectives of people with LTC receiving care delivered via DHT by nurses in GP practices?
3. Conduct a mixed methods study to understand and explore:
    c. The experiences and perspectives of nurses (based in General Practice) using DHT to deliver care for people with long term conditions (survey and qualitative interviews/Focus groups)
    d. The experiences and perspectives of people with LTC receiving care from nurses (based in General Practice) for their condition (qualitative interviews)

10.2 Final Conclusion of Thesis

This Master's by Research (MRes) thesis has investigated DHT being used by nurses in general practice. The rapid scoping review (Chapter 2) identified and examined current evidence on DHT being used by nurses in primary care and provided a comprehensive overview of the literature. The review highlighted both the barriers and facilitators to using DHT when delivering care and by patients in managing their LTC. While the research highlighted a range of positive experiences with DHT, it also identified several barriers to its effective use across primary care.

Key findings from the rapid scoping review identified the types of DHT reported in the literature across primary care and the conditions that are being managed by nurses using the DHT identified. The use of DHT by nurses has rapidly grown in primary care and saw growth during and post the COVID-19 pandemic. DHTs have been identified in the literature as the key to addressing preventative care and supporting people with LTC in primary care.

The rapid scoping review helped to develop the subsequent convergent parallel mixed method mixed methods research questions and assisted with the development of the topic guides and survey design.

The mixed method study identified, similar types of DHTs and LTCs with communication and management of LTC the most common uses for DHT by nurses in GP settings. While benefits of DHT are identified there are still challenges. The majority of participants saw benefits in using DHT to deliver and manage LTC care and agreed that DHT has a role to play. Despite the barriers and challenges identified, participants reported using technologies had made their job easier and they welcomed the changes that DHT brought.

Overall, the findings indicate a general positive perception of DHT among nurses, with an understanding of its benefits and challenges. There are areas that require further research especially related to training, accessibility, workload and infrastructure.

10.3 Knowledge Contribution

This research makes a significant contribution to understanding the evolving role of DHT in nursing practice within primary care, particularly in the general practice setting in the post COVID-19 landscape.

This research holds substantial relevance to nursing as a profession, particularly in relation to patient safety, professional accountability and fitness to practice. The integration of digital technologies raised concerns around data security, clinical decision-making and accountability. These concerns align with the Nursing and Midwifery Code (2015) which emphasise nurses responsibility to preserve patient safety, maintain competencies and adapt to evolving technologies. This research supports nurses concerns around the importance of delivering safe and effective care with the DHT they are provided.

Following on from this, the research identified the need for improved digital literacy and training among nursing staff, aligning with national priorities such as Scotlands National Digital Health and Care Strategy (2021) and NHS Grampian's '*Service Transformation through Digital: a strategy 2020-2025'* (2020) which both highlight the essential skills nurses (and other HCP) require to use DHT safely, confidently and effectively.

Finally, this research has important implications for the healthcare service, particularly in supporting the effective deployment and infrastructure needed for optimising DHT use. The research highlights the need to ensure DHT are accessible, inclusive and adaptable to different populations. This aligns with the UK Governments report on *'Levelling up the UK'* which included a section on 'Addressing digital inequalities in healthcare' (2022) with focus on digital inequalities in the UK including address infrastructure issues, socioeconomic factors, age related inequalities and language barriers.

By exploring the ongoing impact of DHT, this study addresses critical gaps in research and the opportunities for future research which are discussed in the next section (10.4).

10.4 Opportunities for Future Research

The findings from this study have identified further areas for future research.

The scoping review identified three key areas for future research: ongoing impact of DHT integration post COVID-19 pandemic; expanding mHealth solutions for other LTC management; addressing gaps in DHT for healthcare areas with limited digital support.

Ongoing impact of DHT integration post COVID-19 pandemic:

Future research should investigate the lasting effects of DHT on primary care delivery. This would include their influence on nurse roles, patient engagement/satisfaction and service delivery.

Expanding mHealth solutions for other LTC management:

Further research is needed to assess the effectiveness of mHealth technologies in supporting self-management, improving clinical outcomes and delivering personalised interventions for LTC not identified in the scoping review.

Addressing gaps in DHT for healthcare areas with limited digital support:

Research is required to explore how digital tools can better support women's health, chronic pain management, sleep disorders and mental health disorders, where current literature is limited or lacking from these findings.

The mixed methods study identified two opportunities for future research: Firstly to explore peoples lived experiences of digital health technologies; and secondly, to investigate the role of digital health technologies for healthcare areas with limited digital support.

Explore peoples lived experiences of digital health technologies:

As discussed in the strengths and limitations section (9.3) patient participants were not recruited for this study. Having patient and public involvement perspectives is an important aspect in health research, to allow patients with lived experiences to give insight on their experiences and perspectives and also, to ensure needs and expectations are met when developing or implementing something new into practice (Arumugam et al. 2023). With this in mind, future research should involve expanding on this study to recruit people with lived experience of receiving and using digital technology to manage their LTC and explore their perspectives and experience of this.

Investigate the role of digital health technologies for healthcare areas with limited digital support:

The integration of patients self-managing/remotely monitoring their LTC using apps or digital wearable devices was discussed in this study and had positive responses amongst nursing participants. Currently, cardiovascular conditions, respiratory conditions and metabolic conditions are the main LTC self-managed by patients using apps such as the 'my mHealth' apps and 'Florence'. Based on the data collected, there were other health apps used for other conditions, however, they don't appear to be as well reported on or used. Further research should be carried out to identify the uses, effectiveness, feasibility and acceptability apps could have for nurses managing LTC and patients who have LTC. This research could include what other conditions could benefit from the modification of existing apps and digital wearable devices or the development of new apps and wearables.

10.5 Recommendations for Practice

In terms of recommendations for practice, the findings from this thesis offer insights that can inform key stakeholders such as: public health boards, governments, higher education and practice managers to focus on strategies to improve nurses' experiences in delivering care using DHT and enhance patient satisfaction.

Public Health Boards:

Addressing digital literacy and improved access to DHT could ensure that both nurses and patients have access to reliable digital devices and network.

Digital literacy and accessibility could be improved by implementing national or regional initiatives to improve digital literacy among both healthcare providers

and patients. Targeted training programmes or training hubs for patients with limited technology skills could be implemented to promote digital inclusion.

Ways of improving access to digital tools could involve expanding access to reliable digital devices and internet connectivity in underserved areas, potentially by subsidising technology for patients and healthcare professionals. This may involve providing devices to those who lack them or creating more accessible digital platforms to improve access and inclusion.

Governments:

Following on from this, the Government could establish, develop and up date clear policies and guidelines around the use and access of DHT in the NHS and General Practice which may enhance the effectiveness and safe use of DHT.

This could be done by strengthening governance around digital healthcare through ensuring robust data security, patient confidentiality and interoperability between NHS systems (perhaps a standardised digital platform across primary and secondary care).

The government could mandate a Digital Inclusion Framework within the Scottish Governments Digital Strategy, ensuing that patients and healthcare professional have equitable access to digital health services.

