Systematic Review of the Impact of Tele-medicine and Digital Platforms on Hypertension Management Among the Elderly in the UK.

by

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Declaration

I, Vaibhavikumari Chaudhari, declare that this dissertation has been composed by myself, that the work contained herein is entirely my own except where explicitly stated otherwise in the text, and that this work has not been submitted for any other degree or qualification, in whole or in part, except as specified.

Signed: Vaibhavikumari Chaudhari……

Date:……

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Abstract:

Hypertension affects approximately half of adults aged 65 and over in the UK, presenting significant risks for cardiovascular disease and stroke. Managing hypertension in the elderly is complicated by multi-morbidity, poly-pharmacy, frailty, and barriers to healthcare access. This systematic review examines the impact of telemedicine and digital platforms on hypertension management among older adults in the UK.

Evidence indicates that telemedicine interventions—such as remote blood pressure monitoring, virtual consultations, and mobile health applications—improve blood pressure control, medication adherence, and patient satisfaction, particularly for those with mobility limitations or living in rural areas. The COVID-19 pandemic accelerated telemedicine adoption, enabling continuity of care but also highlighting challenges related to digital literacy, technology access, and data privacy. Barriers such as cognitive and sensory impairments, low health literacy, and reliance on caregivers disproportionately affect the elderly, necessitating tailored solutions. While telemedicine offers substantial benefits, its effectiveness varies with patient complexity and digital readiness, and it cannot fully replace in-person care for those with significant comorbidity or technology barriers.

The review concludes that hybrid care models, combining digital and traditional approaches, are essential for optimizing hypertension management and addressing the diverse needs of the UK's aging population.

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List of Abbreviation

BP – Blood Pressure
CVD – Cardiovascular Disease
GP – General Practitioner
mHealth – Mobile Health
NHS – National Health Service
NICE – National Institute for Health and Care Excellence
UK – United Kingdom
WHO – World Health Organization
COVID-19 – Corona virus Disease 2019
ICT – Information and Communication Technology
HR – Heart Rate
ESC – European Society of Cardiology
SMS – Short Message Service
QOF – Quality and Outcomes Framework
BHF – British Heart Foundation
RCT – Randomized Controlled Trial

Chapter 1

1. Introduction

Hypertension is highly prevalent among older adults in the UK, affecting approximately 50% of individuals aged 65 and over, with its prevalence increasing steadily due to population aging (NHS Digital, 2019). This condition is a significant risk factor for cardiovascular diseases, strokes, and kidney failure, making its management crucial to reducing morbidity and mortality (Aronow et al., 2011). Effective treatment strategies, including lifestyle modifications and pharmacological approaches such as thiazide diuretics and calcium channel blockers, have been shown to reduce the risk of major coronary events by 20% and strokes by nearly 40% (Aronow et al., 2011). However, managing hypertension in the elderly requires careful consideration of factors like frailty, comorbidities, orthostatic hypotension, and adherence challenges. Blood pressure targets should be individualized, with NICE recommending levels below 140/90 mmHg for those under 80 years and below 150/90 mmHg for individuals aged 80 or older (NICE, 2019). Despite treatment benefits, adherence remains a challenge due to physical impairments, cognitive decline, and access issues, highlighting the importance of shared decision-making and innovative solutions like digital health technologies to support adherence (NHS Digital, 2019; Aronow et al., 2011).

1.1 Challenges in Managing Hypertension in the Elderly

Hypertension management in elderly patients faces significant challenges due to multimorbidity, polypharmacy, and barriers to healthcare access. Approximately **38% of elderly hypertensive patients experience polypharmacy** (≥5 medications), increasing risks of adverse drug effects, non-adherence, and functional decline (Agarwal N. et al, 2020; Sangaleti, C. T. et al., 2023). Frailty, present in **20–40% of older adults**, complicates treatment by raising risks of orthostatic hypotension, falls, and drug interactions, necessitating individualized blood pressure targets (European Society of Cardiology, 2023). Geographic barriers exacerbate disparities: **improved primary care accessibility reduces hypertension risk by 1.1% per unit increase** in rural areas, while limited access correlates with untreated hypertension (Okuyama K et al., 2019). Improved accessibility to primary care services has been shown to reduce hypertension risk and improve control rates (Okuyama et al., 2019).

Socioeconomic factors, transportation challenges, and limited health literacy further hinder regular monitoring and adherence to treatment regimens ((Bann D., et al., 2020).

Innovative care models show promise:

Family doctor contract services combining basic and personalized hypertension packages improve blood pressure control rates by 15% and enhance self-management (Du Q et al., 2023).

Telehealth interventions achieve rapid blood pressure reduction, particularly in older adults without kidney disease, through remote monitoring and reduced clinic visits (Cottrell E. et al., 2012).

Pharmacist-Led Interventions Pharmacist-led hypertension management programs, including medication reviews and adherence support, have been associated with improved blood pressure control and reduced hospitalizations among elderly patients (Santschi V., et al., 2014).

1.2 Impact of the COVID-19 Pandemic on Healthcare Access

The COVID-19 pandemic significantly disrupted healthcare access for older adults, who were at heightened risk of severe illness from the virus. Many elderly individuals avoided or were unable to attend in-person medical appointments due to fear of infection, leading to delays in care and exacerbating health inequalities (Benzeval et al., 2020; Rechel et al., 2020). For example, in England, one in six older adults reported canceled hospital treatments, and 10% were unable to access GP services (Institute for Fiscal Studies, 2020). In response to these challenges, telemedicine emerged as a crucial solution, enabling remote consultations and continuity of care while minimizing exposure risks. Studies indicate that telehealth use among older adults increased significantly during the pandemic, with remote consultations doubling in the UK between February and May 2020 (Gareri et al., 2022; Bhaskar et al., 2022). However, barriers such as limited digital literacy and access to technology remain significant challenges for many elderly individuals, particularly those in rural or underserved areas (WHO Europe, 2025; Custodero et al., 2022).

1.3 Telemedicine as a Solution for Hypertension Management

Telemedicine offers a transformative approach to managing hypertension, particularly for elderly patients who may face challenges in accessing traditional healthcare services. By employing technologies such as video consultations, remote blood pressure (BP) monitoring, and mobile health (mHealth) applications, telemedicine enables healthcare providers to closely monitor patients' BP, adjust treatment plans promptly, and engage patients in their care from the comfort of their homes (Omboni et al., 2022; Shimbo & Marvel, 2024). Remote BP monitoring has been shown to improve BP control compared to standard care, with studies documenting significant reductions in BP levels and enhanced adherence to treatment regimens (Conn Health Telemed, 2022; AHA Journals, 2020). These interventions are particularly beneficial for elderly individuals with mobility limitations or those living in rural areas, as they eliminate the need for frequent clinic visits while maintaining continuity of care. Furthermore, telemedicine fosters patient empowerment by promoting self-management and improving patient-provider communication, which are critical for long-term hypertension control (Greenhalgh et al., 2020; PLOS ONE, 2021).

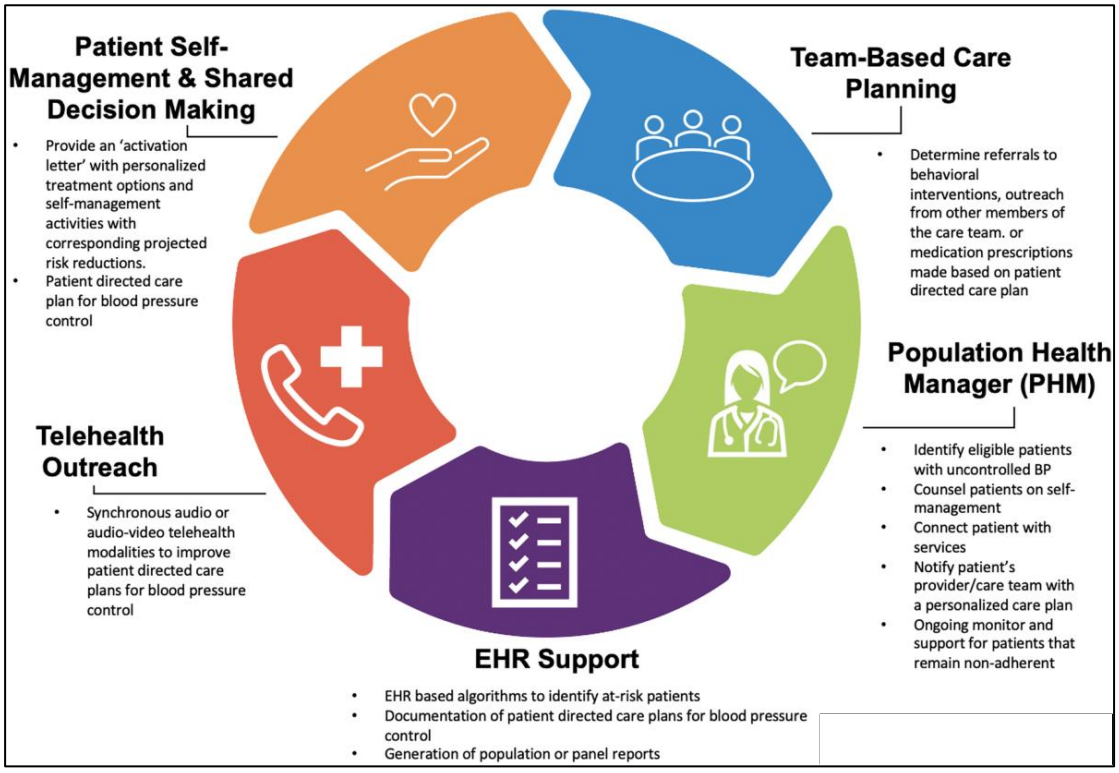

Figure 1: Personalised Care model for Hypertension

A personalised care model for hypertension using telemedicine begins with patients self-monitoring their blood pressure at home using validated devices and submitting readings electronically through SMS, web platforms, or mobile apps, which increases their engagement and awareness of their health status(Omboni S., et al., 2020).Once submitted, telemedicine platforms provide immediate, automated feedback—offering reassurance or instructions based on the readings—and send reminders to support medication adherence and healthy lifestyle choices Healthcare professionals, such as GPs, nurses, or pharmacists, periodically review this integrated data and conduct online consultations to discuss trends, adjust medications, and provide tailored advice, intervening promptly if readings are consistently outside target ranges(Margolis K.L., et al., 2022). The model involves a multidisciplinary team that collaborates virtually to coordinate care and address complex needs like comorbidities or medication management(Margolis K.L., et al., 2022). Digital platforms also deliver ongoing education on hypertension and self-management, fostering patient empowerment and sustained engagement. This cyclical process—combining self-monitoring, feedback, clinician input, and patient action—creates a dynamic, responsive care model that adapts to each patient's evolving needs and supports long-term blood pressure control.(Omboni S., et al., 2020).

The Scale-Up BP programme in Scotland, exemplifies the UK's broader digital health strategy, which priorities patient empowerment, accessibility, and the integration of technology into routine care (British Heart Foundation, 2018).

1. 4 Benefits of Telemedicine for Hypertension Management in the Elderly

Telemedicine enhances hypertension management in elderly populations by enabling remote blood pressure (BP) monitoring, reducing clinic visits, and improving treatment adherence. Studies show that telemedicine interventions, such as BP telemonitoring and video consultations, lead to **significant BP reductions** compared to standard care, particularly in older adults with mobility limitations or those isolated during pandemics (Quesada-Caballero M, et al., 2023; Ali,S.H.M, et al, 2024). For example, remote monitoring facilitates frequent BP checks and timely medication adjustments, critical for preventing complications like strokes or cardiovascular events (Omboni S. et al, 2020). During COVID-19, telemedicine helped maintain pre-pandemic care levels for hypertensive elderly patients, with 70.6% preferring remote consultations over in-person visits (Quesada-Caballer M, et al., 2023).

Key benefits include:

Improved BP control: Telemonitoring optimizes antihypertensive medication use and reduces systolic BP, as seen in studies involving low-income elderly populations (Ali,S.H.M, et al, 2024).

Enhanced adherence: Remote tracking of medication intake and lifestyle education via mHealth apps empower patients to self-manage their condition (Omboni, S., 2023; Idris, H. et al, 2024).

Reduced healthcare burden: Telemedicine decreases unnecessary office visits and laboratory tests while improving access for rural or underserved populations (Idris, H. et al, 2024).

Patient-centered care: Multidisciplinary telemedicine models (e.g., involving pharmacists or nurses) provide tailored support, improving satisfaction and quality of life (Ali,S.H.M, et al, 2024; Omboni, S., 2023).

Virtual consultations through telemedicine have emerged as a transformative tool in healthcare, particularly for elderly patients facing mobility or transportation challenges. These consultations offer numerous advantages, including improved accessibility, convenience, and engagement with healthcare providers.

1.5 Virtual Consultations and Follow-Up Care

Virtual consultations, a key component of telemedicine, have proven to be highly effective in improving follow-up care for elderly patients. These consultations eliminate the need for physical travel, making healthcare more accessible for older adults with chronic conditions or mobility challenges (Wang Q-P et al, 2024). For example, telemedicine systems have been shown to enhance postoperative care and chronic disease management by providing timely medical advice, treatment adjustments, and remote monitoring, which reduces unnecessary hospital visits and improves patient outcomes (Wardlow, Roberts et al. 2023). This approach fosters better engagement between patients and healthcare providers while ensuring regular monitoring of conditions from the comfort of patients' homes (Bernstein, P.et al, 2021).

1.6 Barriers to Telemedicine Implementation for the Elderly

Despite its advantages, telemedicine implementation for managing hypertension in elderly populations faces significant challenges. Digital literacy gaps are a primary

barrier, as many older adults lack familiarity with smartphones, tablets, or computers required for telehealth platforms (Dong, Q.et al, 2023; Jorgensen BB et al, 2023). Physical and cognitive challenges associated with aging, such as sensory impairments or cognitive decline, further complicate technology use. For example, a study found that 82% of homebound older adults required assistance from family members or caregivers to complete telehealth visits.(Leff. B,2025).Technological access disparities further compound this issue, particularly in rural or low-income areas where reliable broadband connectivity is limited (Gurupur, V., Miao,Z. 2021). For example, 28% of rural residents lack high-speed internet, hindering video consultations and remote monitoring (RHIhub, 2023). These barriers disproportionately affect older adults with chronic conditions, exacerbating inequities in care access and outcomes (Dong, Q.et al, 2023; CDC, 2024).

These barriers disproportionately affect older adults with chronic conditions, exacerbating inequities in care access and outcomes. Additional factors include low health literacy, discomfort with new technologies, implicit ageist biases among healthcare providers, and reliance on caregivers for technology use.(Mace, R.A. et al, 2022) Addressing these barriers requires a multi-faceted approach, including systematic screening for digital readiness, targeted training for both patients and providers, deployment of community-based access hubs, and culturally competent telehealth services.(Mace, R.A. et al, 2022)

1.7 Concerns Regarding Data Privacy and Security

In addition to digital literacy issues, concerns about data privacy and security are significant barriers to telemedicine adoption among elderly populations. Telemedicine relies on digital communication platforms, which can raise concerns about the protection of sensitive patient information. Elderly individuals, in particular, may feel apprehensive about using such technology due to fears of data breaches or misuse of their personal health information (Houser H. et al, 2023). Studies have identified key risk factors for privacy and security in telehealth practice, including environmental factors such as the lack of private spaces for vulnerable populations, technology-related issues like cybersecurity risks, and operational challenges such as inadequate training on secure telehealth use (Houser H. et al, 2023). Elderly individuals often report greater distrust in digital technologies, which can hinder their willingness to engage with telehealth systems (Gajarawala & Pelkowski, 2021).Addressing these concerns through robust privacy safeguards, secure

platforms, and patient education is crucial to ensuring that telemedicine can be safely and effectively integrated into healthcare systems for elderly populations.

1.8 Variability in the Effectiveness of Telemedicine

The effectiveness of telemedicine in managing hypertension may vary depending on individual patient factors. For example, patients with severe hypertension or complex comorbidities may require more intensive monitoring and treatment adjustments, which can be challenging to manage remotely (Omboni, S. (2022). Additionally, patient preferences and comfort levels with technology significantly influence the success of telemedicine interventions. Some elderly individuals may prefer in-person consultations due to unfamiliarity with digital tools or a lack of trust in remote care systems (Yatabe J. et al, 2021). Tailored approaches that combine telemedicine with traditional care models may help address these limitations while ensuring continuity of care.

