Enhancing Health Wellbeing of Chronic Patient Through Digital Health; A Systematic Review of Best Nursing Practices and Lessons Learned

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Abstract

Background: Context: Digital health interventions have become essential instruments in contemporary medicine, providing viable means of improving patient outcomes and healthcare provision. The goal of this study is to examine the impact, difficulties, and potential future directions of digital health interventions across a range of healthcare situations by synthesizing results from 12 carefully chosen studies. Aim: This study's objective is to thoroughly examine and summarize the body of research on digital health interventions, with an emphasis on acceptance and utilization as well as implementation and efficacy. Method: Twelve pertinent papers published between 2016 and 2024 were found after a thorough search of electronic databases. Numerous digital health interventions were covered by these research, such as remote monitoring systems, telemedicine, and mobile applications. In order to find common themes, sub-themes, and patterns among the chosen research, thematic analysis was used in the data synthesis process. Results: A number of important themes emerged from the thematic analysis, including interoperability problems, patient engagement, healthcare provider acceptability, regulatory concerns, and usability issues. The sub-themes that fell under these categories emphasized the variables that affect the uptake and efficacy of digital health interventions. Conclusion: The synthesis of data emphasizes how digital health initiatives can increase clinical results, improve patient care, and streamline the delivery of healthcare. But in order to fully reap the benefits, major obstacles like interoperability problems, regulatory

difficulties, and usability impediments need to be solved. The recommendations put forth aim to promote innovation and evidence-based practice in digital health by stressing user-centered design, improving digital literacy among medical practitioners, and encouraging interdisciplinary collaboration.

Keywords: Health Wellbeing. Chronic Patient. Digital Health. Nursing Practices. Mobile Application. Lessons Learned. A Systematic Review.

1. Introduction

Worldwide healthcare systems are facing an increasing load from chronic diseases like diabetes, cardiovascular disease, and chronic respiratory problems (Bhavnani et al., 2017). These illnesses necessitate ongoing management and coordinated care since they are frequently complex and lifelong. Finding novel ways to enhance patient outcomes and quality of life has become imperative due to the increase in the prevalence of chronic diseases (Matthew-Maich et al., 2016). With tools and platforms that facilitate patient education, remote monitoring, and smooth communication between patients and healthcare providers, digital health technology have become a viable alternative (Hewitt et al., 2019). Given their central position in the management and coordination of long-term care, nurses must embrace the use of these technologies in their practice (Howarth et al., 2018).

A wide range of technologies are included in the field of digital health, such as wearable technology, telehealth services, mobile health applications, and electronic health records (Wongvibulsin et al., 2021). Real-time data collecting and analysis is made possible by these instruments, which helps with prompt interventions and individualized treatment plans (Karekla et al., 2019). Digital health technology can help chronic patients with ongoing monitoring of their vital signs, adherence to their drug regimen, and lifestyle choices (Cohen et al., 2016). All critical components of successful illness management. In order to improve patient involvement, self-management, and general wellbeing, nurses are in a unique position to use these technologies as main caregivers (Batra et al., 2017).

In digital health, nurses have a more comprehensive role than in traditional care delivery (Hall et al., 2015). They also teach patients how to use digital tools, understand data, and make well-informed clinical decisions based on current knowledge. Good patient education is essential because it enables people to actively manage their health (Sharma et al., 2018), which improves adherence to treatment regimens and encourages the adoption of healthier lifestyle choices (Guo et al., 2020). Furthermore, digital platforms facilitate regular communication between nurses and patients, enabling them to offer assistance and direction, swiftly address concerns, and modify treatment plans as necessary (Philippe et al., 2022). Establishing trust and guaranteeing patient compliance require this continuous communication (Arigo et al., 2019).

One of the main pillars of digital health is remote monitoring, which has enormous advantages for managing chronic illnesses (Demiris et al., 2019). Nurses can monitor vital signs such as blood pressure, blood glucose, and physical activity of patients on a constant basis via wearable

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technology and smartphone applications (Berry et al., 2019). By detecting possible problems early, this continuous monitoring makes it possible to take prompt action that can avert difficulties and hospital stays (Kvedar et al., 2014). Additionally, patients especially those with mobility issues or those who live in rural areas can receive healthcare more easily and conveniently thanks to remote monitoring, which eliminates the need for frequent in-person visits (Ventura et al., 2022).