The government could invest more in digital workforce training ensuring that general practice nurses receive dedicated health training and mentorship. This should include protected learning time for staff to have time to complete continuing professional development (CPD) initiatives. Funding incentives could also be given to allow ongoing digital training in GP practices, which would allow staff to keep up with rapidly advancing and changing technologies.

Higher Education:

Higher education institutions could continue to embed DHT in the nursing curriculum. This could be done by ensuring all undergraduate and postgraduate nursing programmes across Scotland and the UK integrate mandatory digital health education, covering all areas of DHT – including but not limited to different forms of telehealth, data security, digital devices and electronic health records and digital note taking platforms.

Although workforce development was highlighted in the NHS Grampian Strategy (2020) it was focused around undergraduate training and initial staff training rather than continuous, on-going training and education for healthcare professionals. Higher education institutes could also focus on developing CPD programmes for registered nurses. They could provide micro-credential courses (including practical training courses) in DHT, encouraged by the NHS and local healthboards, offering flexible learning opportunities for nurses and other healthcare professionals.

Practice Managers:

As previously highlighted, the findings show the importance of addressing perceived gaps in training and safety to ensure nurses and other healthcare professionals feel confident in using DHT. The enhanced training programs and implementing ongoing education discussed previously may help bridge these gaps and promote the safe and effective adoption of DHT in GP. However, Practice managers must ensure that protected training time is available for all staff to keep up with the DHT developments and training courses.

There could also be a specific role implemented into general practice for digital training of staff which could ensure confidence in using digital tools for triage,

remote monitoring and using other telehealth services. This could also increase access to on-site IT support within GP to assist with troubleshooting and other issues that occur from the technologies in real-time.

By implementing these targeted recommendations the NHS, UK Government, higher education institutions and GP Practice bosses can work collaboratively to enhance the effective delivery of DHT.

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12 Appendices

12.1 Appendix 1: Rapid Scoping Review Protocol

The use of digital technologies used by nurses in primary care: a rapid scoping review protocol

Authors

Hart-Winks E, Cooper K, Alexander L

Abstract

Objective: The aim of the review is to provide a map of digital technologies being used by nurses across primary care.

Introduction: The World Health Organization (WHO) defines digital health as "the use of information and communication technologies for health". The rapid move to digital technology in healthcare, accelerated by the COVID 19 pandemic, has demonstrated

the benefits and challenges of using technology across clinical settings worldwide. This rapid scoping review will focus on what evidence is available on Digital Health Technologies used by nurses to deliver care/manage patient care in the primary care settings

Inclusion criteria: This rapid scoping review will consider studies that include nursing roles working in primary care, such as Advanced Nurse Practioners, practice nurses, community nurses, district nurses and any specialist nurse based in primary care. The concepts examined by this review are the use of digital technology to support/deliver or manage patient care (such as but not limited to eHealth, Telehealth, eConsults, digital health devices). Any studies that have been conducted in Primary care (General practice) settings in any country will be considered.

Methods: The rapid scoping review will be conducted using the JBI methodology for scoping reviews and the Cochrane Rapid Reviews Methods Group guidance will be used to streamline the review. The databases to be searched include MEDLINE, CINHAL and INTERNURSE. Studies published in English from 2013 to the present day will be included. Data relevant to the review questions will be extracted and will include digital technologies used by nurses in primary care, health conditions that nurses have used digital technology to manage, and barriers, facilitators, acceptability and feasibility in relation to the use of digital technology by nurses. The review findings will be presented in tables and graphs in line with the review question.

Introduction

The World Health Organization (WHO) defines digital health as “the use of information and communication technologies for health” (WHO 2020) which offers innovative solutions for managing our own health, away from hospitals and clinics, which offer patients empowerment and independence to improve their health and wellbeing. Digital health technologies is an umbrella term for a wide range of digital devices and ways of delivering healthcare (Digital Health Innovation for Scotland (DHI), 2022). As well as the previous definitions, the National Institute for Health and Care Excellence (NICE) (NICE 2022) define digital health technologies as digital products that are used to benefit people's health and the social care system. These digital products are listed as: “smartphone apps, standalone software, online tools for treating or diagnosing conditions, preventing ill health or for improving system efficiencies and programmes that can be used to analyse data from medical devices such as scanners, sensors or monitors”. Remote monitoring of patient's conditions is an ever-growing trend that goes outside of the norms of traditional health monitoring and into everyday life.

In 2018 The Scottish Government introduced the first Scottish Digital Health and Care Strategy. The strategy aimed to improve the health and wellbeing of the Scottish people through the use of digital technology. However what no one expected was, with the COVID-19 pandemic, digital technology implementation and use within healthcare was rapidly accelerated and is now at the forefront of Scotland’s response to the aftermath of the pandemic. The strategy states that digital health is critical in addressing the

backlog and increased capacity throughout the NHS that has only increased due to COVID-19. This backlog is evident in primary care and within the General Prcatice (GP) setting. Innovative ways of increasing capacity are urgently needed.

EConsult system, telehealth, telemedicine and other remote ways of delivering care have been introduced across the UK to identify the benefits and effectiveness of using digital technology to provide healthcare (Liddy et al. 2015). Although there is limited evidence, current studies focus, mainly, on doctors and patients'experiences when it comes to using digital technologies to deliver healthcare support (Banks et al. 2018). However, nurses are often patients' main point of contact and support in the management of both acute and long-term conditions through nurse-led clinics within primary care (Booth et al. 2021). Therefore, there is a need to explore nurses experience in this area in order to explore their readiness to engage with digital delivery of care and determine any knowledge and skills gaps that need to be addressed.

Nursing is rapidly becoming a digitally driven profession and the COVID-19 pandemic has accelerated the need for digital technologies to be used across the board within healthcare to deliver care, communicate with patients and colleagues and access information, services and training facilities (Booth et al. 2021). Delivering care or health information over the phone is not an overly new concept to nurses where digital health for them is more than just a phone call and nurses responding to these 'calls' are highly skilled healthcare professionals who are trained in triage and to assess patients virtually (Mataxen and Webb 2019). However, there is still a further need to transform nursing into a digitally enabled profession which is the key to improving patient care and increasing capacity (Booth et al. 2021). Current recommendations for nursing to remain relevant in the digital healthcare age are necessary and nurses should be upskilled in digital health and assist in the development of digital tools to improve care and service delivery as they are the ones delivering it (Booth et al. 2021).

In this scoping review, the current use of digital technology by nurses within primary care will be mapped and synthesised. Due to time constraints and limited funding for the review team, a rapid scoping review approach will be adopted using JBI scoping review methodology (Peters et al. 2020) and following the guidance by the Cochrane Rapid Reviews Methods Groups (REF). Rapid reviews are a type of knowledge synthesis where parts of the review process are streamlined in order to gather information efficiently (Tricco et al. 2015).

The objective of this scoping review is to assess the extent of the literature on nurses use of digital technology within primary care. A preliminary search of PROSPERO, OSF, the Cochrane Database of Systematic Reviews and *JBI Evidence Synthesis* was conducted and no current or underway systematic reviews or scoping reviews on the topic were identified.