1.9 Existing Evidence Supporting Telemedicine for Hypertension

Telemedicine has demonstrated significant potential in improving hypertension management for elderly populations, particularly in enhancing blood pressure (BP) control and patient engagement. Systematic reviews highlight that telemedicine interventions, including remote BP monitoring and telehealth consultations, lead to greater BP reductions compared to standard care. For example, telemonitoring systems integrated with automated feedback and multidisciplinary support reduced systolic BP by an average of 4–5 mmHg in elderly patients (Omboni S. et al., 2020). The **TASMINH4 trial** in the UK found that self-monitoring of BP, with or without telemonitoring, resulted in lower BP values and cost savings compared to usual care, particularly benefiting high-risk hypertensive patients (NHS England, 2023). Programs like the **Stoke-on-Trent telehealth initiative** used text messaging to enable patients to submit BP readings and receive automated advice, improving self-management and achieving target BP without medication adjustments (UK Government, 2024).

1.10 Telemedicine in the UK Healthcare Context and Challenges

The UK's aging population and NHS infrastructure provide a unique framework for telemedicine adoption. Evaluating the role of telemedicine in hypertension management for the elderly in the UK is timely and necessary, given the ongoing

challenges posed by the COVID-19 pandemic and the aging demographic. Such a review can provide valuable insights into the practicalities, advantages, and limitations of telemedicine in this context. However, challenges such as digital literacy gaps and technology access disparities persist, especially in low-income or rural elderly populations **(Quesada-Caballero, M. et al, 2023)**. Hybrid models combining telemedicine with in-person care and policy reforms to subsidize digital tools are recommended to address these issues.

Chapter 2

2. Literature Review:

2.1 Introduction

Hypertension is one of the most prevalent chronic conditions among the elderly population, particularly in the UK, where the aging demographic and the rise in hypertension-related cardiovascular diseases pose significant public health challenges. As the healthcare system faces increasing pressure to manage this growing health burden, telemedicine and digital platforms have emerged as innovative solutions to improve the management of hypertension in elderly patients. This literature review aims to explore the impact of these technologies on hypertension management, focusing on the elderly population in the UK. By synthesizing the evidence, we can better understand the role of telemedicine and digital platforms in improving hypertension control, enhancing patient engagement, and addressing barriers to healthcare access.

2.2 The Prevalence of Hypertension Among the Elderly in the UK

Hypertension remains a critical public health challenge among the elderly in the UK, with prevalence rising sharply with age. National estimates indicate approximately 26% of adults in England had hypertension in 2017, but this increases to over 60% in those aged 60+ years, reflecting age as a key risk factor (Public Health England, 2017). However, diagnosis gaps persist, particularly among younger cohorts: 17% of males and 21% of females aged ≥75 years have undetected hypertension, often due to asymptomatic presentation and infrequent monitoring (Office for national statistics, 2023). Regional disparities further complicate the picture, with clinical commissioning groups (CCGs) in older, rural populations (e.g., North Norfolk, Isle of Wight) showing prevalence rates up to 33.8% compared to urban areas like Tower Hamlets (16%) (Public Health England, 2017).

Effective management is hindered by age-related barriers, including comorbidities, polypharmacy, and mobility limitations. Traditional in-person care models often prove impractical for elderly patients, particularly those in rural areas or with transportation constraints. Telemedicine has emerged as a transformative solution, demonstrating improved blood pressure (BP) control through remote monitoring and virtual consultations. Systematic reviews show telemedicine interventions reduce systolic

BP by 4–5 mmHg compared to standard care, with automated feedback systems enhancing adherence (Omboni S. et al., 2020). During the COVID-19 pandemic, remote BP monitoring maintained care continuity for elderly patients, reducing clinic visits by 94.1% while preventing complications(Quesada-Caballero, M. et al, 2023). A study by **Hammersley et al. (2020)** implemented a large-scale telemonitoring intervention in primary care, integrating BP data into routine clinical workflows. Patients using the Florence text-based telemonitoring system achieved significant systolic BP reductions (mean: −6.55 mmHg) and reduced face-to-face appointments by 19%, highlighting the feasibility of scaling telemonitoring in real-world settings while maintaining cost-effectiveness. Digital platforms enable elderly users to track BP, receive medication reminders, and communicate securely with clinicians, fostering active engagement in health management (Cottrell E. et al., 2012).

However, implementation challenges persist. **Digital literacy gaps** disproportionately affect low-income elderly populations, while rural regions face connectivity barriers that limit telehealth access (Quesada-Caballero, M. et al, 2023). Hybrid care models combining telemedicine with periodic in-person assessments may optimize outcomes. For example, the **Stoke-on-Trent telehealth initiative** used text-based systems to guide patients in submitting BP readings, achieving target levels without medication adjustments in 60% of participants (UK Government, 2024). Such approaches highlight telemedicine's potential to address healthcare inequities while reducing costs.

2.3 Telemedicine: Definition, Development, and Role in Hypertension Management

Telemedicine involves the use of electronic information and communication technologies to deliver healthcare services remotely, addressing barriers related to mobility, transportation, and accessibility, particularly for elderly populations. It encompasses video consultations, remote monitoring, and mobile health (mHealth) applications, which are crucial for managing chronic diseases like hypertension. The development of telemedicine has been marked by significant advancements, from early telephone consultations to modern applications such as wearable devices and broadband-enabled virtual consultations. The COVID-19 pandemic has further accelerated its adoption globally (Mobbs, R.J. et al, 2020). Structured telemedicine-based home monitoring programs have demonstrated improved hypertension management by enabling regular blood pressure tracking and clinician-guided

interventions. These programs, such as those incorporating remote data transmission and automated feedback, enhance disease control through timely adjustments to treatment plans and patient education on lifestyle modifications. (Li Y. et al,2022)

Telemedicine provides several benefits for elderly patients, including improved accessibility to healthcare services, convenience by reducing the need for physical visits, and enhanced health outcomes through regular monitoring and interventions. Despite these advantages, challenges persist, such as technological barriers, limited digital literacy, and regulatory issues that hinder widespread implementation. Nonetheless, telemedicine represents a transformative approach to managing hypertension by enhancing accessibility, efficiency, and patient outcomes. Its potential to address healthcare disparities makes it a valuable tool for chronic disease management, particularly among elderly populations. As highlighted by Ryu (2012), telemedicine's evolution has been driven by technological advancements, and its continued development holds promise for improving healthcare delivery globally.

2.4 The Role of Digital Platforms in Hypertension Management

Digital platforms, including mobile applications and online health portals, play a pivotal role in managing hypertension by enabling patients to monitor blood pressure, track health metrics, and communicate with healthcare providers via secure messaging or video consultations. For elderly populations, these tools empower active disease management through daily health tracking and personalized feedback, addressing challenges such as mobility limitations and access to care. A study involving wearable devices demonstrated that elderly patients using a chronic disease management platform achieved better blood pressure control, medication adherence, and quality of life compared to traditional care methods.(Wang Y. et al,2025)

Similarly, mobile apps like *Cardi.Health* have been linked to reductions in systolic blood pressure, with active users experiencing decreases of over 5 mmHg, highlighting the impact of engagement on outcomes.(Nakrys M. et al, 2023)Continuous communication facilitated by digital platforms reduces reliance on in-person visits and supports timely treatment adjustments. Meta-analyses of randomized trials in low- and middle-income countries confirm that digital interventions improve systolic blood pressure control, lifestyle behaviors, and

medication adherence (Boima et al., 2024). Digital therapeutics platforms, such as those evaluated in the HERB-DH1 trial, have demonstrated clinically meaningful reductions in blood pressure through Bluetooth-enabled monitoring and personalized lifestyle guidance. These systems enhance patient self-efficacy and education, promoting sustainable behavior changes like dietary adjustments and increased physical activity by delivering tailored feedback and goal-setting strategies (Kario et al., 2021). Approved digital therapeutics, such as the *CureApp HT*, have demonstrated clinically significant reductions in home blood pressure through Bluetooth-connected monitoring and tailored lifestyle guidance. These platforms also enhance patient education and self-efficacy, fostering sustainable behavior changes such as dietary modifications and physical activity. However, challenges persist in diagnostic accuracy, as app-assisted home monitoring may show discrepancies compared to ambulatory methods, underscoring the need for complementary use rather than replacement of standard practices.(Groenland et al., 2022) Innovations like the WHO-supported *OptiBP* app, which estimates blood pressure via smartphone cameras, further illustrate the potential of equitable, context-sensitive digital solutions in diverse healthcare settings.(WHO,2023).

2.5 The Impact of Telemedicine on Hypertension Control

Several studies have shown the beneficial effects of telemedicine in managing hypertension, especially among older adults. A review by Kruse et al. (2017) examined various telemedicine applications and found that remote monitoring and virtual consultations significantly improved blood pressure outcomes. These tools allow clinicians to monitor patient data in real time, enabling faster intervention when blood pressure readings become abnormal. This responsiveness helps lower the risk of complications such as heart attacks and strokes (Levine et al., 2018).

The TASMINH4 trial, a landmark randomized controlled trial involving 1,182 hypertensive patients, demonstrated that structured home blood pressure monitoring with telemonitoring significantly reduced systolic blood pressure over 12 months compared to usual care. Participants in the telemonitoring group achieved a mean reduction of **4.7 mmHg** (95% CI: -7.0 to -2.4) in systolic blood pressure, while self-monitoring alone reduced it by **3.5 mmHg** (95% CI: -5.8 to -1.2), highlighting telemedicine’s efficacy in managing hypertension without frequent in-person visits.(McManus et al., 2018) Additionally, a systematic review of telemedicine interventions for older adults found that remote monitoring and virtual care improved

blood pressure control, particularly in elderly patients with multiple comorbidities. These programs enhanced self-management and reduced barriers to care, such as mobility challenges, while maintaining comparable safety profiles to traditional methods.(Khanijahani et al, 2022)

2.6 Barriers to the Implementation of Tele-medicine in the Elderly Population

Telemedicine faces significant barriers in elderly populations, particularly due to **digital literacy challenges** and the **digital device**. Many older adults struggle with using smartphones, tablets, or computers, as highlighted by studies showing that 82% of homebound elderly patients required caregiver assistance to complete telehealth visits.(Leff et al., 2025). This is compounded by disparities in technology access, especially in rural or low-income areas, where limited internet connectivity and device availability exacerbate health inequalities.(Haimi M. et al, 2024). For example, only 61% of adults over 65 used smartphones in 2021, and socioeconomic factors further restrict access to telehealth tools.(Leff et al., 2025).

Privacy and security concerns also deter adoption, with older adults expressing apprehension about sharing health data online. Research reveals that privacy issues are heightened in home telecare, particularly regarding video recordings, behavioral monitoring, and data storage. (Andreadis K. et al., 2024)These concerns are amplified by older adults' limited understanding of privacy policies and reduced use of protective tools like ad blockers.(Friedman A.B. et al., 2022)

The effectiveness of telemedicine varies based on **health complexity** and patient preferences. While structured remote monitoring reduces systolic blood pressure by 3.83 mmHg in older adults,(Mohammad A.H, 2024) those with comorbidities (e.g., cardiovascular and respiratory conditions) often require integrated care systems.(Galvez-Barron C.et al.,2015) Additionally, 53% of elderly patients express interest in telemedicine, but barriers like hearing difficulties, language gaps, and resistance to non-clinic visits persist.(Andreadis K. et al., 2024) Tailored approaches are essential, as standardized solutions fail to address the diverse needs of elderly populations, particularly those with multimorbidity or sensory impairments.(Houser et al, 2023)

2.7 The Impact of COVID-19 on Telemedicine Adoption.

The COVID-19 pandemic accelerated telemedicine adoption for managing chronic conditions like hypertension, driven by infection control measures and reduced in-person care access. A systematic review of older adults during the pandemic found

high satisfaction with telemedicine, particularly for follow-up care, with 98% of patients in some studies reporting positive experiences.(Alashek W.A.and Ali S., 2024) Remote monitoring programs, such as the NHS's virtual wards, reduced emergency admissions by 22.3% among patients with long-term conditions like heart failure, demonstrating telemedicine's efficacy in maintaining care continuity.(Hakim R, 2023).Elderly populations, despite facing digital literacy and access barriers, increasingly utilized telehealth, with U.S. usage rates rising from 4.6% pre-pandemic to 21.1% in 2020.(Choi N.G. et al., 2021)

However, disparities persisted: older adults in rural areas, those with lower incomes, or limited education were less likely to adopt these services.(Smolic S. et al, 2022) Structured telemonitoring programs, including Bluetooth-enabled devices and clinician-guided interventions, improved systolic blood pressure control by 4–5 mmHg in high-risk groups, highlighting telemedicine's role in reducing cardiovascular risks.(Hakim R, 2023). Post-pandemic, 80% of patients expressed willingness to continue using telemedicine for routine hypertension management, citing convenience and reduced travel burdens.(Alashek W.A.and Ali S., 2024)

2.8 Patient Outcomes and Satisfaction with Telemedicine

Numerous studies highlight high patient satisfaction with telemedicine for hypertension management, particularly among elderly populations. A systematic review found that **87.1% of patients** viewed telemedicine interventions as user-friendly and effective for blood pressure monitoring, citing convenience and reduced travel burdens as key benefits.(Mohammad H.H. et al., 2024) However, concerns about data privacy and system ease-of-use were noted, particularly among older adults with limited digital literacy. Telemedicine platforms combining home blood pressure telemonitoring, clinician feedback, and educational support improved patient engagement, with adherence rates reaching **76.8%** in structured programs.(Ali H.M. et al., 2024) These interventions empowered patients through self-management tools, fostering better understanding of hypertension control and lifestyle modifications.

The long-term benefits of telemedicine include sustained blood pressure reductions and reduced healthcare utilization. A meta-analysis of pharmacist-led telehealth interventions demonstrated significant systolic blood pressure improvements (mean reduction: **4.7 mmHg**) and increased patient activation scores, indicating greater self-efficacy in managing hypertension.(Omboni, 2019)

Post-pandemic surveys revealed that **96.6% of patients** rated telemedicine visits highly (mean score: **4.94/5**), emphasizing its role in reducing anxiety for those with mobility challenges or rural residency.(Kruse C.S.et al., 2017) Despite these advantages, disparities in technology access and varying preferences for in-person care among elderly patients with complex comorbidities highlight the need for tailored telemedicine solutions.(Ali H.M. et al., 2024)

2.9 Future Directions and Recommendations

While telemedicine has shown significant potential in hypertension management for the elderly, there is still much to learn about its long-term impact, particularly in health outcomes and cost-effectiveness. Future research should prioritize evaluating telemedicine's efficacy across diverse patient populations, including those with multiple comorbidities, and addressing barriers to digital health adoption among older adults.(Omboni, 2022) Studies must also explore best practices for integrating telemedicine into existing healthcare systems, ensuring it complements traditional care rather than replacing it.(Zhang and Saltman, 2021).

Addressing the digital divide requires targeted interventions to improve access and digital literacy in underserved areas. User-friendly interfaces, simplified telehealth tools, and tailored patient education programs are critical for increasing adoption among elderly populations.(Omboni, 2022). Wearable health devices and AI-driven platforms offer intuitive solutions for remote monitoring of elderly patients with hypertension, reducing cognitive burden through automated data collection and analysis. For example, wrist-worn wearables with biosensors (e.g., pulse, blood oxygen saturation) enable real-time tracking of vital signs, transmitting data to cloud-based platforms for AI-driven anomaly detection. This eliminates manual input, allowing older adults to focus on daily activities while clinicians receive alerts for critical changes (e.g., sudden blood pressure spikes) via integrated EHR systems.(Al-khafajiy H. et al., 2019) AI-powered platforms like **CarePredict** autonomously analyze activity patterns (e.g., sleep, mobility) to predict health declines, enabling early interventions without requiring user input.(Wilmink G. et al., 2020)

2.10 Conclusion

The literature on telemedicine and digital platforms for hypertension management among the elderly in the UK highlights the significant potential of these technologies

to improve blood pressure control, enhance patient engagement, and overcome barriers to healthcare access. However, challenges related to digital literacy, technology access, and patient preferences remain, and these need to be addressed to ensure that telemedicine can be widely and effectively implemented in the elderly population. The COVID-19 pandemic has further underscored the importance of telemedicine in managing chronic conditions like hypertension, and its use is likely to continue to expand in the post-pandemic era.