Review question

What evidence exists on digital technologies used by nurses working in primary care settings to deliver healthcare services?

Sub Questions:

5. What digital technologies have been used by nurses working in primary care to deliver healthcare services?
6. What conditions are digital technologies used for treatment and management by nurses in primary care settings?
7. What has been reported in the literature on the barriers, facilitators, acceptability and feasibility of using digital technologies by nurses working in primary care?
8. What gaps exist in the evidence-base regarding the use of digital technologies by nurses working in primary care settings?

Eligibility criteria

Participants

This rapid scoping review will consider studies that include nurses working in primary care, such as Advanced Nurse Practitioners, practice nurses, community nurses, district nurses, family nurses and any specialist nurse based in primary care. Literature that includes nurses working in hospital based settings or care homes will be excluded from this scoping review. In addition, literature will be excluded if it relates to other health care professions. Studies with mixed populations will be included if 70%or greater are nurses or the findings are reported separately.

Concept

The concept examined by this review is the use of digital technology to support/deliver or manage patient care. Any kind of digital technology being used by nurses will be included (such as but not limited to eHealth, Telehealth, eConsults, telephone, digital health devices). Digital technology specifically utilised by medical or other healthcare professionals within the primary care setting will be excluded.

Context

This scoping review will consider studies that have been conducted in Primary care settings in any country.

Settings outwith acute or secondary care/hospital are of interest. Globally, this is defined as Primary care according to the World Health Organisation. For the purposes of this review, the term primary care will be adopted to represent settings across all nations and the different terms will be included within the search strategy.

Types of Sources

This rapid scoping review will consider all study designs. This includes both qualitative and quantitative studies and systematic reviews. Quantitative studies will include both experimental and quasi-experimental study designs such as randomised controlled trials, non-randomised controlled trials, before and after studies and interrupted time-series studies. In addition, analytical observational studies including prospective and

retrospective cohort studies, case-control studies and analytical cross-sectional studies will be considered for inclusion. This review will also consider descriptive observational study designs including case series, individual case reports and descriptive cross-sectional studies for inclusion. Qualitative studies will also be considered including, but not limited to, designs such as phenomenology, grounded theory, ethnography, qualitative description, action research and feminist research.

In addition, systematic reviews that meet the inclusion criteria will also be considered to identify reviews within this topic area and also to identify primary studies within the reviews for inclusion in this rapid scoping review.

Methods

The proposed rapid scoping review will be conducted in accordance with the JBI methodology for scoping reviews (Peters et al, 2020) and the Cochrane Rapid Reviews Methods Group guidance (GARRITTY et al, 2021) will be used to streamline the review. A rapid review is a method to provide summaries of literature by using techniques to streamline traditional systematic review approaches using methods to produce evidence in a resource-efficient manner (Moons, Goossens and Thompson, 2021). A rapid review does not mean the review will not be robust, the review will form a streamlined approach to focus the sensitivity and specificity of the search and synthesise the evidence in a timely matter.

Search strategy

The search strategy will aim to locate both published and unpublished studies. An initial limited search of 'nurse', 'digital health' and 'primary care' was undertaken to identify articles on the topic. The text words contained in the titles and abstracts of relevant articles, and the index terms used to describe the articles were used to develop a full search strategy (See appendix 1 for full search strategy for Medline). The search strategy, including all identified keywords and index terms, will be adapted for each included database and/or information source. The reference list of all included sources of evidence following full text screening will be screened for additional studies. The search strategy will be peer reviewed for spelling errors and correct use of Boolean operators prior to operationalising.

The size of the search strategy will be reduced by limiting the number of information sources and increasing the precision of the search. Input and guidance will be obtained from an information specialist on database selection and search strategy. The databases to be searched include MEDLINE (EBSCOhost), CINHAL (EBSCOhost) and AMED (EBCOhost). Sources of unpublished studies/ gray literature to be searched include Google (incognito mode search, limited to PDFs, searched until page 10 of search results), Networked Digital Library of Theses and Dissertations (NDLTD). Modified search terms will be used for searches for unpublished/gray literature and reported in the final review.

Only studies published in English will be included in order to manage time and studies published from 2013 to present day will be included for relevance.

Study/Source of Evidence selection

Following the search, all identified citations will be collated and uploaded into Zotero and duplicates removed. All citations will then be uploaded to Covidence, to facilitate screening and data extraction. Following a pilot test, titles and abstracts will then be screened. Using the guidance from the Cochrane Rapid Review Group Series, dual screening will be conducted for a proportion of the records (20%) then the rest will be screened by one reviewer for assessment against the inclusion criteria for the review. Potentially relevant sources will be retrieved in full and assessed in detail against the inclusion criteria and, using the same guidance, dual screening will be conducted independently by two reviewers for a proportion (20%) with the remainder screened by one reviewer. Decisions will be discussed between reviewers for both title and abstract and full text screening to establish consistency before independent reviewing starts. Reasons for exclusion of sources of evidence at full text will be recorded and reported in the final rapid scoping review. The results of the search and the study inclusion process will be reported in full in the final review and presented in a Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for scoping review (PRISMA-ScR) flow diagram.

Data Extraction

Data will be independently extracted from included papers by two or more reviewers using a data extraction tool developed by the review team. Following piloting of the extraction tool with 20% of the included studies between two reviewers, one reviewer will then go on to extract the data (Cohrane Rapid Review Methods Guidance). Extracted data will include specific descriptive details about the participants, concept, context, study methods and key findings relevant to the review question/s. Data extraction will be conducted in Covidence.

Data to be extracted will include author(s), year of publication, country, setting, aims/purpose, population/sample size and methodology/study design. Extracted data relevant to the review questions will include type of digital technology, conditions managed by digital technology, and barriers, facilitators, acceptability and feasibility in relation to the use of digital technology.

A draft extraction form is provided (see Appendix II*).* The draft data extraction tool will be modified and revised as necessary during the process of extraction from each included evidence source. Any modifications will be detailed in the final review. If appropriate, authors of papers will be contacted to request missing or additional data, where required.

As per scoping review guidance (Peters et al. 2020), no quality appraisal will be conducted for the included studies.

Data Analysis and Presentation

The extracted data will be presented visually as a series of figures, graphs and tables in line with the review questions. Descriptive analysis to identify trends and patterns in the extracted data will be reported and accompanied by narrative synthesis. The review findings will indicate gaps in the evidence and will be used to identify areas for subsequent research recommendations on digital health and its use in primary care.

Funding

This project is funded by the Digital Health Innovation for Scotland (DHI). The views expressed are those of the authors and not those of the DHI.

Conflifct of Interest

None

12.2 Appendix 2: MEDLINE, CHINAL, AMED Search Strategy's and Grey Literature Search

MEDLINE

Search Conducted on August 21, 2023

CINHAL

Search conducted August 22, 2023

Search	Query	Records retrieved
# 1	AB ‘nurs*’ OR (MH ‘Primary Care Nurse Practitioner’) OR	411, 762
Search	Query / AB ‘primary care nurse practitioner’ OR AB ‘advanced nurse practitioner’ OR (MH ‘Family Nurse Practitioners)	Records retrieved
# 1	[illegible]	528, 022
# 2	[illegible] ‘Community Health	257, 402
# 2	[illegible] Health Services’) OR AB ‘community health	244, 061
# 3	[illegible] consultations’ OR AB ‘eHealth’ Or AB ‘mHealth’	90, 537
# 3 / # 4	#1 AND #2 AND #3 / (MH ‘Digital Technology’) OR AB ‘digital technology’ OR MH ‘Telemedicine’) OR AB ‘telemedicine’ OR (MH ‘Telehealth’) OR AB ‘telehealth’ OR (MH ‘Remote	890 / 90,638
Date: Limited to 2013 to present	Consultation’) OR TX ‘remote consultation’ OR (MH ‘Remote Area Nurses’) OR TX ‘remote area nursing OR AB ‘eHealth’ OR AB ‘mHealth’	
# 4	#1 AND #2 AND #3	847
Date: Limited to 2013 to present		

AMED

Search Conducted August 22, 2023

Search	Query	Records retrieved
# 1	TX 'nurs*' OR TX 'nurse practitioner' OR TX 'advanced nurse practitioner' OR TX 'primary care nurse practitioner' OR TX 'family nurse' OR TX 'family nurse practitioner' TX 'district nurs*' OR TX 'community nurs*'OR 'TX 'community health nurse' OR TX 'health visitor' OR TX 'public health nurs*'	20,226
# 2	TX 'primary health care' OR TX 'primary healthcare' OR TX 'primary care' OR TX 'access to primary healthcare' OR TX 'community health services' OR TX 'community health services accessibility' OR TX 'access to primary care'TX 'digital healthcare'	6,147
# 3	TX 'digital technology' OR TX 'telemedicine' OR TX 'telehealth' OR TX 'remote consultation' OR TX 'remote area nursing' OR TX 'eHealth' OR TX 'mHealth'	1,491
# 4	#1 AND #2 AND #3	29
Date: Limited to 2013 to present		

Grey Literature

Google

Search Terms

- Digital healthcare, nursing and primary care

NDLTD

- Nurse AND digital healthcare AND primary care (7) (English only)
- Nurs* AND digital health AND primary healthcare

12.3 Appendix 3: Data Extraction Instrument

Data extraction Instrument

Study iD/ Title	**Author(s), Year, Country**	**Aim/ Purpose**	**Methodology/ Study Design**	**Setting** (*Should be primary care but what setting. Ie. General practice, community clinic)*	**Population/ Sample Size** (Patients) (*Nurses) (Report Separately*)	**Nurse Profession** (*GP Nurse, Advanced Nurse Practitioner, District Nurse etc*)	**Digital technologies used by nurses in primary care** (e*Consults, phone consultations, devices used to manage care ie. Glucose monitors/apps*)	**Conditions** (*what health conditions nurses have used digital technology to manage ie. Diabetes, cardiovascular disease, weight management*)	**Barriers to using digital technology** (*If not focus of paper =NA If a focus but not reported =NR)*	**Facilitators to using digital technology** (*If not focus of paper =NA If a focus but not reported =NR)*	**Key Findings**

12.4 Appendix 4: Excluded References from Rapid Scoping Review

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12.5 Appendix 5: IRAS Approval

NHS
Health Research Authority

Yorkshire & The Humber - Bradford Leeds Research Ethics Committee
NHSBT Newcastle Blood Donor Centre
Holland Drive
Newcastle upon Tyne
NE2 4NQ

Telephone: 02071048083

03 July 2023

Dr Lyndsay Alexander
School of Health Sciences, Ishbel Gordon Building
Robert Gordon University, Garthdee Road
Aberdeen
AB10 7QG

Dear Dr Alexander

Study title:	**Exploring nurses' and patients' experiences of using digital technology to deliver and receive care within General Practice settings**
REC reference:	**23/YH/0130**
Protocol number:	**323622**
IRAS project ID:	**323622**

Thank you for your recent correspondence, responding to the Proportionate Review Sub-Committee's request for changes to the documentation for the above study.

The revised documentation has been reviewed and approved on behalf of the PR sub-committee.

Confirmation of ethical opinion

On behalf of the Research Ethics Committee (REC), I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised.

Good practice principles and responsibilities

The UK Policy Framework for Health and Social Care Research sets out principles of good practice in the management and conduct of health and social care research. It also outlines the responsibilities of individuals and organisations, including those related to the four elements of research transparency:

1. registering research studies

12.6 APPENDIX 6: R&D APPROVAL

Dear Dr Alexander

Management Permission for Non-Commercial Research

STUDY TITLE: Exploring nurses' and patients' experiences of using digital technology to deliver and receive care within General Practice settings
PROTOCOL NO: V2, 9.6.23
REC REF: 23/PR/0593
IRAS REF: 323622

Thank you very much for sending all relevant documentation. I am pleased to confirm that the project is now registered with the NHS Grampian Research & Development Office. The project now has R & D Management Permission to proceed locally. This is based on the documents received from yourself and the relevant Approvals being in place.

All research with an NHS element is subject to the UK Policy Framework for Health and Social Care Research (2017 v3), and as Chief or Principal Investigator you should be fully committed to your responsibilities associated with this.

R&D Permission is granted on condition that:

1) **The R&D Office will be notified and any relevant documents forwarded to us if any of the following occur:**
   - **Any Serious Breaches in Grampian (Please forward to pharmaco@abdn.ac.uk).**
   - **A change of Principal Investigator in Grampian or Chief Investigator.**
   - **Any change to funding or any additional funding**

2) **When the study ends, the R&D Office will be notified of the study end-date.**

3) **The Sponsor will notify all amendments to the relevant National Co-ordinating centre. For single centre studies, amendments should be notified to the R&D office directly.**

We hope the project goes well, and if you need any help or advice relating to your R&D Management Permission, please do not hesitate to contact the office.

Yours sincerely

Susan Ridge
Non-Commercial Manager

cc: Jill Johnston

Research Monitor

Professor Kay Cooper

Erin Hart-Winks

Sponsor: Robert Gordon University

12.7 Appendix 7: PARTICIPANT IFORMATION SHEET

FOR PATIENTS

Study Title: *Exploring nurses' and patients' experiences of using digital technology to deliver and receive care within General Practice.*

Introduction:

You are being invited to take part in a research study that is being conducted by the School of Health Sciences at Robert Gordon University. This study is being funded by the Digital Health Innovation for Scotland. Before you decide, it is important for you to understand why the research is being done and what it will in involve. Please read the following information carefully and discuss It with others if you wish. If there is anything that is not clear, or you would like any more information please ask us. Take time to decide whether or not you wish to take part and thank you for taking time to read this information sheet.

What is the purpose of this study?

This study will explore nurses and patients experiences of using digital technology to give or receive care within general practice.