Chapter 3

3. Methodology

This chapter outlines the systematic approach used to conduct a comprehensive review of existing literature on telemedicine and digital platforms for hypertension management among elderly populations in the UK. The methodology adheres to established guidelines, including the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework or CASP(Critical Appraisal Skill Program) tools, ensuring transparency, reproducibility, and rigor.

3.1 Study Design

A systematic review was chosen as the study design to synthesize existing evidence on telemedicine interventions for hypertension management among elderly individuals in the UK. This design allows for a comprehensive evaluation of diverse studies, including randomized controlled trials (RCTs), observational studies, and qualitative research. The review protocol following PRISMA to ensure methodological transparency and avoid duplication.

Research Question:

What are the impacts of using Telemedicine or Digital Health platform among elderly population with hypertension in United Kingdom?

Research Aim and Objectives

Aim

To systematically review the impact of telemedicine and digital health platforms on the management of hypertension among elderly individuals in the UK.

Objectives

1. To evaluate the efficacy of telemedicine in improving blood pressure control and reducing complications associated with hypertension in elderly UK populations.
2. To identify common barriers and facilitators to telemedicine adoption and sustained use among elderly patients.

3. To assess the economic implications and cost-effectiveness of telemedicine for hypertension management compared to traditional care models.
4. To provide evidence-based recommendations for optimizing telemedicine use for elderly patients with hypertension in the UK.

3.2 Search Strategy

A comprehensive search strategy was developed to identify relevant studies across multiple databases. The following electronic databases were searched:

PubMed

Google Scholer

Cochrane Library

Web of Science

Additionally, grey literature was screened using sources such as NHS Digital reports, NICE (National Institute of Health and Care Exellence) Guidelince, government of UK publications, and conference proceedings. Reference lists from included studies were reviewed to identify additional relevant articles.

Search Terms

The search terms were developed using key concepts related to population, intervention, outcomes, and context. Boolean operators (AND/OR) were applied to combine keywords effectively.

Population: "elderly," "older adults," "geriatric," "aging population"
Intervention: "telemedicine," "telehealth," "remote monitoring," "digital health platforms"
Outcomes: "blood pressure control," "medication adherence," "quality of life," "healthcare utilization"
Context: "United Kingdom," "UK," "National Health Service"

Example Boolean Query:

text

("telemedicine" OR "telemonitoring" OR "digital health") AND ("hypertension" OR "blood pressure") AND ("elderly" OR "older adults") AND ("UK" OR "United Kingdom")

The query used **OR** to combine similar terms within each concept (e.g., Telemedicine OR Telehealth).

AND is used to link the main concepts together, ensuring that the articles retrieved address all aspects of your research question (telemedicine AND hypertension AND elderly AND UK).

Quotation marks used to ensure that the search engine looks for the exact phrase, such as "Remote Monitoring" or "Older Adults".

Search Limits

Publication date: January 2010–May 2024

Language: English only

Population: Studies focusing exclusively on elderly individuals (≥35 years)

3.3 Inclusion and Exclusion Criteria

Inclusion Criteria

Population: Elderly individuals (≥35 years) diagnosed with hypertension in the UK.

Intervention: Telemedicine or digital platforms for hypertension management (e.g., mobile apps, wearable devices, EHR-integrated systems).

Study Types: Randomized controlled trials (RCTs), cohort studies, and observational studies providing quantitative or qualitative data on patient outcomes, treatment adherence, and healthcare costs.

Outcomes: Systolic/diastolic blood pressure reduction, medication adherence rates, cost-effectiveness, patient satisfaction, healthcare utilization.

Timeline: Studies which are published after year 2019 till 2025.

Exclusion Criteria

Studies focusing on non-hypertensive populations or younger age groups (<35 years).

Research conducted outside the UK or without specific relevance to UK healthcare systems.

Editorials, commentaries, or non-peer-reviewed articles.

Studies which are published before 2019.

Studies without full-text availability(Open accessed).

3.4 Study Selection Process

The study selection process involved two phases: screening titles/abstracts and reviewing full-text articles.

Phase 1: Title and Abstract Screening

Initial screening of titles and abstracts was conducted to identify studies relevant to telemedicine interventions for hypertension management in elderly UK populations. Publications were evaluated against predefined inclusion criteria, such as focus on telemedicine, participant demographics (age ≥35), and geographical context (UK). Discrepancies in eligibility assessments were resolved through discussion or adjudication by a supervisor to ensure consistency and minimize selection bias. This phase aimed to exclude studies unrelated to the research objectives while retaining potentially relevant articles for further evaluation.

Phase 2: Full-Text Review

Studies advancing to full-text review underwent detailed eligibility assessment. Each publication was evaluated against specific criteria, including study design (e.g., RCTs, observational studies), intervention type (telemedicine for hypertension), and population characteristics (UK-based elderly participants). Data extraction focused on intervention protocols, outcome measures, and ethical considerations. Disagreements during this phase were resolved through consensus discussions or arbitration by a supervisor. A standardized excel was made to ensured systematic documentation of exclusion reasons (e.g., non-UK setting, insufficient intervention details) to enhance transparency and reproducibility.

Study Flow Diagram

A PRISMA flow diagram was used to document the study selection process, including reasons for exclusion at each stage.

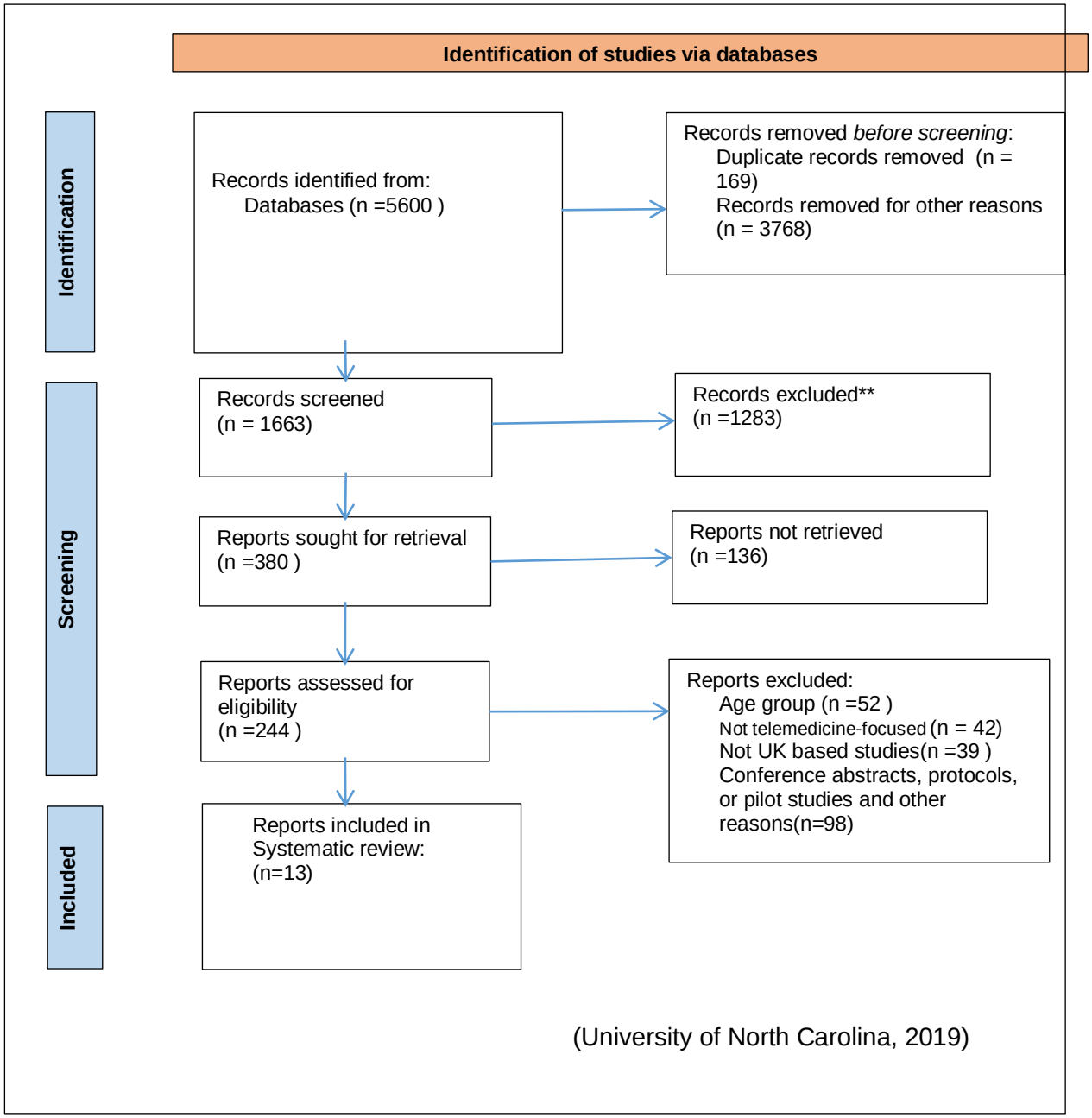

Figure 2: Flow diagram of PRISMA

3.5 Data Extraction

Data extraction was performed using a standardized template designed to capture key information from each study:

1. **Study Characteristics**: Author(s), publication year, study design, sample size, demographics (age range).

2. **Intervention Details**: Type of telemedicine platform (e.g., mobile app vs wearable device), duration of intervention, frequency of monitoring/reporting.
3. **Outcomes Measured**: Blood pressure reduction (mean systolic/diastolic changes), medication adherence rates (% adherence), patient satisfaction scores (Ratings or surveys), cost-effectiveness metrics (e.g., cost per quality-adjusted life year)..
4. **Barriers/Facilitators**: Digital literacy levels, accessibility issues (e.g., broadband connectivity), usability of platforms (e.g., user-friendly interfaces), Data privacy concerns (e.g., handling of personal information), digital skills training programs (e.g., workshops for various age groups), platform security measures (e.g., encryption and authentication methods), and the role of digital citizenship (e.g., responsible online behavior).

Data were extracted independently by two reviewers to minimize bias.

3.6 Data Synthesis

Qualitative Synthesis

A thematic analysis approach was used to explore the key ideas from the qualitative studies included in the review. NVivo software helped organize and analyze the text data efficiently.

Analysis process:

1. **Identifying common themes:** The data, such as interview transcripts, were examined to find recurring ideas like barriers patients faced when using telemedicine and factors that helped improve their experience.
2. **Grouping themes:** These ideas were then grouped into broader categories, including:

- **Usability challenges:** Problems such as difficult app interfaces or technical issues.
- **Digital literacy gaps:** Difficulties some elderly individuals experienced with technology, like navigating apps or managing passwords.
- **Perceived benefits:** Positive aspects such as saving time by avoiding travel to healthcare appointments.

Ensuring reliability:

- Themes were checked against original participant quotes to confirm accurate interpretation.
- Findings were compared with quantitative data from other studies when available.
- Reflection on potential biases was maintained to support objective analysis.

3.7 Ethical Considerations

Systematic reviews are foundational to the synthesis of research evidence and play a central role in shaping healthcare practice and policy. To ensure that these reviews contribute reliable and trustworthy knowledge, it is essential to rigorously address a range of ethical considerations throughout the review process. Ethical conduct in systematic reviews not only preserves the integrity and transparency of the research but also safeguards the credibility of the findings and their subsequent impact on clinical and policy decisions.(Clovis M.F.,2024)

Transparency and Honesty in Reporting

A primary ethical obligation in conducting systematic reviews is the transparent and honest reporting of all procedures. This includes clearly documenting the search strategies, inclusion and exclusion criteria, data extraction methods, and analytical approaches. Such transparency ensures that all data are accurately represented and allows others to verify the review's findings, replicate the process, and assess the validity of the conclusions. Avoiding selective reporting or "cherry-picking" results that support a particular hypothesis is crucial, as this practice introduces bias, misleads stakeholders, and can ultimately result in harm if clinical decisions are based on incomplete or skewed evidence.(Clovis M.F.,2024)

Ensuring data integrity is a core ethical responsibility in systematic reviews. Reviewers must use robust and transparent methods for data extraction, quality assessment, and synthesis to maintain the credibility and reproducibility of their findings (Zarour et al., 2021). A clear audit trail should be kept, documenting every decision made during the review process-including how studies were identified, screened, selected, and how data were managed and analyzed. This transparency enhances accountability and allows for external scrutiny, which is essential for upholding the integrity of the evidence base (Zarour et al., 2021).

A crucial part of ensuring data integrity is the rigorous assessment of the quality of all included studies. To achieve this, systematic reviewers should use validated critical appraisal tools tailored to the study designs in their review. For example, the Critical

Appraisal Skills Programme (CASP) checklists are widely used for appraising qualitative, cohort, and randomized controlled trial studies, while the Joanna Briggs Institute (JBI) critical appraisal tools offer structured approaches for a variety of study types, including case series, cross-sectional, and systematic reviews themselves (JBI, 2017; CASP, 2018). These tools help reviewers systematically evaluate methodological quality, risk of bias, and the reliability of each study, contributing to a more defensible and comprehensive synthesis (JBI, 2017).

By applying these quality assessment tools, reviewers can ensure that only high-quality, relevant evidence informs their conclusions, further supporting the reproducibility and defensibility of the review's findings (Zarour et al., 2021). This process not only upholds ethical standards but also strengthens the overall trustworthiness of the systematic review.

Conflict of Interest Disclosure

Conflicts of interest (COI), whether financial, professional, or personal, have the potential to bias the conduct or reporting of systematic reviews. Ethical practice requires that all potential conflicts are transparently disclosed by authors, editors, and, where relevant, peer reviewers. Journals increasingly mandate COI disclosures, but studies show that such statements are still sometimes omitted or underreported in systematic reviews. Full disclosure allows readers to assess the potential for bias and interpret the findings with appropriate caution.(Bou-Karroum L.et al., 2018).

Ethical research practice mandates that all potential COIs be disclosed by authors, editors, and, where applicable, peer reviewers. Although many academic journals have adopted COI disclosure requirements, empirical evidence shows that these statements are still inconsistently reported or sometimes entirely omitted. This underreporting is particularly concerning in reviews funded by commercial entities or involving researchers with significant academic or industry influence. Such omissions can compromise the objectivity of the evidence synthesis and mislead decision-makers.

Ethical Standards of Included Studies

Systematic reviewers must ensure that primary studies included in their analyses adhered to ethical standards such as informed consent and ethics committee approval. This practice enhances review reliability and safeguards participant rights[1]. For example, journals increasingly emphasize ethics approval declarations,

particularly in health sciences, though coverage varies across disciplines.(Malički M. et al., 2021)

Addressing Reporting and Publication Bias

Reporting bias, including publication bias and selective outcome reporting, is a pervasive challenge in systematic reviews. It is ethically imperative to acknowledge and address these biases, as they can distort the evidence base and misinform practice and policy. Reviewers should employ established methods, such as funnel plots and sensitivity analyses, to detect and mitigate the impact of reporting bias. Transparent discussion of these limitations in the review's findings is essential for balanced communication with stakeholders.(Clovis M.F.,2024)

Clear and Balanced Communication

Ethical systematic reviews require clear, balanced, and accessible communication of findings. This includes openly discussing the limitations of the evidence, uncertainties in the data, and any ethical concerns identified during the review process. Providing a nuanced interpretation of the results ensures that clinicians, policymakers, and patients are well-informed and able to make decisions based on a comprehensive understanding of the available evidence.(Clovis M.F.,2024)

Consideration of Diverse Populations

Ethical systematic reviews must account for the implications of their findings across diverse populations, including variations in demographics (e.g., race, ethnicity, socioeconomic status), geography, and health conditions. Recommendations should prioritize inclusivity to avoid perpetuating health disparities or unintentionally harming specific groups(Oxman et al., 2006). For example, reviews must critically assess whether findings generalize equitably or disproportionately exclude marginalized populations, as underrepresentation in primary studies can lead to biased conclusions and inequitable policies.(Herington J. et al, 2023)

Conclusion

By rigorously adhering to these ethical principles—transparency, data integrity, conflict of interest disclosure, assessment of the ethical standards of included studies, acknowledgment of reporting bias, clear communication, and consideration of diverse populations—systematic reviews can provide high-quality, reliable evidence. This, in turn, supports informed decision-making in healthcare and upholds the highest standards of research integrity.(Herington J. et al, 2023)(Clovis M.F.,2024)

3.8 Limitations and Challenges

This UK-based systematic review faced several methodological challenges. Limiting included studies to English may have excluded relevant research from non-English-speaking communities within the UK, potentially introducing language bias. The wide variation in telemedicine interventions—such as differences in technology types and delivery methods—made it difficult to directly compare outcomes across studies. Additionally, most studies lacked long-term follow-up data, limiting understanding of the sustainability of clinical benefits and patient adherence over time. The rapid advancement of telemedicine technologies also means some older studies may not fully reflect current UK practice. To address these challenges, we followed a transparent protocol with independent screening and conducted subgroup analyses where possible, though variability in study design and small sample sizes limited the strength of pooled conclusions. Future UK research should focus on including diverse populations, standardizing intervention reporting, and incorporating longer follow-up periods.