The use of digital technology (eHealth, Telehealth, eConsults, digital health devices and many more) within healthcare has been accelerated in the last few years due to the Covid 19 pandemic and the need to safely deliver care via digital technology. This study is interested in the use of digital technology used in GP surgeries by nurses to deliver care. As part of this study, we would also like to find out how people with different long term health conditions feel about this way of receiving care from nurses. This knowledge will then be used to inform digital services delivered by nurses in GP practices.

Why have I been chosen?

We would like to speak to people who have experience of managing their long-term health condition by nurses at their GP surgery using digital technology.

Digital technology can be anything from:

- Phone consultations
- Video consultations
- eConsults
- Using digital devices to manage care (eg. Blood pressure devices, heart rate monitors, ECG devices, connected inhalers, smart thermometers, continuous glucose monitors, smart phone apps, etc)

You have been invited to take part because:

- You are aged 18 or over
- You have received digitally delivered care by a nurse working in general practice.

- You manage your long-term condition using a form of digital technology under the care of a nurse working in general practice.

Do I have to take part?

No. It is up to you to decide whether or not to take part. If you do decide to take part, you are advised to keep this information sheet. If you decide to take part, you are free to withdraw at any time and without giving a reason.

What does taking part in the study involve?

If you decide to take part, we will ask you take part in a one-off interview with a researcher over the telephone or a video-call (on Microsoft Teams). The interview will take no longer than one hour, and we would like to talk to you about your views and experiences of receiving or managing digitally delivered healthcare from nurses at your GP surgery.

What are the possible disadvantages of taking part?

We do not anticipate any disadvantages to you, beyond giving up your time to take part in the interview. There will be no impact on the care you receive from taking part or not in this study.

We do not anticipate any of the interview questions to be intrusive or upsetting. However, it is possible that some people may find talking about aspects of their health upsetting. You are welcome to stop the interview at any time and we can decide how to proceed from there. Sources of support are listed at the end of this information sheet if you need to seek further assistance.

What are the possible benefits of taking part?

There are no direct benefits to you for taking part in this study. However, you will be contributing to increasing our knowledge of digital healthcare being delivered in GP surgeries by nurses which will be used to inform future development of services in GP surgeries.

What if something goes wrong?

If you have a concern about any aspect of this study, you should speak to the researchers who will do their best to answer your question. If you have any complaints about the conduct of this study, you should contact the Convenor, School of Health Sciences Research Ethics Committee, Robert Gordon University (SREC@rgu.ac.uk) or Mrs Laura Binnie, Head of School, School of Health Sciences (l.m.binnie@rgu.ac.uk).

Will my taking part I the study be kept confidential?

Yes. The interviews will be recorded (using a secure encrypted audio recorder) and a transcript of the conversation will be produced by a professional transcription service approved by the University. This will all be confidential, and we will not use your name in the transcript. All study materials will identify you using only a unique ID number. Your contact details will only be used by research staff and will not be shared with anyone else. We will make sure no-one can work out who are from the reports we write. We will use anonymised quotes from interviews to illustrate research findings in papers and

reports, but it will not be possible to identify you from any anonymised quotes. All information in this study will be collected and stored within the requirements of the General Data Protection Regulations (GDPR, 2018). You can find out more about how we use your information by contacting: Data Protection Officer, Robert Gordon University, Garthdee, Aberdeen, AB10 7QB. Email: dp@rgu.ac.uk Telephone: 01224 262076

What will happen to the results of the research study?

We will combine the results from the interviews with the results from focus groups, questionnaires and interviews with nurses and share the results widely. We will publish the results in academic journals and present them at conferences. You will be able to obtain a summary of the results by contacting the study team, but it may be some time before these are available. At the end of the study we will save some of the data in case we need to check it or for future research.

Who has reviewed the study?

All research in the NHS is looked at and approved by an independent group of people, called a Research Ethics Committee, to protect your interests (IRAS ID: 323622). The School of Health Sciences Research Ethics Committee (RGU) have also peer reviewed this study (SHS/22/33).

What do I do now?

If you would like to take part, please contact the research team using the contact details below. If you would like any further information, please contact any members of the team using the contact details below.

Thank you for considering taking part in this research study. Please feel free to discuss this information with anyone you wish prior to deciding.

CONTACTS FOR FURTHER INFORMATION**:**

ERIN HART-WINKS (MRES STUDENT)
SCHOOL OF HEALTH SCIENCES, ROBERT GORDON UNIVERSITY
E.HART-WINKS1@RGU.AC.UK

DR LYNDSAY ALEXANDER (PRINCIPAL SUPERVISOR)
SCHOOL OF HEALTH SCIENCES, ROBERT GORDON UNIVERSITY
L.A.ALEXANDER@RGU.AC.UK

Sources of Support

Samartitans:

- **https://www.samaritans.org**
- **Tel: 116123**

Breathing Space

- **https://breathingspace.scot**
- **0800838587**

12.8 Appendix 8: PARTICIPANT INFORMATION SHEET FOR NURSES

Study Title: *Exploring nurses' and patients' experiences of using digital technology to deliver and receive care within General Practice settings.*

SREC: SHS/22/33

IRAS: 323622

Introduction:

You are being invited to take part in a research study being conducted by the School of Health Sciences, Robert Gordon University. Before you decide, it is important for you to understand why the research is being done and what it will in involve. Please read the following information carefully and discuss It with others if you wish. If there is anything that is not clear, or you would like any more information please ask us. Take time to decide whether or not you wish to take part and thank you for reading this information sheet.

What is the purpose of this study?

This study will explore nurses' experiences of using digital technology to deliver care for people with long term conditions within general practice. This study is funded by the Digital Health Innovation for Scotland.

The use of digital technology within healthcare has been accelerated in the last few years due to the COVID-19 pandemic and there is a need to explore and learn from healthcare professionals' experiences in using this technology in practice. This is particularly relevant within primary care and GP practices to learn how we communicate with our patients about their healthcare needs and support them to manage their care digitally.

We want to explore experiences of nurses based in general practice settings delivering care using digital technology and how you feel about it. We also want to explore how you manage patients with long-term conditions using digital technology (such as E consults, electronic notes, telephone consultations, Near Me, blood glucose monitoring devices, health Apps). This knowledge will then be used to help inform long term condition service delivery within general practice settings.

Why have I been chosen?

We are looking to recruit nurses who are working in General Practice and use digital technology to deliver care.

We would like to invite you to take part if:

- You are a Practice Nurse, Advanced Nurse Practitioner or a Specialist nurse working in a General Practice.

- You deliver care to patients using digital technology (ie. using E consults, electronic notes, telephone consultations, Near Me) and use digital technology to support you in your workplace.
- You support patients to manage their long-term condition using a form of digital technology (such as Diabetes devices, smartphone app trackers, heart rate monitors etc).

Do I have to take part?

No. It is up to you to decide whether or not to take part. If you do decide to take part, you are advised to keep this information sheet. If you decide to take part, you are free to withdraw at any time and without giving a reason.

What does taking part in the study involve?

If you decide to take part, we will ask you to complete a short online survey that will take around 5-10 minutes. The survey will ask you some questions related to you (age, gender, job title, agenda for change band, how long have you been qualified and how long have you worked in general practice) and questions about your experiences and perceptions of using digital technology to deliver care for people with long term conditions. The survey will then end by inviting you to take part in a one-off interview to explore this topic in more depth.

The interviews will be conducted either one to one or as a group (with other nurses working in your general practice) and the choice of either option will be up to you. The interviews will be conducted face to face or online, (by telephone or using Microsoft Teams). The interview should last no longer than one hour.

What are the possible disadvantages of taking part?

We do not anticipate any disadvantages to you, beyond giving up your time to complete the survey and take part in the interview.

What are the possible benefits of taking part?

There are no direct benefits to you for taking part in this study. You will be contributing to increasing our knowledge of the use of digital healthcare in general practice for people with long term conditions, which will be used to inform future development of services for people receiving care via digital technology.

What if something goes wrong?

If you have a concern about any aspect of this study, you should speak to the researchers who will do their best to answer your question. If you have any complaints about the conduct of this study, you should contact the Convenor, School of Health Sciences Research Ethics Committee, Robert Gordon University (SREC@rgu.ac.uk) or Mrs Laura Binnie, Head of School, School of Health Sciences (l.m.binnie@rgu.ac.uk).

Will my taking part in the study be kept confidential?

Yes. The interviews will be recorded (using a secure encrypted audio recorder) and a transcript will be produced by a professional transcription service approved by the University. This will all be confidential, and we will not use your name in the transcript.

All study materials will identify you using only a unique ID number. Any contact details will only be used by research staff and will not be shared with anyone else. Contact details will be securely stored and only accessible to the research team. We will make sure no-one can work out who you are from the reports we write. We will use anonymised quotes from interviews to illustrate research findings in papers and reports, but it will not be possible to identify you from any anonymised quotes. All information will be collected and stored within the requirements of the General Data Protection Regulations (GDPR, 2018). You can find out more about how we use your information by contacting: Data Protection Officer, Robert Gordon University, Garthdee, Aberdeen, AB10 7QB. Email: dp@rgu.ac.uk Telephone: 01224 262076

What will happen to the results of the research study?

We will combine the results from the survey, interviews and focus groups with the results from interviews with patients and share the results widely. We will publish the results in academic journals and present them at conferences. The results will also be written up and submitted as a thesis towards the Master of Research (MRes) award. You will be able to obtain a summary of the study results by contacting the study team, but it may be some time before these are available. At the end of the study we will save some of the data in case we need to check it or for future research.

Who has reviewed the study?

All research in the NHS is looked at and approved by an independent group of people, called a Research Ethics Committee, to protect your interests. The School of Health Sciences Research Ethics Committee (SHS/22/23) and the Bradford Leeds Research Ethics Committee (IRAS 323622) have reviewed and approved this study.

What do I do now?

If you would like to take part please contact the research team using the contact details below. If you would like any further information, please contact any members of the team using the contact details below.

Thank you for considering taking part in this research study. Please discuss this information with anyone you wish prior to making a decision.

CONTACTS FOR FURTHER INFORMATION**:**

ERIN HART-WINKS (MRES STUDENT)
SCHOOL OF HEALTH SCIENCES, ROBERT GORDON UNIVERSITY
E.HART-WINKS1@RGU.AC.UK

DR LYNDSAY ALEXANDER (PRINCIPAL SUPERVISOR)
SCHOOL OF HEALTH SCIENCES, ROBERT GORDON UNIVERSITY
L.A.ALEXANDER@RGU.AC.UK TEL: 01224 263264

12.9 Appendix 9: Qualitative Distress Policy

Distress Protocol 1 (participant): The protocol for managing distress in the context of a research focus group /interview (Modified from: Draucker C B, Martsolf D S and Poole C (2009) Developing Distress Protocols for research on Sensitive Topics. Archives of Psychiatric Nursing 23 (5) pp 343-350 and Mental Health First Aid)

Distress	A participant indicates they are experiencing a high level of stress or emotional distress OR exhibit behaviours suggestive that the discussion/interview is too stressful such as uncontrolled crying, shaking etc
Stage 1 response	Stop the discussion/interview. One of the researchers (who is a health professional) will offer immediate support Assess mental status: Tell me what thoughts you are having? Tell me what you are feeling right now? Do you feel you are able to go on about your day? Do you feel safe?
Review	If participant feels able to carry on; resume interview/discussion. Signpost participant after interview/discussion to support e.g. Breathing Space, Samaritans, NHS24 OR If participant is unable to carry on Go to stage 2
Stage 2 response	Remove participant from discussion and accompany to quiet area (if face to face) or discontinue interview (stop recording) Encourage the participant to contact their GP or mental health provider OR Offer, with participant consent, for a member of the research team to do so OR If in immediate risk (suicide) call police or GP
Follow-up	Follow participant up with courtesy call (if participant consents) & re-iterate signposting OR Encourage the participant to call either if he/she experiences increased distress in the hours/days following the focus group

Distress Protocol 2 (the researcher): The protocol for managing distress in the context of a research focus group /interview management (Adapted from McCosker et al (2001). Undertaking Sensitive Research: Issues and Strategies for Meeting the Safety Needs of All. Forum: Qualitative Social Research, 2(1) and Mental Health First Aid)

Before data collection	The researcher should consider the potential physical and psychological impact on the researcher of the participants description of life experiences The researcher should consider how many interviews could be undertaken in a week The researcher should be aware of the potential for emotional exhaustion
During data collection	If the topic is potentially sensitive/distressing data collection to be undertaken by two members of the research team Regular scheduled debriefing sessions with a named member of the research team May be encouraged to journal their thoughts and feelings which may then become part of fieldwork notes in some research approaches
Analysis	Is alerted prior to transcription review of potentially "challenging" or "difficult" interviews has regular scheduled debriefing sessions with a named member of the research team
Follow up	Encourage the researcher to access a research mentor and/or principal investigator if he/she experiences increased distress in the hours/days following transcription

12.10 Appendix 10: Consent Form for Nurses

Project Title:

Exploring nurses' and patients' experiences of using digital technology to deliver and receive care within General Practice to inform service development.

SREC Ref: SHS/22/33

IRAS Ref: 323622

Researcher: Erin Hart-Winks, Dr Lyndsay Alexander, Prof Kay Cooper

Consent Form For Nurse Interview/focus groups

*For **focus groups** each participants will fill out the below consent form prior to the interview commencing.*

*For **interviews** consent will be either audio recorded immediately prior to the interview commencing or (if in person) participants will fill out the consent form below prior to interview commencing.*

Instructions: - **If consent is to be audio recorded, participants will be asked to state their name and date of birth. The researcher must read each statement and the participant must reply "Yes" to each question to take part in the study OR please initial the box for returned forms.**	
1. I confirm that I have read and understood the information sheet dated 08/03/2023 (version 1) for the above study. I have had the opportunity to consider the information, ask questions and have these answered satisfactorily.	☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason.	☐
3. I understand that data collected during the study, may be looked at by individuals from Robert Gordon University, from regulatory authorities or from NHS Grampian, for purposes of monitoring the research. I give permission for these individuals to have access to the data.	☐
4. I agree to taking part in an interview/ focus group for the above study.	☐
5. I agree to my interview/ focus group being audio recorded.	☐
6. I agree to anonymised quotes from the interview being used in research outputs from this study (e.g. academic articles, professional papers, conference presentations).	☐
7. I understand that information collected about me will be used to support other research in the future and may be shared anonymously with other researchers.	☐
8. I agree to take part in the above study.	☐

12.11 Appendix 11: Consent form for Patients

Project Title:

Exploring nurses' and patients' experiences of using digital technology to deliver and receive care within General Practice to inform service development.