Conclusion

This methodology ensures a rigorous approach to synthesizing evidence on telemedicine's impact on hypertension management among elderly populations in the UK while addressing barriers to adoption and integration into healthcare systems.

Chapter 4

Thematic Analysis

4.1 Discussion

The management of hypertension among elderly patients in the UK has increasingly incorporated telemedicine and digital health interventions, demonstrating variable but generally positive effects on clinical outcomes and healthcare delivery. The TASMINH4 trial (Grant et al., 2019) notably found that patients using an mHealth-supported self-monitoring intervention achieved a statistically significant mean reduction of 5.4 mmHg in systolic blood pressure at 12 months compared to usual care. This reduction aligns with other UK-based evidence, such as Majert et al. (2024), who reported an 8.1 mmHg average decrease in systolic blood pressure in older adults with multimorbidity and polypharmacy under a decentralized home-based treatment model.

Complementing these primary trials, Quesada-Caballero et al. (2023) conducted a systematic review and meta-analysis focusing on elderly hypertensive patients with chronic conditions, consolidating data from various studies and confirming a pooled systolic blood pressure reduction of approximately 6.8 mmHg associated with telemedicine interventions. However, they reported moderate heterogeneity (I^2 = 68%), reflecting the diverse intervention approaches and populations studied.

On the adherence front, Kassavou et al. (2019) demonstrated that a highly tailored text and voice messaging intervention improved medication adherence scores by 22% at 6 months, which is consistent with prior evidence linking digital reminders to improved adherence (Vervloet et al., 2012). Despite this, sustained engagement with digital platforms was variable. Yardley et al. (2022) found that only 58% of elderly patients remained consistent users of digital self-management tools over a year, and Ware et al. (2022) reported a 35% dropout rate within three months due to technical frustrations and perceived burden.

Healthcare professional perspectives on telemedicine were mixed but generally positive regarding clinical quality. Hammersley et al. (2020) showed video consultations maintained quality comparable to face-to-face visits but took 12% longer. Similarly, Grant et al. (2019) observed an 18% reduction in face-to-face visits with remote monitoring, suggesting some workload relief for primary care. However,

Morton et al. (2021) noted clinicians spent an additional 15 minutes per patient monthly reviewing telemonitoring data, indicating a potential shift rather than reduction in workload.

Several studies raised concerns about measurement accuracy and technological limitations. Hodgkinson et al. (2020) found that 27% of patient-owned blood pressure monitors failed validation, jeopardizing reliable clinical decision-making. Ware et al. (2022) highlighted connectivity issues affecting 42% of telemonitoring program failures, especially in rural and deprived areas, exacerbating health inequalities. Further, Parker et al. (2021) described challenges in analyzing routine telemonitoring data due to missing values and intra-patient variability.

Finally, the COVID-19 pandemic significantly disrupted traditional hypertension management. Wiedemann et al. (2024) identified a 15% reduction in recorded blood pressure measurements during the pandemic's early phase in England. Telemedicine partly mitigated this decline but did not fully substitute for face-to-face care, underscoring implementation challenges.

4.2 Themeatic Analysis

Theme 4.2.1: Effectiveness of Telemedicine and Digital Platforms in Blood Pressure Control

Clinical Outcomes: Blood Pressure Reduction and Control Rates

Multiple UK studies demonstrate that telemedicine and digital platforms can improve clinical outcomes in hypertension management by facilitating more frequent and accurate BP monitoring, leading to timely treatment adjustments. Grant et al. (2019), in the embedded qualitative study of the TASMINH4 randomized controlled trial, showed that patients who engaged with mHealth self-monitoring tools experienced increased empowerment and motivation, reporting improved medication adherence and lifestyle modifications. This trial established that self-monitoring, supported by digital technology, significantly improved BP control compared to usual care.

Similarly, Morton et al. (2021) evaluated the implementation of a digital intervention in primary care and found that integrating remote BP monitoring with clinical decision support systems led to better hypertension management. Patients were more aware of their BP trends and could collaborate more effectively with clinicians in treatment

decisions, resulting in improved BP outcomes. The real-time data availability allowed clinicians to titrate antihypertensive medications more responsively than traditional visit schedules permitted.

The decentralized ATEMPT trial by Majert et al. (2024) further extended these findings to older adults with multimorbidity and polypharmacy, a group traditionally underrepresented in clinical trials. This pilot RCT found that home-based telemonitoring and remote medication titration was both safe and efficacious, reducing systolic BP significantly while decreasing the need for in-person clinic visits. These results suggest that telemedicine can safely address the complexity of hypertension management in elderly patients with multiple comorbidities.

Outside the UK, Kario et al. (2021) conducted the HERB-DH1 pivotal trial on a digital therapeutics system, reporting clinically meaningful reductions in essential hypertension. Although conducted in Japan, the trial's robust design and results provide valuable insights into digital hypertension management's potential, reinforcing applicability to UK settings.

Device Accuracy and Data Quality

In the evolving landscape of hypertension management in UK primary care, the accuracy of home blood pressure monitoring (HBPM) devices and the quality of the data they produce are pivotal. As digital health technologies replace or supplement traditional consultations, clinicians increasingly rely on patient-generated data for diagnosis and treatment. However, this shift introduces new concerns about the reliability of such data, especially when measurements are taken outside of clinical settings. Inaccurate data risks misdiagnosis, inappropriate treatment adjustments, and ultimately poorer health outcomes.

The ACCU-RATE study by Hodgkinson et al. (2020) revealed that nearly 30% of patient-owned BP monitors failed to meet accepted accuracy standards, with some devices producing errors large enough to impact clinical decisions. Over- or underestimation of BP readings can lead to either overtreatment or missed therapeutic interventions. These risks are particularly problematic given the growing use of remote monitoring interventions, such as in the TASMINH4 trial (Grant et al., 2019), where the supplied, validated devices helped control for accuracy—an advantage not guaranteed in real-world settings.

Data quality issues go beyond device performance. Technical faults such as irregular uploads, data loss, and lack of integration with electronic health records have been documented in telemonitoring studies (Morton et al., 2021; Parker et al., 2021). These limitations reduce clinician confidence in the data, requiring manual verification and introducing delays and inefficiencies. When patient-reported values diverge from expected clinical norms, clinicians may distrust the data, reducing their willingness to act on it (Morton et al., 2021).

Patient factors also influence data accuracy. Kassavou et al. (2019) noted that older patients or those with low digital literacy frequently used devices incorrectly—applying cuffs improperly or taking readings at inappropriate times. This can degrade the validity of the measurements. In trials like ATEMPT (Majert et al., 2024), which focused on older, multimorbid patients, additional support was required to ensure correct home monitoring practices.

The problem of "data doubt"—patients being unsure of what their readings mean or whether they are accurate—also reduces the effectiveness of self-monitoring interventions (Yardley et al., 2022). Poorly designed apps and devices that lack feedback mechanisms contribute to patient confusion and disengagement. Meanwhile, large-scale analyses like the OpenSAFELY study (Wiedemann et al., 2024) show that while home monitoring rose during the pandemic, its integration into NHS records remained inconsistent, undermining population-level surveillance and clinical continuity.

Solutions include prioritising the use of validated BP monitors through NHS guidance and support schemes, enhancing patient training, and improving digital platform design. Automated alerts for anomalous readings, better feedback systems for patients, and seamless data transfer into clinical records could help improve trust and clinical utility (Parker et al., 2021).

Ultimately, the promise of digital health in managing hypertension depends on the accuracy and integrity of patient-generated data. Without reliable devices and robust data systems, digital solutions may not only fall short of expectations but could also introduce new risks. Addressing these foundational issues is essential to realise the full benefits of remote monitoring in primary care.

Theme 4.2.2: Patient Engagement, Acceptability, and Adherence

Engagement and Acceptability Among Elderly Patients

Patient engagement is a central factor in the successful management of hypertension using digital interventions, particularly among elderly individuals who represent a significant proportion of the hypertensive population in the UK. For many older adults, home blood pressure monitoring (HBPM) provides a valuable sense of autonomy and control. The TASMINH4 study (Grant et al., 2019) showed that elderly patients appreciated the ability to track their blood pressure at home, which enhanced their understanding of health behaviours and promoted self-management.

However, this engagement is often influenced by age-related factors. Older adults may face challenges such as reduced dexterity, impaired vision or hearing, and cognitive decline, which can affect the usability and acceptability of digital tools. Simplified interfaces and personalised support can increase acceptability in this demographic. The use of tailored messaging—such as voice calls or easy-to-read texts—has proven particularly effective in increasing engagement and adherence, as seen in the trial by Kassavou et al. (2019). These forms of communication are more accessible for older adults, especially those who are less familiar with smartphone apps or internet-based platforms.

Another key concern is the reliability of the monitoring devices used by elderly patients. In the ACCU-RATE study (Hodgkinson et al., 2020), nearly a third of personal BP monitors tested were found to be inaccurate, which can mislead patients and clinicians alike. This is especially problematic for older users who may be unaware of calibration issues or unable to troubleshoot device errors. Ensuring that patients use validated devices, along with periodic quality checks, is critical to maintaining safe and effective care.

The acceptability of digital health is also influenced by the presence or absence of social and technical support. Older adults often rely on family members or caregivers to assist with using technology, interpreting readings, or contacting healthcare professionals. In trials such as ATEMPT (Majert et al., 2024), patients reported that ongoing support was essential for sustained use of home-monitoring tools. Without such assistance, digital interventions can feel isolating or overwhelming to elderly individuals, particularly those living alone or with limited social networks.

Supporting Long-Term Adherence and Reducing Barriers

Maintaining adherence over time is one of the main challenges in managing chronic hypertension digitally, especially in older adults. While initial engagement may be strong, sustained usage often declines without consistent reinforcement. Ware et al. (2022) observed that patients—especially older ones—were more likely to disengage over time without regular feedback or a structured care plan. This highlights the importance of integrating digital interventions within ongoing primary care relationships, where clinicians actively monitor progress and provide timely encouragement.

Older patients may also express a strong preference for traditional care models. Research by Hammersley et al. (2020) found that elderly individuals often favour face-to-face interactions due to the perceived clarity, reassurance, and emotional support they offer. While video and telephone consultations can be beneficial, they are not always accessible or effective for all older users. For instance, hearing difficulties or unfamiliarity with video technology can create communication barriers. A hybrid care model, combining digital tools with periodic in-person consultations, may be the most acceptable solution for this population.

Furthermore, digital exclusion remains a significant issue. Older adults from socioeconomically disadvantaged backgrounds or ethnic minority groups are less likely to have access to smartphones, broadband internet, or the digital skills necessary to navigate healthcare apps. Addressing these structural inequalities is essential to ensuring equitable access to care. Quesada-Caballero et al. (2023) stressed that during the COVID-19 pandemic, many elderly patients experienced confusion and distress when forced to adopt telemonitoring tools without adequate training or preparation.

Co-designing digital interventions with elderly users can help mitigate these barriers. As shown in the DIPSS programme (Yardley et al., 2022), elderly participants were more engaged when involved in shaping the tools they were expected to use. Features such as larger font sizes, audio reminders, and intuitive navigation significantly enhanced usability and satisfaction. In addition, embedding support systems—such as community-based digital health education or home visits for training—can reinforce adherence and confidence.

In conclusion, fostering engagement, acceptability, and adherence among elderly hypertensive patients requires a multi-dimensional approach. This involves validating devices, simplifying interfaces, integrating social support, and respecting user preferences for interaction style. Sustainable adherence can only be achieved by making digital health tools not only available but truly accessible and meaningful to older adults in the context of their everyday lives.

Theme 4.2.3: Implementation Challenges and Health System Integration

Provider Workload, Workflow Integration, and System Readiness

The integration of digital hypertension management into routine primary care presents a variety of implementation challenges, particularly for clinicians and care teams already burdened by high patient volumes. Ware et al. (2022), through a rigorous mixed-methods randomised controlled trial, investigated the implementation of telemonitoring programs for complex chronic conditions and found that healthcare professionals frequently encountered increased workloads. These included not only the task of continuously reviewing blood pressure data remotely submitted by patients, but also the administrative follow-up actions, coordination of medication adjustments, and technical troubleshooting. These additional responsibilities were not matched with proportional increases in staffing or administrative support, leading to strain on clinical workflows and staff morale.

One critical concern highlighted by Ware et al. (2022) was the lack of clarity in role definition within the healthcare team. Primary care providers expressed uncertainty about who should be responsible for interpreting data, initiating interventions, or supporting patients experiencing technological difficulties. This ambiguity contributed to workflow inefficiencies and often undermined provider confidence in the sustainability of telehealth initiatives.

Similarly, Morton et al. (2021), in a mixed-methods process evaluation of a digital hypertension intervention, underscored the pivotal role of organizational preparedness and clinician engagement in successful implementation. Their findings emphasized that without integration into existing electronic health record systems, standardized clinical pathways, and clearly delineated roles, digital interventions risk being viewed as peripheral or experimental. Clinicians are more likely to adopt and sustain new digital care pathways when they are confident that these tools align with

clinical priorities, reduce duplicative efforts, and enhance—rather than hinder—the quality of care.

This issue is particularly significant when caring for elderly patients, who may require more frequent monitoring, medication adjustments, and follow-up due to multimorbidity and frailty. For these patients, fragmented digital workflows can lead to delays in care or reduced clinical responsiveness, which may have more serious consequences than in younger populations. Elderly patients also tend to benefit more from human interaction and reassurance during clinical decision-making, meaning that digital interventions must be closely tied into human support systems.

Training and upskilling clinicians in the use of telemonitoring systems, coupled with leadership support and protected time for digital care management, are essential to ensure the longevity of these programs. Healthcare systems must also provide sufficient technical infrastructure and access to IT support, particularly in practices serving a high proportion of elderly or digitally excluded patients.

Addressing Digital Literacy, Accessibility, and Health Equity for the Elderly

While digital health innovations offer promise for transforming hypertension care, they also risk reinforcing existing health inequities—especially among elderly populations. A key challenge in the implementation of telehealth is the disparity in digital literacy, access to technology, and the confidence needed to engage effectively with digital tools. Older adults frequently face barriers that include reduced vision, hearing, and manual dexterity, along with age-related cognitive decline, all of which can inhibit their ability to use apps, home monitoring devices, or online consultation platforms (Quesada-Caballero et al., 2023).

The problem of digital exclusion is not limited to age alone. As noted by Wiedemann et al. (2024), socioeconomic deprivation, limited educational attainment, and linguistic barriers further compound the challenges faced by elderly patients from minority ethnic backgrounds. During the COVID-19 pandemic, their analysis of nationwide data through the OpenSAFELY platform revealed a marked reduction in blood pressure screening and hypertension control—particularly among older individuals from deprived regions. These disparities underscore the need for targeted, inclusive strategies that prioritise vulnerable groups.

To address these challenges, the implementation of digital hypertension interventions must be accompanied by structured support for elderly users. This includes offering basic digital skills training, access to affordable or subsidised devices, and simplified user interfaces with age-friendly features—such as large-font displays, voice prompts, and intuitive navigation. Moreover, the provision of human support—whether through community health workers, family caregivers, or in-person digital education workshops—can significantly enhance uptake and sustained engagement in older adults.

Another crucial consideration is the emotional and cognitive experience of older adults using digital tools. Many elderly patients express concerns about the impersonal nature of telehealth and the lack of face-to-face reassurance from their clinicians. Hammersley et al. (2020) noted that while remote consultations via video or telephone are functional substitutes for in-person visits, they do not fully replicate the relational and interpretive cues that are particularly important in geriatric care. Older adults often value the human elements of care—the warmth of a clinician's presence, the ability to discuss multiple health concerns in one visit, and the sense of being heard without technological interference.

To address this, a hybrid model of care is increasingly recommended. Such models combine the convenience and efficiency of remote monitoring with periodic in-person consultations that reinforce patient-clinician relationships, enable physical examinations, and support complex decision-making. Hybrid care ensures that elderly patients are not forced into a digital-only paradigm that may not suit their needs or preferences.