SREC: SHS/22/33

IRAS ID: 323622

Researcher: Erin Hart-Winks, Dr Lyndsay Alexander, Prof Kay Cooper

Consent Form For Patient Interviews

Interview consent will be audio recorded immediately prior to the interview commencing. Researcher asks that Participant states their name and date of birth first

Instructions: The researcher must read each statement and the participant must reply "Yes" to each question to take part in the study
1. I confirm that I have read and understood the information sheet dated 08/03/2023 (version 1) for the above study. I have had the opportunity to consider the information, ask questions and have these answered satisfactorily.
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason.
3. I understand that data collected during the study, may be looked at by individuals from Robert Gordon University, from regulatory authorities or from NHS Grampian, for purposes of monitoring the research. I give permission for these individuals to have access to the data.
4. I agree to taking part in an interview for the above study.
5. I agree to my interview being audio recorded.
6. I agree to anonymised quotes from the interview being used in research outputs from this study (e.g. academic articles, professional papers, conference presentations).
7. I understand that information collected about me will be used to support other research in the future, and may be shared anonymously with other researchers.
8. I agree to take part in the above study.

12.12 Appendix 12: Letter of Invitation for Patients

Date <as postmarked>

School of Health Sciences

Robert Gordon University

Aberdeen

AB10 7QG

Dear Sir/ Madam,

"Exploring nurses' and patients' experiences of using digital technology to deliver and receive care within General Practice"

We would like to invite you to take part in an interview for the above research study. We are interested in finding out about the experiences of people with long term conditions in receiving care using digital technology from nurses based in General Practices. The study is being conducted by a Masters in Research student in the School of Health Sciences, Robert Gordon University and is supervised by Dr Lyndsay Alexander and Professor Kay Cooper. This study has been funded by the Digital Health Innovation for Scotland.

You have been invited to take part as you have received care delivered digitally from a nurse working in General Practice or you use a digital device to manage your long-term condition.

If you are interested in taking part in this study, please read the enclosed information sheet. After reading this, if you are interested in taking part in a short interview, please contact me by email (e.hart-winks1@rgu.ac.uk) and leave your name and contact number.

If you have any questions please also contact me directly via email.

Thank you for considering taking part in this study.

Yours sincerely

Erin Hart-Winks

MRes Student

12.13 Appendix 13: Survey Example

Nurses Questionnaire/Survey

Title: Exploring nurses' and patients' experiences of using digital technology to deliver and receive care within General Practice to inform service development.

This is a Master of Research study being conducted by a post-graduate student from the School of Health Sciences at Robert Gordon University and is funded by the Digital Health Innovation for Scotland.

We are keen to explore the experiences and perceptions of using digital technology by nurses working in general practice. We are interested to learn about how digital technology has been used to provide care for people with long term conditions and other health needs and how nurses have adapted to managing patients' health via digital technology.

As well as this questionnaire we are asking nurses based in general practice to take part in a one-off interview to discuss the topic. If you would like to take part in the interview as well/ only take part in the interview please leave your details here <hyperlink> and we will be in touch to book an interview.

<HYPERLINK TAKES TO WHERE TO FILL IN INFORMATION>

Name:

Email:

GP Practice:

Contact Number:

Consent form for survey study – Nurses

To take part in this survey, please complete the consent questions below.

Please initial box

1. I confirm that I have read and understood the information sheet dated 25/11/2022 (version 1) for the above study. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason. ☐
3. I understand that data collected during the study will be looked at by individuals from Robert Gordon University where it is relevant to my taking part in this research. I give permission for these individuals to have access to the data. ☐
4. I agree to take part in the above study ☐

NEXT button

If consent options not ticked, the "next" button will take them to a thank you "exit" page. They will no longer be able to take part in the survey.

Section 1: General Information about you

1. Please state your current age:

- ☐ 18- 24
- ☐ 25- 34
- ☐ 35- 44
- ☐ 45- 54
- ☐ >64

2. Please state your gender:

- ☐ Male
- ☐ Female
- ☐ Gender diverse
- ☐ Prefer not to state

3. Please select your main role from the disciplines below:

- ☐ Practice Nurse
- ☐

Advanced Nurse Practitioner

☐ Other Nursing Title, please specify:

Click or tap here to enter text

4. How many years have you been as a qualified nurse? Please specify:
   Click or tap here to enter text

5. How many hours do you work as a Nurse?

   ☐ Full – time (as least 32 hours per week)

   ☐ Part – time, please specify how many hours: Click or tap here to enter text

6. Are you a Nurse prescriber?

   ☐ Yes

   ☐ No

7. What conditions would you normally treat or help manage? (Please check all that apply)

   ☐ Diabetes

   ☐ Cancers

   ☐ Cardiovascular conditions

   ☐ Neurological conditions

☐ Respiratory conditions

☐ Health promotion

☐ Wound care

☐ Mental health

☐ Obesity

☐ Routine checks/appointments, please specify: Click or tap here to enter text

☐ Emergency appointments, please specify: Click or tap here to enter text

☐ Other, please specify: Click or tap here to enter text

Section 2: Use of digital technology in your practice

State what digital technology is – we would like to know what digital technology you use in clincial practice within general practice surgeries.

1. What digital technology do you use to provide/monitor care in your practice? Please choose all that apply

☐ Telephone consultation

tew

☐ Video consultations (Near me etc)

☐ E Consults - explain

☐ Digital notes/ note taking

☐ Digital devices to monitor long term conditions (ie. Heart rate monitors, diabetes monitors etc)

☐ Other, please specify: Click or tap here to enter text.

2. Since COVID – 19, which of these services did you previously provide face to face, but now provide remotely using digital technology? you normally provide face – to – face and continue to do so remotely? (please check one box per row)

	Yes, we still provide it face-to face and remotely	Yes, we provide it only by face – to face	Yes, we provide it only remotely	No, we do not usually provide it
Clinical assessment/ Routine Appointments	☐	☐	☐	☐
Diagnosis	☐	☐	☐	☐
Referral to other services	☐	☐	☐	☐
Emergency Appointments	☐	☐	☐	☐
Teaching/ training other clinicians, students. patients and carers	☐	☐	☐	☐
Health promotion and wellbeing	☐	☐	☐	☐
Prescribing medications	☐	☐	☐	☐

3. Have you made any changes to how you monitor patients with long term conditions due to COVID – 19?

☐ Yes, please specify: Click or tap here to enter text.