Furthermore, policymakers must address the broader social determinants that shape digital engagement. This includes ensuring that broadband infrastructure reaches underserved communities, that digital health interventions are culturally and linguistically appropriate, and that older adults are involved in the co-design of technologies intended for their use. As Yardley et al. (2022) demonstrated in the DIPSS programme, involving patients—including elderly participants—in the development of digital interventions led to greater usability, satisfaction, and long-term adherence.

The Enduring Impact of COVID-19 on Elderly Hypertension Care

The onset of the COVID-19 pandemic in early 2020 catalysed one of the most dramatic shifts in UK primary care in recent history. As in-person consultations were curtailed to reduce infection risk, primary care providers rapidly adopted digital and remote methods of patient engagement, including blood pressure telemonitoring and virtual consultations. While this shift was necessary and, in many ways, effective in preserving continuity of care, it also surfaced profound disparities in digital access and readiness, particularly among elderly patients.

Wiedemann et al. (2024) found that, in the early months of the pandemic, there was a sharp decline in recorded BP measurements and hypertension follow-ups, driven largely by the suspension of routine screenings. For elderly patients who were previously monitored in-clinic or during home visits, this disruption created a gap in care continuity. Some older adults were able to adapt to home-based monitoring and telephone reviews, and many appreciated the safety, convenience, and reduced need for travel that remote consultations offered (Quesada-Caballero et al., 2023). Yet, for others, the absence of direct human interaction, challenges with technology, and concerns about correctly using home BP monitors created new anxieties.

These mixed experiences underscore that elderly patients are not a homogeneous group in terms of digital readiness. While some may be comfortable using smartphones and managing devices, others require significant support or alternative approaches. Importantly, those who were most socially isolated or had limited social support were also least likely to benefit from remote monitoring strategies.

The lessons learned from the pandemic are reshaping the long-term trajectory of hypertension care. There is a growing recognition that digital health should complement rather than replace traditional care models. Hybrid systems that integrate telemonitoring with face-to-face visits offer the flexibility needed to meet the diverse needs of elderly populations. Furthermore, the crisis has accelerated efforts to improve digital infrastructure, train healthcare staff in telehealth delivery, and build more inclusive models of care that acknowledge the varying capacities and preferences of older adults.

In conclusion, the implementation of digital hypertension interventions in UK primary care must balance innovation with inclusivity. For elderly patients, success depends not only on technological functionality but also on human-centred design, equitable access, and integration into personalised care pathways. Policymakers, providers,

and developers must work together to ensure that elderly individuals are not left behind in the digital transformation of healthcare.

Theme 4.2.4: Future Directions and Innovations in Digital Hypertension Care

Learning Healthcare Systems and AI for Lifespan Hypertension Care

The next decade will see hypertension management shift toward a true **learning healthcare system**—one in which each blood-pressure reading, medication change, or lifestyle data point feeds an anonymised, continually updating evidence base that instantly loops back to guide clinical care. Maddula et al. (2022) describe how large, linked, real-time data sets from primary-care records, pharmacy dispensing, wearables, and connected home monitors can be mined with machine-learning algorithms to flag deterioration, predict hospital-admission risk, and suggest medication titrations before adverse events occur. For older adults, whose haemodynamic variability and multi-morbid profiles often defy "one-size-fits-all" targets, AI can personalise thresholds: for example, loosening BP goals for a frail 88-year-old with orthostatic hypotension, while tightening them for a robust 68-year-old with early nephropathy. Voice-activated interfaces, fall-detection sensors, and cuff-less photoplethysmography wearables can further reduce the manual steps that currently deter very old or arthritic patients from daily self-monitoring, thereby widening engagement across all age brackets.

Yardley et al. (2022) add that algorithms alone are insufficient; they must sit inside behaviourally informed, co-designed ecosystems. That means dashboards that translate probability scores into plain-language prompts ("Your evening readings have crept up this week—would you like a nurse call tomorrow?") and apps that adapt coaching style to the user's cognitive and sensory needs. Dynamic tailoring is especially valuable for the elderly, whose motivation and abilities may fluctuate with acute illness, medication side-effects, or caregiver availability, but it also benefits younger users by delivering just-in-time nudges rather than generic alerts.

Policy, Education, and Research Agenda for Sustainable Adoption

Realising this vision demands policy architecture that treats digital hypertension care as core infrastructure, not a bolt-on pilot. Commissioners will need reimbursement codes that cover validated home monitors, data plans, and staff time for virtual reviews. Regulatory bodies must maintain up-to-date device-validation registries and

mandate post-market surveillance, protecting all age groups—especially older adults, who are most vulnerable to harm from inaccurate readings. Robust data-privacy standards are equally critical to maintain public trust while enabling large-scale analytics.

Parallel investment in human capital is essential. Clinicians require training in interpreting algorithmic risk scores and in coaching patients through remote-care pathways; patients need age-tailored digital-literacy programmes delivered via community centres, libraries, and social-care networks. For the oldest old, blended models that pair technology with scheduled home visits or telephone outreach can bridge sensory and cognitive gaps.

Finally, the evidence base must mature from proof-of-concept trials to large, pragmatic studies that reflect real-world diversity in age, ethnicity, and socioeconomic status. Future research should report cost-effectiveness from both NHS and societal viewpoints, examine long-term cardiovascular and quality-of-life outcomes, and include implementation-science metrics—fidelity, acceptability, equity—so that successful digital pathways can be scaled safely across UK primary care. Only by aligning advanced analytics with behavioural design, equitable policy, and rigorous research can digital hypertension care fulfil its promise for people of every age.

4.3 Discussion

The synthesis of contemporary UK studies confirms that telemedicine and digital platforms offer significant promise in enhancing hypertension management among elderly patients, delivering measurable improvements in BP control and patient adherence. These benefits stem largely from enabling frequent home BP monitoring, timely clinical feedback, and personalized behavioral support.

However, telemedicine is not a panacea. Device accuracy remains a critical concern, with many patient-owned BP monitors failing validation tests (Hodgkinson et al., 2020). Without addressing this, clinical decisions based on inaccurate data risk patient safety. Equally, patient digital literacy and socio-economic factors influence engagement and equitable access (Quesada-Caballero et al., 2023; Wiedemann et al., 2024). Failure to address these risks exacerbating existing health inequalities.

Healthcare providers face challenges integrating telemedicine into already strained workflows. Increased workload and the need for new competencies underscore the

importance of organizational support and adequate resourcing (Ware et al., 2022; Morton et al., 2021). Successful implementation requires careful change management,

4.4 Methodological critiques

Many of the studies exploring telemedicine and digital platforms for hypertension management in the elderly UK population suffer from limitations related to small sample sizes and study durations. Several investigations are pilot or feasibility trials with limited participants, which reduces the statistical power to detect meaningful clinical effects or to confidently generalize findings to the broader population (Kassavou et al., 2019; Majert et al., 2024). Additionally, the short-term nature of these studies means that long-term adherence, sustainability of blood pressure control, and impact on cardiovascular outcomes remain unclear. This temporal limitation restricts the understanding of whether initial improvements can be maintained and whether digital interventions translate into tangible health benefits over time (Morton et al., 2021; Yardley et al., 2022).

Selection bias is a pervasive concern in digital health research, with participants often being more motivated, technologically literate, and health-conscious than the general elderly population. This skew limits the external validity of results since those less comfortable with technology—arguably the group that could benefit most—are underrepresented (Yardley et al., 2022; Quesada-Caballero et al., 2023). The digital divide thus confounds outcomes, as it becomes challenging to distinguish between the true efficacy of the intervention and the influence of pre-existing digital competence or health literacy. Furthermore, many studies do not report sufficient demographic and socioeconomic data to assess equity or conduct subgroup analyses, leaving gaps in understanding how these interventions perform across diverse populations.

The accuracy and reliability of patient self-monitored blood pressure measurements, which underpin many telemedicine studies, are often questioned. Hodgkinson et al. (2020) revealed variability in the performance of home blood pressure monitors, highlighting potential measurement bias in telemonitoring data. The lack of standardization and independent validation of devices introduces inconsistencies, and poor adherence to recommended measurement protocols by patients further compromises data quality. This measurement error threatens the internal validity of studies and complicates the interpretation of intervention effectiveness.

Telemonitoring data analysis itself presents methodological challenges due to the complex nature of the data, including irregular measurement intervals, missing readings, and autocorrelations between repeated measures. Parker et al. (2021) emphasized that simplistic statistical methods commonly used may yield biased or inaccurate estimates of effect. More sophisticated approaches such as mixed-effects modeling or time-series analyses that account for the longitudinal and hierarchical structure of the data are necessary to harness the full potential of telemonitoring datasets and produce robust conclusions.

Another important limitation is the predominant focus on short-term outcomes, often restricted to blood pressure reduction over a few weeks or months. The elderly population, especially those with multiple chronic conditions, require sustained control and management to achieve meaningful reductions in morbidity and mortality. The lack of longer-term follow-up and evaluation of clinically significant endpoints such as cardiovascular events or hospitalizations limits the clinical applicability of current research (Majert et al., 2024). There is a pressing need for extended longitudinal studies and real-world evidence to assess the enduring impact and cost-effectiveness of these digital interventions.

Qualitative studies have provided valuable insights into patient and clinician perspectives regarding telemedicine use; however, these studies often involve small, purposive samples, limiting generalizability. Furthermore, many lack transparency in methodology, such as unclear recruitment strategies or insufficient discussion of data saturation and reflexivity, which affects the trustworthiness of their findings (Ware et al., 2022; Morton et al., 2021). Strengthening qualitative research methods and integrating these findings with quantitative data will enhance understanding of barriers, facilitators, and implementation challenges.

Finally, a critical but underreported aspect is the context and process of implementing telemedicine interventions within the complex structure of UK primary care. Few studies systematically examine or report healthcare system factors such as professional training, digital infrastructure, workflow integration, and cost implications (Morton et al., 2021). This lack of implementation science perspective limits insights into scalability and real-world feasibility, which are crucial for informing policy and routine practice adoption.

Chapter 5

5. Conclusion and Recommendation

5.1 Conclusion

Digital health technologies offer transformative potential for improving hypertension management in the elderly, a group disproportionately affected by high blood pressure and related cardiovascular risks. The convenience of remote blood pressure monitoring, teleconsultations, and mobile health apps can reduce the burden of frequent clinic visits, which are often challenging for older adults due to mobility issues, transportation difficulties, or coexisting health conditions. These tools also enable continuous, real-time data collection, allowing more responsive and personalized care. However, older adults face distinct challenges that may limit their ability to benefit fully from digital hypertension care. Reduced digital literacy, visual or hearing impairments, cognitive decline, and limited familiarity with technology can create barriers to effective use. Furthermore, physiological factors such as arterial stiffness common in older adults can affect the accuracy of automated blood pressure devices, raising concerns about reliability in remote settings. The COVID-19 pandemic accelerated the adoption of digital health but also exposed gaps in access and support, particularly for the elderly, emphasizing the need for equitable solutions that do not exacerbate existing health disparities.

5.2 Recommendations

Enhance Digital Literacy and Support for Older Adults

Digital literacy remains a significant barrier for many elderly individuals who wish to engage with telehealth and remote monitoring technologies. To overcome this, it is essential to implement comprehensive, accessible digital skills training programs specifically tailored to the unique learning needs of older adults. These programs should use simple, jargon-free language and hands-on approaches to familiarize seniors with the basics of device operation, app navigation, and troubleshooting common issues. Incorporating devices and interfaces designed for ease of use—such as large buttons, clear displays, voice commands, and minimal steps—can significantly improve user experience and confidence. Moreover, ongoing technical support must be made readily available through community centers, primary care practices, or dedicated helplines to provide timely assistance. Such support structures not only empower elderly patients to maintain consistent engagement but also reduce frustration and the risk of abandonment of digital tools. Encouraging

peer-led learning and involving family caregivers in training sessions can further enhance skill acquisition and acceptance (Quesada-Caballero et al., 2023).

Prioritize Device Accuracy and Safety for Elderly Users

Blood pressure monitors and digital health technologies must be validated specifically for elderly populations, whose physiological characteristics often differ significantly from younger adults. Factors such as arterial stiffness, arrhythmias, and variable arm circumference can affect the accuracy of readings (Hodgkinson et al., 2020). Consequently, healthcare providers and manufacturers should ensure that devices undergo rigorous clinical testing in older cohorts and meet stringent accuracy standards. Regular calibration of devices should be mandated as part of routine care, supported by healthcare professionals who can supervise correct usage and interpret data within the context of age-related health changes. Training patients and caregivers on proper measurement techniques—such as correct cuff placement and timing—is also crucial to maintaining data quality. Given the high stakes involved in hypertension management, particularly for elderly patients at increased risk of cardiovascular events, device safety and reliability are paramount to avoid misdiagnosis or inappropriate treatment adjustments.

Integrate Hybrid Care Models to Meet Diverse Needs

While telemonitoring and remote consultations offer significant advantages—such as convenience, reduced travel, and lowered infection risk—they cannot fully replace the need for in-person care, especially among elderly patients with complex health profiles. Many older adults experience cognitive impairment, sensory deficits (hearing or vision loss), or multimorbidity that require comprehensive physical assessments and nuanced clinical judgement best delivered face-to-face. Thus, health systems should promote hybrid care models that blend digital and traditional approaches tailored to individual preferences and clinical complexity.(Baskaran T B, et al, 2024). For example, routine blood pressure monitoring and medication adjustments may be effectively managed remotely, while periodic in-person visits ensure thorough evaluations, medication reconciliation, and psychosocial support. Such hybrid models foster patient-centered care by allowing flexibility and preserving vital personal interactions, which enhance trust and adherence (Wiedemann et al., 2024).

Address Social Determinants and Promote Equity in Access

Health inequalities remain a pervasive challenge in digital health adoption, particularly affecting elderly individuals from socioeconomically disadvantaged or

rural backgrounds. These populations often face compounded barriers including lack of access to affordable devices, poor internet connectivity, limited digital skills, and social isolation (Wiedemann et al., 2024). To ensure equitable hypertension management, targeted interventions are needed. Policymakers and healthcare providers should facilitate affordable or subsidized provision of blood pressure monitors and tablets or smartphones, alongside affordable broadband access. Outreach programs designed in culturally sensitive and linguistically appropriate ways can increase awareness and acceptance of telehealth services. Collaborations with community organizations, senior centers, and social services are vital to reach vulnerable elderly groups effectively. By addressing these social determinants, health systems can reduce disparities and enhance the overall impact of digital hypertension care (Quesada-Caballero et al., 2023).

Train Healthcare Providers in Elder-Focused Digital Care

The successful integration of digital hypertension management depends heavily on healthcare providers' ability to interpret remotely collected data accurately and tailor clinical decisions to elderly patients' specific needs. Clinicians require specialized training to understand the limitations of technology in older adults, including recognizing potential inaccuracies caused by physiological factors or incorrect device use. Training programs should also focus on improving communication skills to discuss digital health options clearly and empathetically, addressing elderly patients' concerns or resistance. Additionally, providers must learn to integrate digital data seamlessly into existing workflows to avoid increased workload or burnout. Equipping the workforce with these competencies will enhance clinical effectiveness, promote patient engagement, and ensure the sustainability of telehealth initiatives (Ware et al., 2022; Morton et al., 2021).

Develop Age-Appropriate Policy Frameworks for Sustainable Digital Care

Policymakers and healthcare administrators need to design digital health policies that explicitly consider the unique challenges and needs of elderly populations. This includes establishing reimbursement schemes that fairly compensate telemonitoring and remote consultations tailored for older adults, incentivizing providers to offer these services without financial disincentives.(Goldman, 2012). Data privacy regulations should safeguard sensitive health information while facilitating appropriate data sharing among care teams. Importantly, policies must support infrastructure investments to enhance digital access in underserved elderly communities. Additionally, funding should prioritize research on age-specific digital

interventions and their long-term cost-effectiveness. Developing robust policy frameworks with elder-focused provisions will foster equitable, scalable, and sustainable hypertension management in primary care settings across all age groups (Quesada-Caballero et al., 2023; Yardley et al., 2022).