☐ No

☐ Not applicable as I do not monitor patients with long term conditions

Can you explain your answer and what changes you have made – please specifify

4. Have you made any changes to routine appointments and health checks for patients due to COVID-19 in relation to using digital technology

   ☐ Yes – please explain

   ☐ No

   ☐ Not applicable, I do not see patients for routine appointments or health checks

5. If patients are being treated remotely using digital technology, have you had to make any changes to how you work to enable you to address patients symptoms, diagnosis, reporting or concerns?

   ☐ Yes, please specify: Click or tap here to enter text.

   ☐ Not applicable

	Strongly Agree	Agree	Disagree	Strongly Disagree	Unsure/ N/A
Are patients needs being met by treating them remotely using digital technology?	☐	☐	☐	☐	☐
Do patients express any concerns or reservations of their care being delivered via digital technology?	☐	☐	☐	☐	☐
Do patients need support with how to use digital technologies to interact with nurses?	☐	☐	☐	☐	☐
Do you think some patients are being excluded with the rise of digital technologies being used in general practice?	☐	☐	☐	☐	☐
Do you think you have had enough training in regards to delivering digitally delivered healthcare?	☐	☐	☐	☐	☐
Do you think your time is managed better since the implementation of digital technologies in your practice?	☐	☐	☐	☐	☐
Do you think patients feel disappointed when they can't have a face-to-face appointment?	☐	☐	☐	☐	☐
Do you think patients find virtual/remote consultations more convenient than going to the practice?	☐	☐	☐	☐	☐
Do you think your delivery of digital healthcare has been just as effective as face – to – face appointments?	☐	☐	☐	☐	☐

6. Do you have to convert to face – to – face consultations for the majority of virtual appointments?

   ☐ Yes

   ☐ No

7. Please state reasons for having to convert to face – to – face consultation

Click or tap here to enter text.

Section 3: Barriers and facilitators to digitally delivered

1. What are the barriers to delivering care digitally to patients? (please check all that apply?

- ☐ Lack of support
- ☐ Lack of training on how to use technology
- ☐ Lack of training in how to treat and deliver care to patients remotely
- ☐ Staff shortages
- ☐ Perceived increase in workload
- ☐ Negative attitudes towards digital technologies and remote healthcare delivery
- ☐ Lack of perceived clinical usefulness/ effectiveness
- ☐ Patient safety concerns
- ☐ Lack of equipment/ technology for secure and private delivery
- ☐ Patients do not have the technology to receive care remotely
- ☐ Lack of safeguarding in place
- ☐ Lack of privacy
- ☐ Other, please specify: Click or tap here to enter text

2. What forms of communication/ support are used with patients when delivering care digitally that have been implemented since the COVID-19 pandemic?

	Yes, we offer both	Yes, we offer it only face – to face	Yes, we offer it only remotely
Telephone consultations	☐	☐	☐
E Consults	☐	☐	☐
Video consultations (Near me)	☐	☐	☐
Sending photos/videos for review	☐	☐	☐
Online resources for patients to view/download	☐	☐	☐
Emailing resources for support	☐	☐	☐
Digital devices (to track health trends/ monitoring)	☐	☐	☐
Smartphone apps (e.g activity log, health tracker, health monitoring apps)	☐	☐	☐
Other	☐	☐	☐

If checked 'Other', please specify: Click or tap here to enter text.

3. Do you experience any barriers to using these forms of digitally delivered healthcare?

☐ Yes

☐ No

4. If yes, please specify barriers:

Click or tap here to enter text.

5. What do you think you would need to be able to provide digitally delivered care effectively to patients?

Click or tap here to enter text.

6. What are the benefits of digital healthcare and delivering care remotely?

- ☐ Flexibility
- ☐ Easily accessible
- ☐ Cost-effective
- ☐ Convenience
- ☐ Personalisation (able to tailor to patients needs)
- ☐ Patient engagement
- ☐ Time efficient
- ☐ No benefits

7. Do you feel satisfied with the current way of delivering/ monitoring care to patients using digital technologies and remote delivery?

- ☐ Yes, please specify:

  Click or tap here to enter text

- ☐ No, please specify:

  Click or tap to enter text

END OF QUESTIONNAIRE

Thank you for your time and for completing this questionnaire. The results from this may help us understand the experiences of nurses delivering digitally delivered care within general practice to improve service delivery.

As said at the beginning, we are keen to explore someone of your responses in further detail. If you are happy to be interviewed to discuss this further, please provide your contact details here <hyperlink> and we will be in touch to arrange an interview.

Thanks again!

<HYPERLINK TAKES TO WHERE TO FILL IN INFORMATION>

Name:

Email:

GP Practice:

Contact Number:

12.14 Appendix 14: Nurses Interview Topic Guide

Nurses Interview Topic Guide

IRAS Ref: 323622

SREC Ref: SHS/22/33

Project Title:

Exploring nurses' and patients' experiences of using digital technology to deliver and receive care within General Practice settings

Aim: To explore nurses' experiences of delivering care digitally in the general practice setting. To explore their perception of the barriers (and how these have been overcome) and facilitators (and how these could be optimised) for successful use of digital technology to deliver care in general practice. To explore their perceptions of the impact of digital delivered care on patient care. The interviews have a general purpose to obtain feedback from those who have experience in delivering care and supporting patients to manage their long term conditions via digital technology.

Consent: Answer any participant questions, then obtain and record (written or verbal) informed consent

Participant information to be gathered at start of each interview: nursing position, Agenda for change band, gender, years qualified, length of time they have worked in general practice.

Topic Guide Questions

1. **Can you describe your role within the General Practice?**
   - How has this role been for the last few years? Have there been many changes in relation to how you deliver care? What kind of conditions do you see?
2. **In your role, do you have to use much digital technology?**
   - (If they do) Can you tell me about the digital technology you use in your everyday job? *Has this changed over the last few years?*
   - (If they do) How confident have you been in delivering care using digital technology to patients? *Has this changed over the last few years?*
   - (if they don't) Are you aware of any additional digital technologies that could be implemented in your work place? How would this benefit your practice?
3. **Tell me about your experience using digital technology to deliver care to patients within your practice?**
   - What technologies are you current using?
   - Do you have a criteria for who you will see virtually? Can you tell me about it?
   - Are you supporting anyone using a digital device to manage their care?
   - How has digital technology affected the way you deliver care?
   - What do you see as the pros and cons of digital delivered care in your opinion?

4. **How do you think patients feel about the use of digital technology to manage their care?**
    - Can you explain why you think this?
5. **Tell me about the training you have received in order to deliver care digitally?**
    - Do you feel equipped to deliver care in this way with the technology you have?
    - Have you had enough training to feel confident to use the digital technologies available?
    - Do you have enough support if something goes wrong?
    - If not received training – what training do you think you need?
6. **Is there anything else you would like to tell me about digital healthcare being delivered by nurses within your practice?**

Patient recruitment