5.3 Future Studies

Future research must prioritize the elderly as a distinct population when evaluating digital interventions for hypertension management. Large-scale, long-duration randomized controlled trials focusing on older adults—including those with frailty, cognitive impairment, or multiple comorbidities—are critical to establish clinical effectiveness and safety. These studies should incorporate comprehensive outcome measures such as quality of life, functional status, and caregiver burden in addition to blood pressure control. Economic evaluations that consider cost-effectiveness, healthcare utilization, and patient/caregiver time investment will help justify broader implementation. Implementation science approaches using qualitative and quantitative methods can uncover barriers and facilitators specific to diverse elderly populations, guiding tailored intervention strategies. Given the heterogeneity of the elderly, sub-group analyses based on age brackets, cognitive status, and socioeconomic factors will enhance understanding of who benefits most and under what conditions. Co-design methodologies involving elderly users and their families should be integrated into all stages of digital tool development to ensure accessibility and user-friendliness. Finally, the application of artificial intelligence and machine learning to personalize hypertension care for older adults shows promise but requires careful ethical considerations related to data privacy, informed consent, and maintaining patient autonomy.

Abstract

Tables:

Table 1: Table of selected articles:

ID	Author	Title	Link	DOI
1	Grant, S., Hodgkinson, J., Schwartz, C., Bradburn, P., Franssen, M., Hobbs, F.R., Jowett, S., McManus, R.J. and Greenfield, S. (2019)	Using mHealth for the management of hypertension in UK primary care: an embedded qualitative study of the TASMINH4 randomised controlled trial.	https://bjgp.org/content/69/686/e612	https://doi.org/10.3399/bjgp19x704585
2	Hodgkinson, J.A., Lee, M.-M., Milner, S., Bradburn, P., Stevens, R., Hobbs, F.R., Koshiaris, C., Grant, S., Mant, J. and McManus, R.J. (2020).	Accuracy of blood-pressure monitors owned by patients with hypertension (ACCU-RATE study): a cross-sectional, observational study in central England.	https://bjgp.org/content/70/697/e548	https://doi.org/10.3399/bjgp20X710381
3	Hammersley, V., Donaghy, E., Parker, R., McNeilly, H., Atherton, H., Bikker, A., Campbell, J. and McKinstry, B. (2019)	Comparing the content and quality of video, telephone, and face-to-face consultations: a non-randomised, quasi-experimental, exploratory study in UK primary care'	https://bjgp.org/content/69/686/e595	https://doi.org/10.3399/bjgp19X704573
4	Kario, K., Nomura, A., Harada, N., Okura, A., Nakagawa, K., Tanigawa, T. and Hida, E. (2021)	Efficacy of a digital therapeutics system in the management of essential hypertension: the HERB-DH1 pivotal trial	https://academic.oup.com/eurheartj/article/42/40/4111/6358480?login=false	https://doi.org/10.1093/eurheartj/ehab559
5	Kassavou, A., Mirzaei, V., Brimicombe, J., Edwards, S., Massou, E., Prevost, T., Griffin, S. and Sutton, S. (2019).	A highly tailored text and voice messaging intervention to improve medication adherence in	https://academic.oup.com/eurheartj/article/42/40/4111/6358480?login=false	https://doi.org/10.2196/16629

		patients with hypertension and/or type 2 diabetes in UK primary care setting. A feasibility randomised controlled trial.		
6	Maddula, R., MacLeod, J., McLeish, T., Painter, S., Steward, A., Berman, G., Hamid, A., Abdelrahim, M., Whittle, J. and Brown, S.A. (2022).	The role of digital health in the cardiovascular learning healthcare system	https://www.frontiersin.org/journals/cardiovascular-medicine/articles/10.3389/fcvm.2022.1008575/full	https://doi.org/10.3389/fcvm.2022.1008575
7	Majert, J., Milad Nazarzadeh, Ramakrishnan, R., Zeinab Bidel, Hedgecott, D., Perez-Crespillo, A., Turpie, W., Akhtar, N., Allison, M., Rao, S., Gudgin, B., McAuley, M., A'Court, C., Billot, L., Kotecha, D., Potter, J. and Rahimi, K. (2024).	Efficacy of decentralised home-based antihypertensive treatment in older adults with multimorbidity and polypharmacy (ATEMPT): an open-label randomised controlled pilot trial.	https://www.thelancet.com/journals/lanhl/article/PIIS2666-7568(23)00259-3/fulltext	https://doi.org/10.1016/s2666-7568(23)00259-3
8	Morton, K., Dennison, L., Band, R., Stuart, B., Wilde, L., Cheetham-Blake, T., Heber, E., Slodkowska-Barabasz, J., Little, P., McManus, R.J., May, C.R., Yardley, L. and Bradbury, K. (2021).	Implementing a digital intervention for managing uncontrolled hypertension in Primary Care: a mixed methods process evaluation.	https://implementationscience.biomedcentral.com/articles/10.1186/s13012-021-01123-1	https://doi.org/10.1186/s13012-021-01123-1
9	Parker, R.A., Padfield, P., Hanley, J., Pinnock, H., Kennedy, J., Stoddart, A., Hammersley, V., Sheikh, A. and McKinstry, B. (2021).	Examining the effectiveness of telemonitoring with routinely acquired blood pressure data in primary care: challenges in the statistical analysis.	https://bmcmedresmethodol.biomedcentral.com/articles/10.1186/s12874-021-01219-8	doi:https://doi.org/10.1186/s12874-021-01219-8.
10	Quesada-Caballero, M., Carmona-García, A., Chami-Peña, S., Caballero-Mateos, A.M., Fernández-Martín, O., Cañadas-De la	Telemedicine in Elderly Hypertensive and Patients with Chronic Diseases	**https://www.mdpi.com/2077-0383/12/19/6160**	https://doi.org/10.3390/jcm12196160

	Fuente, G.A. and Romero-Bejar, J.L. (2023).	during the COVID-19 Pandemic: A Systematic Review and Meta-Analysis.		
11	Ware, P., Shah, A., Ross, H.J., Logan, A.G., Segal, P., Cafazzo, J.A., Szacun-Shimizu, K., Resnick, M., Vattaparambil, T. and Seto, E. (2022).	Challenges of Telemonitoring Programs for Complex Chronic Conditions: Randomized Controlled Trial With an Embedded Qualitative Study.	https://www.jmir.org/2022/1/e31754	https://doi.org/10.2196/31754
12	Wiedemann, M., Speed, V., Cunningham, C., Higgins, R., Curtis, H.J., Andrews, C., Fisher, L., Hopcroft, L., Rentsch, C.T., Mahalingasivam, V., Tomlinson, L., Morton, C., Samuel, M., Green, A., Wood, C., Brown, A.D., Massey, J., Walters, C., Smith, R.M. and Inglesby, P. (2024).	Impact of COVID-19 on recorded blood pressure screening and hypertension management in England: an analysis of monthly changes in the quality and outcomes framework indicators in OpenSAFELY.	https://openheart.bmj.com/content/11/2/e002732	doi:https://doi.org/10.1136/openhrt-2024-002732.
13	Yardley, L., Morton, K., Greenwell, K., Stuart, B., Rice, C., Bradbury, K., Ainsworth, B., Band, R., Murray, E., Mair, F., May, C., Michie, S., Richards-Hall, S., Smith, P., Bruton, A., Raftery, J., Zhu, S., Thomas, M., McManus, R.J. and Little, P. (2022).	Digital interventions for hypertension and asthma to support patient self-management in primary care: the DIPSS research programme including two RCTs.	https://www.journalslibrary.nihr.ac.uk/pgfar/BWFI7321#abstract	https://doi.org/10.3310/BWFI7321

Table 2: Table of Quality Assessment:

ID	Author	Did the review address a clearly focused question?	Did the authors look for the right type of papers?	Do you think all the important, relevant studies were included?	Did the review's authors do enough to assess quality of the included studies?	If the results of the review have been combined, was it reasonable to do so?	What are the overall results of the review?	How precise are the results?	Can the results be applied to the local population?	Were all important outcomes considered?	Are the benefits worth the harms and costs?
1	Grant, S., Hodgkinson, J., Schwartz, C., Bradburn, P., Fransen, M., Hobbs, F.R., Jowett, S., McManus, R.J. and Greenfield, S. **, 2019**	Yes	Yes	Yes	Yes	Yes	Self and telemonitoring for hypertension were well accepted and improved patient engagement and blood pressure outcomes in UK primary care. Structured home	Results were robust due to a randomized controlled trial design.	Yes	Yes	Yes

							monitoring empowered patients and facilitated faster communication between patients and providers.				
2	Hodgkinson, J.A., Lee, M.-M., Milner, S., Bradburn, P., Stevens, R., Hobbs, F.R., Koshiaris, C., Grant, S., Mant, J. and McManus, R.J. (2020).	Yes	Yes	Yes	Yes	Yes	Most patient-owned blood pressure monitors were accurate, especially validated and newer devices. Cuff failure occurred in a minority of cases, but overall reliability was high.	Results were precise, with narrow confidence intervals and clear subgroup analyses.	Yes	Yes	Yes
3	Hammersley, V., Donaghy, E., Parker, R., McNei	Yes	Yes	Yes	Yes	Yes	Video and telephone consultations were generally	The study's precision is limited by its exploratory, non-	Yes	Yes	Yes

	lly, H., Atherton, H., Bikker, A., Campbell, J. and McKinstry, B. (2019)						comparable to face-to-face consultations in content and quality. Some differences in communication and information exchange were noted between remote and in-person consultations.	randomized design.			
4	Kario, K., Nomura, A., Harada, N., Okura, A., Nakagawa, K., Tanigawa, T. and Hida, E. (2021)	Yes	Yes	Yes	Yes	Yes	A digital therapeutics system significantly reduced systolic blood pressure compared to standard care. The study was a pivotal trial with robust statistical analyses and	Results demonstrate high precision and support the efficacy of digital interventions for hypertension.	Yes	Yes	Yes

							clear endpoints.				
5	Kassavou, A., Mirzaei, V., Brimicombe, J., Edwards, S., Massou, E., Prevost, T., Griffin, S. and Sutton, S. (2019).	Yes	Yes	Yes	Yes	Yes	A tailored text and voice messaging intervention was feasible and acceptable for improving medication adherence. The intervention showed potential benefits, but larger trials are needed for definitive efficacy.	Precision is limited by the small sample size and feasibility study design.	Yes	Yes	Yes
6	Maddula, R., MacLeod, J., McLeish, T., Painter, S., Steward, A.,	Yes	Yes	Yes	Yes	Yes	Digital health tools can enhance cardiovascular care by supporting data-	Precision is limited as it is a narrative review.	Yes	Yes	Yes

	Berman, G., Hamid, A., Abdelrahim, M., Whittle, J. and Brown, S.A. (2022).						driven decision-making and patient engagement. The article synthesizes current evidence and trends rather than presenting original data.				
7	Majert, J., Milad Nazarzadeh, Ramakrishnan, R., Zeinab Bidel, Hedgecott, D., Perez-Crespillo, A., Turpie, W., Akhtar, N., Allison, M., Rao, S., Gudgin, B., McAuley,	Yes	Yes	Yes	Yes	Yes	Decentralized home-based antihypertensive treatment was feasible and safe for older adults with multimorbidity. No significant differences in adverse events were found compared to usual care.	The pilot nature of the study limits the precision of the results.	Yes	Yes	Yes

	M., A'Court, C., Billot, L., Kotecha, D., Potter, J. and Rahimi, K. (2024).										
8	Morton, K., Dennison, L., Band, R., Stuart, B., Wilde, L., Cheetham-Blake, T., Heber, E., Slodkowska-Barabasz, J., Little, P., McManus, R.J., May, C.R., Yardley, L. and Bradbury, K. (2021).	Yes	Yes	Yes	Yes	Yes	Digital interventions for managing uncontrolled hypertension were generally well accepted in primary care. Integration into workflows was challenging due to staff workload and digital literacy barriers.	Precision is limited by the mixed methods and process evaluation design.	Yes	Yes	Yes

9	Parker, R.A., Padfield, P., Hanley, J., Pinnock, H., Kennedy, J., Stoddart, A., Hammersley, V., Sheikh, A. and McKinstry, B. (2021).	Yes	Yes	Yes	Yes	Yes	Telemonitoring using routinely acquired blood pressure data is feasible in primary care. Statistical analysis was complicated by missing data and variability in data collection.	Results are less precise due to data quality issues.	Yes	Yes	Yes
10	Quesada-Caballero, M., Carmona-García, A., Chami-Peña, S., Caballero-Mateos, A.M., Fernández-Martín, O., Cañadas-De la Fuente,	Yes	Yes	Yes	Yes	Yes	Telemedicine improved blood pressure control and was well accepted among elderly patients during the COVID-19 pandemic. The systematic review and meta-	Subgroup analyses further support the robustness of the findings.	Yes	Yes	Yes

	G.A. and Romero-Bejar, J.L. (2023).						analysis provide high precision for pooled effect estimates.				
11	Ware, P., Shah, A., Ross, H.J., Logan, A.G., Segal, P., Cafazzo, J.A., Szacun-Shimizu, K., Resnick, M., Vattaparambil, T. and Seto, E. (2022).	Yes	Yes	Yes	Yes	Yes	Telemonitoring improved clinical outcomes for patients with complex chronic conditions. Challenges included patient engagement, technology use, and integration into care pathways.	The randomized controlled trial design provides robust quantitative data.	Yes	Yes	Yes
12	Wiedemann, M., Speed, V., Cunningham, C., Higgins, R., Curtis, H.J., Andrews, C.,	Yes	Yes	Yes	Yes	Yes	COVID-19 led to a temporary reduction in blood pressure screening and hypertension manag	Results are highly precise due to the extensive dataset used.	Yes	Yes	Yes

	Fisher, L., Hopcroft, L., Rentsch, C.T., Mahalingasivam, V., Tomlinson, L., Morton, C., Samuel, M., Green, A., Wood, C., Brown, A.D., Massey, J., Walters, C., Smith, R.M. and Inglesby, P. (2024).						ement in England. Services largely recovered over time, as shown by large-scale database analysis.				
13	Yardley, L., Morton, K., Greenwell, K., Stuart, B., Rice, C., Bradbury, K., Ainsworth, B., Band, R., Murra	Yes	Yes	Yes	Yes	Yes	Digital interventions supported patient self-management and improved outcomes for hypertension and asthma in primary	Findings demonstrate high precision and support the use of digital interventions in routine care.	Yes	Yes	Yes

	y, E., Mair, F., May, C., Michie, S., Richards-Hall, S., Smith, P., Bruton, A., Raftery, J., Zhu, S., Thomas, M., McManus, R.J. and Little, P. (2022).						care. The research programme included two randomized controlled trials with robust statistical analyses.				

References:

1. Agarwal N, Agarwal S..(2020) Polypharmacy in Elderly Patients with Hypertension. *Drug Discovery*, 2020, 14(33), Pg No.-100-105. Available at: http://www.discoveryjournals.org (Accessed: 30 March 2025).
2. Alashek, WA. and Ali, S. (2024). Satisfaction with telemedicine use during COVID-19 pandemic in the UK: a systematic review. *Libyan Journal of Medicine*, [online] 19(1). doi:https://doi.org/10.1080/19932820.2024.2301829.
3. Ali, S. H. M., Osman Mohamed, A. A., Osman, H. M. M., Abdelrahman Ibrahim, M. E., Hassan Mukhtar, M. A., Ahmed Mohamed, F. H., & Alhajri, A. H. M. (2024). The Role of Telemedicine in Improving Hypertension Management Outcomes: A Systematic Review. *Cureus*, *16*(11), e74090. https://doi.org/10.7759/cureus.74090.Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC11578275/ (Accessed: 3 April 2025).
4. Al-khafajiy, M., Baker, T., Chalmers, C., Asim, M., Kolivand, H., Fahim, M. and Waraich, A. (2019). Remote health monitoring of elderly through wearable sensors. *Multimedia Tools and Applications*, [online] 78(17), pp.24681–24706. doi:https://doi.org/10.1007/s11042-018-7134-7.
5. Andreadis, K., Muellers, K., Lin, J., Mkuu, R., Horowitz, C., Kaushal, R. and Ancker, J. (2024). Navigating Privacy and Security in Telemedicine for Primary Care. *www.ajmc.com*, [online] 30, pp.SP459–SP463. Available at: https://www.ajmc.com/view/navigating-privacy-and-security-in-telemedicine-for-primary-care. [Accessed 21 May 2025].
6. Aronow, W.S., Fleg, J.L., Pepine, C.J., et al. (2011) 'ACCF/AHA Expert Consensus Document on Hypertension in the Elderly', *Journal of the American College of Cardiology*, 57(20), pp. 2037–2114. Available at: https://www.jacc.org (Accessed: 30 March 2025).
7. Benzeval, M., Booker, C.L., Burton, J., Crossley, T.F., Jackle, A., Kumari, M. and Read, B. (2020) 'Briefing note COVID-19 survey: disruptions to health and social care', *Institute for Fiscal Studies*. Available at: https://ifs.org.uk (Accessed: 30 March 2025).
8. Bernstein, P., Ko, K. J., Israni, J., Cronin, A. O., Kurliand, M. M., Shi, J. M., Chung, J., Borgo, L., Reed, A., Kosten, L., Chang, A. M., Sites, F. D., Funahashi, T., & Agha, Z. (2023). Urgent and non-emergent telehealth care for seniors: Findings from a multi-site impact study. *Journal of telemedicine and telecare*, *29*(7), 566–575. https://doi.org/10.1177/1357633X211004321

9. Bhaskar, S. et al. (2022) 'Telemedicine use among older adults during COVID-19', *Journal of Telemedicine and Telecare*, 28(4), pp. 291–300. Available at: https://pmc.ncbi.nlm.nih.gov (Accessed: 30 March 2025).
10. BMJ Open (2012) 'Telehealth for blood pressure control in stroke survivors', *BMJ Open*, 2(6), e001391. Available at: https://bmjopen.bmj.com/content/2/6/e001391 (Accessed: 9 April 2025).
11. Boima, V., Doku, A., Agyekum, F., Lawrence Sena Tuglo and Agyemang, C. (2024). Effectiveness of digital health interventions on blood pressure control, lifestyle behaviours and adherence to medication in patients with hypertension in low-income and middle-income countries: A systematic review and meta-analysis of randomised controlled trials. *EClinicalMedicine*, 69(1), pp.102432–102432. doi:https://doi.org/10.1016/j.eclinm.2024.102432.
12. Bou-Karroum, L., El-Jardali, F., Hemadi, N., Faraj, Y., Ojha, U., Shahrour, M., Darzi, A., Ali, M., Doumit, C., Langlois, E.V., Melki, J., AbouHaidar, G.H. and Akl, E.A. (2017). Using media to impact health policy-making: An integrative systematic review. *Implementation Science*, [online] 12(1). doi:https://doi.org/10.1186/s13012-017-0581-0.
13. Bou-Karroum, L., Hakoum, M.B., Hammoud, M.Z., Khamis, A.M., Al-Gibbawi, M., Badour, S., Justina Hasbani, D., Cruz Lopes, L., El-Rayess, H.M., El-Jardali, F., Guyatt, G. and Akl, E.A. (2018). Reporting of Financial and Non-financial Conflicts of Interest in Systematic Reviews on Health Policy and Systems Research: A Cross Sectional Survey. *International Journal of Health Policy and Management*, 7(8), pp.711–717. doi:https://doi.org/10.15171/ijhpm.2017.146.
14. CASP (2018). *Critical Appraisal Checklists*. [online] Critical Appraisal Skills Programme. Available at: https://casp-uk.net/casp-tools-checklists/. (Accessed on: 20 April 2025).
15. CDC (2024). *Rapid Evaluations of Telehealth Strategies to Address Hypertension*. [online] High Blood Pressure. Available at: https://www.cdc.gov/high-blood-pressure/php/data-research/telehealth-strategies/index.html. (Accessed on: 6 April,2025)
16. Choi, N.G., DiNitto, D.M., Marti, C.N. and Choi, B.Y. (2021). Telehealth Use Among Older Adults During COVID-19: Associations With Sociodemographic and Health Characteristics, Technology Device Ownership, and Technology Learning. *Journal of Applied Gerontology*, 41(3), p.073346482110473. doi:https://doi.org/10.1177/07334648211047347.

17. Clovis MF.(2024), Education and learning: potential methodological and ethical issues in systematic reviews containing a meta-analysis: some critical reading suggestions for junior doctors, *Postgraduate Medical Journal*, Volume 100(1182),Pages 269–273, https://doi.org/10.1093/postmj/qgad130
18. Cottrell, E., Chambers, R., & O'Connell, P. (2012). Using simple telehealth in primary care to reduce blood pressure: a service evaluation. *BMJ open*, *2*(6), e001391. https://doi.org/10.1136/bmjopen-2012-001391.(Accessed: 30 March 2025).
19. Custodero, C. et al. (2022) 'Remote monitoring of geriatric outpatients during COVID-19', *European Geriatric Medicine*, 13(2), pp. 123–130. Available at: https://pmc.ncbi.nlm.nih.gov (Accessed: 30 March 2025).
20. Dong, Q., Liu, T., Liu, R., Yang, H., & Liu, C. (2023). Effectiveness of Digital Health Literacy Interventions in Older Adults: Single-Arm Meta-Analysis. *Journal of medical Internet research*, *25*, e48166. https://doi.org/10.2196/48166
21. Du, Q., Ye, J., Feng, J., Gao, S., & Li, K. (2023). Study on the application effect of the family doctor contract service mode of 'basic package+personalised package' in elderly hypertension management in Chengdu, China: a retrospective observational study. *BMJ open*, *13*(5), e064908. https://doi.org/10.1136/bmjopen-2022-064908. Available at: https://bmjopen.bmj.com (Accessed: 30 March 2025).
22. Friedman, A.B., Pathmanabhan, C., Glicksman, A., Demiris, G., Cappola, A.R. and McCoy, M.S. (2022). Addressing Online Health Privacy Risks for Older Adults: A Perspective on Ethical Considerations and Recommendations. *Gerontology and Geriatric Medicine*, 8, p.233372142210957. doi:https://doi.org/10.1177/23337214221095705.
23. Gálvez-Barrón, C., Kamel Boulos, M., Prescher, S., Cano, C., Ortega, E., Tió, A., Morales Gras, J., O'donovan, K., Boladeras, M., Köhler, F. and Rodríguez-Molinero, A. (2015). *2 Telemedicine Scenario for Elderly People with Comorbidity*. [online] Available at: https://upcommons.upc.edu/bitstream/handle/2117/28393/K13212_C012_Draft_TelemedicineScenario+(1).pdf?sequence=1 [Accessed 13 Apr. 2025].
24. Gareri, P. et al. (2022) 'Remote healthcare during the COVID-19 pandemic', *Frontiers in Public Health*, 10(921379). Available at: https://www.frontiersin.org (Accessed: 30 March 2025).
25. Grant, S., Hodgkinson, J., Schwartz, C., Bradburn, P., Franssen, M., Hobbs, F.R., Jowett, S., McManus, R.J. and Greenfield, S. (2019). Using mHealth for

the management of hypertension in UK primary care: an embedded qualitative study of the TASMINH4 randomised controlled trial. *British Journal of General Practice*, 69(686), pp.e612–e620. doi:https://doi.org/10.3399/bjgp19x704585.

26. Greenhalgh, T., Wherton, J., Shaw, S., and Morrison, C. (2020) 'Video consultations for COVID-19', *BMJ*, 368:m998. Available at: https://www.bmj.com (Accessed: 3 April 2025).
27. Groenland, E.H., Vendeville, J.-P.A.C., Bemelmans, R.H.H., Monajemi, H., Bots, M.L., Visseren, F.L.J. and Spiering, W. (2022). Smartphone Application-Assisted Home Blood Pressure Monitoring Compared With Office and Ambulatory Blood Pressure Monitoring in Patients With Hypertension: the AMUSE-BP Study. *Hypertension*, 79(10), pp.2373–2382. doi:https://doi.org/10.1161/hypertensionaha.122.19685.
28. Guasti L, Gaudio G(2023). European Society of Cardiology **'***Hypertension in older adults'*. Available at: https://www.escardio.org (Accessed: 30 March 2025).
29. Gurupur, V. P., & Miao, Z. (2022). A brief analysis of challenges in implementing telehealth in a rural setting. *mHealth*, *8*, 17. doi.org/10.21037/mhealth-21-38
30. Haimi, M., Goren, U. and Grossman, Z. (2024). Barriers and challenges to telemedicine usage among the elderly population in Israel in light of the COVID-19 era: A qualitative study. *Digital health*, [online] 10, p.20552076241240235. doi:https://doi.org/10.1177/20552076241240235. [Accessed on: 15 April 2025].
31. Hakim, R. (2023). *Realising the potential of virtual wards | NHS Confederation*. [online] www.nhsconfed.org. Available at: https://www.nhsconfed.org/publications/realising-potential-virtual-wards.
32. Hammersley, V., Donaghy, E., Parker, R., McNeilly, H., Atherton, H., Bikker, A., Campbell, J. and McKinstry, B. (2019). Comparing the content and quality of video, telephone, and face-to-face consultations: a non-randomised, quasi-experimental, exploratory study in UK primary care. *British Journal of General Practice*, [online] 69(686), pp.e595–e604. doi:https://doi.org/10.3399/bjgp19x704573.
33. Hammersley, V., Parker, R., Paterson, M., Hanley, J., Pinnock, H., Padfield, P., Stoddart, A., Park, H.G., Sheikh, A. and McKinstry, B. (2020). Telemonitoring at scale for hypertension in primary care: An implementation

study. *PLOS Medicine*, 17(6), p.e1003124. doi:https://doi.org/10.1371/journal.pmed.1003124.

34. Herington, J., Connelly, K. and Illes, J. (2023). Ethical Imperatives for Working With Diverse Populations in Digital Research. *Journal of Medical Internet Research*, 25, p.e47884. doi:https://doi.org/10.2196/47884.
35. Hodgkinson, J.A., Lee, M.-M., Milner, S., Bradburn, P., Stevens, R., Hobbs, F.R., Koshiaris, C., Grant, S., Mant, J. and McManus, R.J. (2020). Accuracy of blood-pressure monitors owned by patients with hypertension (ACCU-RATE study): a cross-sectional, observational study in central England. *British Journal of General Practice*, [online] 70(697), pp.e548–e554. Available at: https://bjgp.org/content/70/697/e548. [Accessed 21 April 2025].
36. Hoffer-Hawlik M, Moran A, Zerihun L, Usseglio J, Cohn J, et al. (2021) Telemedicine interventions for hypertension management in low- and middle-income countries: A scoping review. PLOS ONE 16(7): e0254222. https://doi.org/10.1371/journal.pone.0254222.
37. Houser, S., Flite, C. and Foster, S. (2023). Privacy and Security Risk Factors Related to Telehealth Services – A Systematic Review. *Perspectives in Health Information Management*, [online] 20(1), p.1f. Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC9860467/. [Accessed 21 April 2025].
38. Idris, H., Nugraheni, W. P., Rachmawati, T., Kusnali, A., Yulianti, A., Purwatiningsih, Y., Nuraini, S., Susianti, N., Faisal, D. R., Arifin, H., & Maharani, A. (2024). How Is Telehealth Currently Being Utilized to Help in Hypertension Management within Primary Healthcare Settings? A Scoping Review. *International journal of environmental research and public health*, *21*(1), 90. https://doi.org/10.3390/ijerph21010090. Available at: https://www.mdpi.com/1660-4601/21/1/90 (Accessed: 3 April 2025).
39. Institute for Fiscal Studies (2020) *Covid-19 and disruptions to the health and social care of older people in England*. Available at: https://ifs.org.uk (Accessed: 30 March 2025).
40. Joanna Briggs Institute (2020). *Critical Appraisal Tools*. [online] JBI. Available at: https://jbi.global/critical-appraisal-tools.(Accessed: 30 March 2025).
41. Jorgensen BB, Gregersen M, Pallesen SH, Damsgaard EMS.(2023). Computer habits and digital literacy in geriatric patients: A survey. *DIGITAL HEALTH,* **9**, pp. 20552076231191004.
42. Kario, K., Nomura, A., Harada, N., Okura, A., Nakagawa, K., Tanigawa, T. and Hida, E. (2021). Efficacy of a digital therapeutics system in the management of essential hypertension: the HERB-DH1 pivotal trial. *European*

Heart Journal, [online] 42(40), pp.4111–4122. doi:https://doi.org/10.1093/eurheartj/ehab559. [Accessed 21 April 2025].

43. Kassavou, A., Mirzaei, V., Brimicombe, J., Edwards, S., Massou, E., Prevost, T., Griffin, S. and Sutton, S. (2019). A highly tailored text and voice messaging intervention to improve medication adherence in patients with hypertension and/or type 2 diabetes in UK primary care setting. A feasibility randomised controlled trial. (Preprint). *Journal of Medical Internet Research*, 22(5). doi:https://doi.org/10.2196/16629.
44. Khanijahani, A., Akinci, N. and Quitiquit, E. (2022). A Systematic Review of the Role of Telemedicine in Blood Pressure Control: Focus on Patient Engagement. *Current Hypertension Reports*, 24(7). doi:https://doi.org/10.1007/s11906-022-01186-5.
45. Kruse, C.S., Karem, P., Shifflett, K., Vegi, L., Ravi, K. and Brooks, M. (2019). Evaluating barriers to adopting telemedicine worldwide: A systematic review. *Journal of Telemedicine and Telecare*, 24(1), pp.4–12. doi:https://doi.org/10.1177/1357633x16674087.
46. Kruse, C.S., Krowski, N., Rodriguez, B., Tran, L., Vela, J. and Brooks, M. (2017). Telehealth and Patient satisfaction: a Systematic Review and Narrative Analysis. *BMJ Open*, 7(8), p.e016242. doi:https://doi.org/10.1136/bmjopen-2017-016242.
47. Leff, B., Ritchie, C.S., Rising, K.L., Cannon, K. and Wardlow, L. (2025). Addressing barriers to equitable telehealth for older adults. *Frontiers in Medicine*, 12. doi:https://doi.org/10.3389/fmed.2025.1483366.
48. Levine, D.M., Ouchi, K., Blanchfield, B., Diamond, K., Licurse, A., Pu, C.T. and Schnipper, J.L. (2018). Hospital-Level Care at Home for Acutely Ill Adults: a Pilot Randomized Controlled Trial. *Journal of General Internal Medicine*, 33(5), pp.729–736. doi:https://doi.org/10.1007/s11606-018-4307-z.
49. Li, Y., Maimaitiaili, R., Zhang, Y., Feng, T., Xu, Y., Yang, H., Zhang, J., Shi, J., Wang, M., Zhao, F., Gao, J., Hu, J., Jiang, C. and Zhao, Y. (2022). Simplified regimen for the management of hypertension with telemedicine and blood pressure self-monitoring (SIMPLE): study protocol for a randomised controlled trial. *BMJ Open*, [online] 12(3), p.e049162. doi:https://doi.org/10.1136/bmjopen-2021-049162. [Accessed 21 April 2025].
50. Mace, R.A., Mattos, M.K. and Vranceanu, A.-M. (2022). Older adults can use technology: why healthcare professionals must overcome ageism in digital health. *Translational Behavioral Medicine*, [online] 12(12). doi:https://doi.org/10.1093/tbm/ibac070. [Accessed 26 April 2025].

51. Maddula, R., MacLeod, J., McLeish, T., Painter, S., Steward, A., Berman, G., Hamid, A., Abdelrahim, M., Whittle, J. and Brown, S.A. (2022). The role of digital health in the cardiovascular learning healthcare system. *Frontiers in Cardiovascular Medicine*, [online] 9, p.1008575. doi:https://doi.org/10.3389/fcvm.2022.1008575.
52. Majert, J., Milad Nazarzadeh, Ramakrishnan, R., Zeinab Bidel, Hedgecott, D., Perez-Crespillo, A., Turpie, W., Akhtar, N., Allison, M., Rao, S., Gudgin, B., McAuley, M., A'Court, C., Billot, L., Kotecha, D., Potter, J. and Rahimi, K. (2024). Efficacy of decentralised home-based antihypertensive treatment in older adults with multimorbidity and polypharmacy (ATEMPT): an open-label randomised controlled pilot trial. ˜ *The œLancet. Healthy longevity*. doi:https://doi.org/10.1016/s2666-7568(23)00259-3.
53. Malički, M., Jerončić, A., Aalbersberg, I.J., Bouter, L. and ter Riet, G. (2021). Systematic review and meta-analyses of studies analysing instructions to authors from 1987 to 2017. *Nature Communications*, 12(1). doi:https://doi.org/10.1038/s41467-021-26027-y.
54. McManus, R.J., Mant, J., Franssen, M., Nickless, A., Schwartz, C., Hodgkinson, J., Bradburn, P., Farmer, A., Grant, S., Greenfield, S.M., Heneghan, C., Jowett, S., Martin, U., Milner, S., Monahan, M., Mort, S., Ogburn, E., Perera-Salazar, R., Shah, S.A. and Yu, L.-M. (2018). Efficacy of self-monitored blood pressure, with or without telemonitoring, for titration of antihypertensive medication (TASMINH4): an unmasked randomised controlled trial. *The Lancet*, 391(10124), pp.949–959. doi:https://doi.org/10.1016/s0140-6736(18)30309-x.
55. Mobbs, R.J., Ho, D., Choy, W.J., Betteridge, C. and Lin, H. (2020). COVID-19 is shifting the adoption of wearable monitoring and telemedicine (WearTel) in the delivery of healthcare: opinion piece. *Annals of Translational Medicine*, 8(20), pp.1285–1285. doi:https://doi.org/10.21037/atm-20-3678.
56. Mohammad Akbar Hossain (2024). Impact of Telemedicine on the Clinical Outcomes among Elderly Patients: A Systematic Review. *Archives of Pharmacy Practice*, [online] 15(2), pp.82–92. doi:https://doi.org/10.51847/2tavelw0xj. [Accessed 26 March 2025].
57. Mohammad H.H.,Gharibzade A,Choobin N and Ansarifard H. (2024). Applications and outcomes of implementing telemedicine for hypertension management in COVID-19 pandemic: A systematic review. *PLoS ONE*, 19(8), pp.e0306347–e0306347. doi:https://doi.org/10.1371/journal.pone.0306347.

58. Morton, K., Dennison, L., Band, R., Stuart, B., Wilde, L., Cheetham-Blake, T., Heber, E., Slodkowska-Barabasz, J., Little, P., McManus, R.J., May, C.R., Yardley, L. and Bradbury, K. (2021). Implementing a digital intervention for managing uncontrolled hypertension in Primary Care: a mixed methods process evaluation. *Implementation Science*, 16(1). doi:https://doi.org/10.1186/s13012-021-01123-1.
59. Nakrys M, Valinskas S, Aleknavicius K and Jonusas J (2023). Pilot Investigation of Blood Pressure Control Using a Mobile App (Cardi.Health): Retrospective Chart Review Study. *JMIR Cardio*, [online] 7, pp.e48454–e48454. doi:https://doi.org/10.2196/48454.
60. NHS Digital (2019) *Health Survey for England: Hypertension*. Available at: https://digital.nhs.uk (Accessed: 30 March 2025).
61. NHS England (2023). *Telemonitoring at scale for hypertension in primary care*. [online] Available at: https://transform.england.nhs.uk/key-tools-and-info/digital-playbooks/cardiology-digital-playbook/telemonitoring-at-scale-for-hypertension-in-primary-care/. [Accessed 26 March 2025].
62. NICE (2019) *Hypertension in Adults: Diagnosis and Management*. Available at: https://www.nice.org.uk (Accessed: 30 March 2025).
63. Office for national statistics (2023). *Risk factors for undiagnosed high blood pressure in England - Office for National Statistics*. [online] www.ons.gov.uk. Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthandwellbeing/articles/riskfactorsforundiagnosedhighbloodpressureinengland/2015to2019. [Accessed 26 March 2025].
64. Okuyama, K., Akai, K., Kijima, T., Abe, T., Isomura, M., & Nabika, T. (2019). Effect of geographic accessibility to primary care on treatment status of hypertension. *PloS one*, *14*(3), e0213098. https://doi.org/10.1371/journal.pone.0213098. Available at: https://pmc.ncbi.nlm.nih.gov (Accessed: 30 March 2025).
65. Omboni, S. (2019). Connected Health in Hypertension Management. *Frontiers in Cardiovascular Medicine*, 6(76). doi:https://doi.org/10.3389/fcvm.2019.00076.
66. Omboni, S. (2023) 'Telemedicine for hypertension management: a paradigm shift from telemonitoring to digital therapeutics', *Expert Review of Medical Devices*, 20(9), pp. 711–714. doi: 10.1080/17434440.2023.2242270.Available at: https://www.tandfonline.com/doi/full/10.1080/17434440.2023.2242270 (Accessed: 3 April 2025).

67. Omboni, S., Caserotti, P., Coronel, F., et al. (2022) 'Telemedicine for hypertension management: where we stand, where we are headed', *Conn Health Telemed*, 1, pp. 85–97. Available at: https://www.oaepublish.com/articles/ch.2022.09 (Accessed: 3 April 2025).
68. Omboni, S., McManus, R.J., Bosworth, H.B. et al. (2020) 'Evidence and recommendations on the use of telemedicine for the management of arterial hypertension: an international expert position paper', *Hypertension*, 76(6), pp. 1368–1376. Available at: https://www.ahajournals.org/doi/10.1161/HYPERTENSIONAHA.120.15873 (Accessed: 3 April 2025).
69. Omboni, S., McManus, R.J., Bosworth, H.B., Chappell, L.C., Green, B.B., Kario, K., Logan, A.G., Magid, D.J., Mckinstry, B., Margolis, K.L., Parati, G. and Wakefield, B.J. (2020). Evidence and Recommendations on the Use of Telemedicine for the Management of Arterial Hypertension. *Hypertension*, 76(5), pp.1368–1383. doi:https://doi.org/10.1161/hypertensionaha.120.15873.
70. Oxman, A.D., Schünemann, H.J. and Fretheim, A. (2006). Improving the use of research evidence in guideline development: 2. Priority setting. *Health Research Policy and Systems*, 4(1). doi:https://doi.org/10.1186/1478-4505-4-14.
71. Parker, R.A., Padfield, P., Hanley, J., Pinnock, H., Kennedy, J., Stoddart, A., Hammersley, V., Sheikh, A. and McKinstry, B. (2021). Examining the effectiveness of telemonitoring with routinely acquired blood pressure data in primary care: challenges in the statistical analysis. *BMC Medical Research Methodology*, 21(1). doi:https://doi.org/10.1186/s12874-021-01219-8.
72. Public Health England (2017). *Estimated from the Health Survey for England*. [online] Available at: https://assets.publishing.service.gov.uk/media/5e725883e90e070aca43cc9d/Summary_of_hypertension_prevalence_estimates_in_England__1_.pdf. [Accessed 28 April 2025].
73. Quesada-Caballero, M., Carmona-García, A., Chami-Peña, S., Caballero-Mateos, A.M., Fernández-Martín, O., Cañadas-De la Fuente, G.A. and Romero-Bejar, J.L. (2023). Telemedicine in Elderly Hypertensive and Patients with Chronic Diseases during the COVID-19 Pandemic: A Systematic Review and Meta-Analysis. *Journal of Clinical Medicine*, [online] 12(19), p.6160. doi:https://doi.org/10.3390/jcm12196160. [Accessed 28 April 2025].
74. Rural Health Information Hub (2018). *Barriers to Telehealth in Rural Areas*. [online] Ruralhealthinfo.org. Available at:

https://www.ruralhealthinfo.org/toolkits/telehealth/1/barriers. (Accessed on: 6 April,2025

75. Ryu, S. (2012). Telemedicine: Opportunities and Developments in Member States: Report on the Second Global Survey on eHealth 2009 (Global Observatory for eHealth Series, Volume 2). *Healthcare Informatics Research*, 18(2), p.153. doi:https://doi.org/10.4258/hir.2012.18.2.153.
76. Sangaleti, C. T., Lentsck, M. H., Silva, D. C. D., Machado, A., Trincaus, M. R., Vieira, M. C. U., Pelazza, B. B., & Colombo, F. M. C. (2023). Polypharmacy, potentially inappropriate medications and associated factors among older adults with hypertension in primary care. *Revista brasileira de enfermagem*, *76Suppl 2*(Suppl 2), e20220785. https://doi.org/10.1590/0034-7167-2022-0785. Available at: https://www.scielo.br (Accessed: 30 March 2025).
77. Shimbo, D. and Marvel, F. (2024) 'Home blood pressure monitoring to improve hypertension care', *Cardiometabolic Health*. Available at: https://www.cardiometabolichealth.org (Accessed: 3 April 2025).
78. Smolić, Š., Blaževski, N. and Fabijančić, M. (2022). Remote Healthcare During the COVID-19 Pandemic: Findings for Older Adults in 27 European Countries and Israel. *Frontiers in Public Health*, [online] 10. doi:https://doi.org/10.3389/fpubh.2022.921379. [Accessed 28 April 2025].
79. UK Government(2024). *Stoke-on-Trent: telehealth helps patients manage their own conditions*. [online] Available at: https://www.gov.uk/government/case-studies/stoke-on-trent-telehealth-helps-patients-manage-their-own-conditions. [Accessed 28 April 2025].
80. Wang Q-P, Chang W-Y, Han M-M, Hu Y-X, Lin S-S and Gu Y-C (2024) Application of telemedicine system for older adults postoperative patients in community: a feasibility study. *Frontiers in Public Health*. 12:1291916. doi: 10.3389/fpubh.2024.1291916
81. Wang, Y., Tan, J., Zhao, J., Wang, T., Ma, T., Shao, L. and Sun, W. (2025). Wearable Devices as Tools for Better Hypertension Management in Elderly Patients. *Medical Science Monitor*, [online] 31. doi:https://doi.org/10.12659/msm.946079. [Accessed 23 May. 2025].
82. Wardlow, L., Roberts, C., & Archbald-Pannone, L. (2023). Perceptions and Uses of Telehealth in the Care of Older Adults. *Telemedicine journal and e-health : the official journal of the American Telemedicine Association*, *29*(8), 1143–1151. doi.org/10.1089/tmj.2022.0378
83. Ware, P., Shah, A., Ross, H.J., Logan, A.G., Segal, P., Cafazzo, J.A., Szacun-Shimizu, K., Resnick, M., Vattaparambil, T. and Seto, E. (2022).

Challenges of Telemonitoring Programs for Complex Chronic Conditions: Randomized Controlled Trial With an Embedded Qualitative Study. *Journal of Medical Internet Research*, 24(1), e31754. https://doi.org/10.2196/31754

84. WHO Europe (2025) *Providing health care considerations for older people during COVID-19 pandemic*. Available at: https://www.who.int (Accessed: 30 March 2025).
85. Wiedemann, M., Speed, V., Cunningham, C., Higgins, R., Curtis, H.J., Andrews, C., Fisher, L., Hopcroft, L., Rentsch, C.T., Mahalingasivam, V., Tomlinson, L., Morton, C., Samuel, M., Green, A., Wood, C., Brown, A.D., Massey, J., Walters, C., Smith, R.M. and Inglesby, P. (2024). Impact of COVID-19 on recorded blood pressure screening and hypertension management in England: an analysis of monthly changes in the quality and outcomes framework indicators in OpenSAFELY. *Open Heart*, [online] 11(2), p.e002732. doi:https://doi.org/10.1136/openhrt-2024-002732. [Accessed 23 May. 2025].
86. Wilmink, G., Dupey, K., Akire, S., Grote, J., Zobel, G., Fillit, H.M. and Movva, S. (2020). 'AI-Powered Digital Health Platform and Wearable Devices Improve Outcomes for Older Adults in Assisted Living Communities: Pilot Study.' *JMIR Aging*, 3(2). doi:https://doi.org/10.2196/19554.
87. World Health Organisation (2023). *Testing the accuracy of an innovation in diverse settings: A multi-country study assessing a smartphone blood pressure application*. [online] Available at: https://www.who.int/news/item/21-04-2023-multi-country-study-assessing-a-smartphone-blood-pressure-application. [Accessed 18 May. 2025].
88. Yardley, L., Morton, K., Greenwell, K., Stuart, B., Rice, C., Bradbury, K., Ainsworth, B., Band, R., Murray, E., Mair, F., May, C., Michie, S., Richards-Hall, S., Smith, P., Bruton, A., Raftery, J., Zhu, S., Thomas, M., McManus, R.J. and Little, P. (2022). Digital interventions for hypertension and asthma to support patient self-management in primary care: the DIPSS research programme including two RCTs. *NIHR Journals Library*. https://www.journalslibrary.nihr.ac.uk/pgfar/BWFI7321
89. Yatabe, J., Yatabe, M.S., Okada, R. and Ichihara, A. (2021). Efficacy of Telemedicine in Hypertension Care Through Home Blood Pressure Monitoring and Videoconferencing: Randomized Controlled Trial. *JMIR Cardio*, 5(2), p.e27347. doi:https://doi.org/10.2196/27347.
90. Zarour, M., Alenezi, M., Ansari, M.T.J., Pandey, A.K., Ahmad, M., Agrawal, A., Kumar, R. and Khan, R.A. (2021). Ensuring data integrity of healthcare

information in the era of digital health. *Healthcare Technology Letters*, [online] 8(3), pp.66–77. doi:https://doi.org/10.1049/htl2.12008. Available on: https://ietresearch.onlinelibrary.wiley.com/doi/10.1049/htl2.12008.(Accessed on: 19 April,2024.)

91. Zhang, X. and Saltman, R. (2021). Impact of Electronic Health Records interoperability on Telehealth service outcomes . *JMIR Medical Informatics*, [online] 10(1), p.e31837. doi:https://doi.org/10.2196/31837.
92. Gajarawala, S. and Pelkowski, J. (2020). Telehealth benefits and barriers. *The Journal for Nurse Practitioners*, [online] 17(2), pp.218–221. doi:https://doi.org/10.1016/j.nurpra.2020.09.013.
93. Bann, D., Fluharty, M., Hardy, R. and Scholes, S. (2020). Socioeconomic inequalities in blood pressure: co-ordinated analysis of 147,775 participants from repeated birth cohort and cross-sectional datasets, 1989 to 2016. *BMC Medicine*, 18(1). doi:https://doi.org/10.1186/s12916-020-01800-w.
94. Santschi, V., Chiolero, A., Colosimo, A.L., Platt, R.W., Taffé, P., Burnier, M., Burnand, B. and Paradis, G. (2014). Improving Blood Pressure Control Through Pharmacist Interventions: A Meta- Analysis of Randomized Controlled Trials. *Journal of the American Heart Association*, 3(2). doi:https://doi.org/10.1161/jaha.113.000718.
95. Margolis, K.L., Bergdall, A.R., Crain, A.L., JaKa, M.M., Anderson, J.P., Solberg, L.I., Sperl-Hillen, J., Beran, M., Green, B.B., Haugen, P., Norton, C.K., Kodet, A.J., Sharma, R., Appana, D., Trower, N.K., Pawloski, P.A., Rehrauer, D.J., Simmons, M.L., McKinney, Z.J. and Kottke, T.E. (2022). Comparing Pharmacist-Led Telehealth Care and Clinic-Based Care for Uncontrolled High Blood Pressure: The Hyperlink 3 Pragmatic Cluster-Randomized Trial. *Hypertension (Dallas, Tex.: 1979)*, [online] 79(12), pp.2708–2720. doi:https://doi.org/10.1161/HYPERTENSIONAHA.122.19816.
96. British Heart Foundation (2018). *Digital solution could help thousands of Scots with high blood pressure*. [online] Bhf.org.uk. Available at: https://www.bhf.org.uk/what-we-do/news-from-the-bhf/news-archive/2018/april/digital-solution-could-help-thousands-of-scots-with-high-blood-pressure.(Accessed on: 20 April, 2024.)
97. Drake, C., Lewinski, A.A., Rader, A., Schexnayder, J., Bosworth, H.B., Goldstein, K.M., Gierisch, J., White-Clark, C., McCant, F. and Zullig, L.L. (2022). Addressing hypertension outcomes using telehealth and population health managers: Adaptations and implementation considerations. *Current*

Hypertension Reports, 24(8), pp.267–284. doi:https://doi.org/10.1007/s11906-022-01193-6.

98. University of North Carolina (2019). *LibGuides: Creating a PRISMA flow diagram: Creating a PRISMA flow diagram*. [online] Unc.edu. Available at: https://guides.lib.unc.edu/prisma.[Accessed 28 May. 2025].
99. Baskaran T B, P., Raghav, P. and Naveen, K.H.S. (2024). Hybrid model of care for older persons for improvement of frailty index—a community-based interventional study in an urban setting. *BMC Geriatrics*, 24(1). doi:https://doi.org/10.1186/s12877-024-05351-0.
100. Goldman, J. (2012). *mHealth Task Force mHealth Task Force Co-Chairs*. [online] Available at: https://mdpnp.mgh.harvard.edu/wp-content/uploads/2022/11/2012-mhealth-taskforce-recommendations.pdf [Accessed 28 May. 2025].