Adoption of digital health technologies is not without difficulties, though. Patients' and healthcare practitioners' differing degrees of technical literacy are one of the main obstacles (Bevilacqua et al., 2021). A successful deployment depends on making sure that both parties are sufficiently trained and at ease with these technologies (Hernandez et al., 2015). In order to guide and assist patients in using digital health platforms, nurses need to possess the requisite competencies (Clarkeet al., 2017). To guarantee that all people have equitable access to these technologies, it is also imperative to solve the digital divide. A patient's capacity to efficiently use digital health tools can be influenced by age, location, and socioeconomic status (Azelton et al., 2021).

Significant issues in the field of digital health also include data security and privacy. Strong safeguards must be in place to prevent data breaches and unauthorized access since patient information protection is of utmost importance (Safavi et al., 2019). Maintaining patient trust and protecting the privacy of sensitive health information requires nurses to be informed about, and to follow, pertinent laws and best practices for data security (Li et al., 2020). Delivering healthcare in the modern era requires striking a balance between the advantages of digital health and the requirement for strict security measures (Duffy et al., 2022).

More proactive and individualized treatment is possible when digital health technology are included into nursing practice (Kelley et al., 2020). Nurses may create individualized care plans that meet the specific requirements of each patient by utilizing the power of real-time data (Bevilacqua et al., 2021). This individualized strategy raises patient participation and happiness while also improving health outcomes (Ibrahim et al., 2022). Digital platforms enable collaboration among healthcare providers, ensuring a coordinated approach to managing chronic diseases and maximizing resource and expertise utilization (Tran et al., 2020).

Digital health is a complex endeavor that calls for cooperation, education, and technology to improve the health and wellbeing of chronic patients (Dang et al., 2021). In order to monitor, inform, and assist patients in managing their chronic diseases, nurses play a crucial part in this process by using digital tools. The management of chronic diseases could greatly benefit from digital health, notwithstanding certain obstacles (Stark et al., 2022). Healthcare systems may enhance patient outcomes, lessen the burden of chronic diseases, and transition to a more effective and efficient model of care by implementing best practices and addressing the lessons discovered from present implementations.

Significant of study

This study is significant because it examines how digital health technology can improve nursing practices and improve the health and wellness of people with chronic conditions (Bevilacqua et al., 2021). Innovative strategies that enhance patient outcomes and quality of life are desperately

needed, as chronic diseases continue to place a significant burden on healthcare systems throughout the world. This study attempts to offer insights into practical approaches for patient education, remote monitoring, and individualized treatment by methodically examining best nursing practices and lessons discovered in the use of digital health resources. Knowing these procedures helps to improve the integration of digital health technologies in the future, which will lead to more proactive and patient-centered chronic illness management. It also informs present nursing practice.

Aim of the study

In order to improve the health and wellness of chronic patients, this study aims to thoroughly review and summarize the best nursing practices and lessons discovered in the use of digital health technology (Hewitt et al., 2019). This research aims to offer comprehensive insights that can help nurses and healthcare providers optimize the management of chronic diseases by identifying successful strategies for interdisciplinary collaboration, patient education, personalized care, and remote monitoring within digital health frameworks. By emphasizing evidence-based strategies that enhance patient outcomes and quality of life in the context of chronic illness, the study ultimately seeks to advance nursing practice.

2. Methodology

Research question

This project aims to investigate the following research question: What are the most effective nursing practices and important takeaways from using digital health technology to improve the health and well-being of long-term patients? With the purpose of identifying essential insights and useful nursing techniques for the application of digital health tools including patient education, telehealth, and remote monitoring, this study will methodically explore and analyze the literature currently in publication. The goal of the research is to answer this issue and offer evidence-based suggestions that can enhance nursing practice and lead to improved outcomes and a higher quality of life for patients with chronic conditions.

Research Question		How do digital health technologies (I) compared to conventional nursing care without digital tools (C) influence health outcomes and wellbeing metrics (O) among adults with chronic illnesses like diabetes, heart disease, or long-term respiratory disorders (P), assessed from January 2014 to June 2024 (T)?
Population	P	Adults who suffer from a variety of chronic illnesses, such as diabetes, heart disease, or long-term respiratory disorders.
Intervention	I	Use of digital health technologies (e.g., telemedicine, remote monitoring systems, mobile health apps).
Comparison	C	Nursing treatment that is conventional or standard and does not use digital health technologies based on the past literature.
Outcome	O	Enhanced welfare metrics and health results (e.g., patient happiness, quality of life, and illness management).
Timeframe	T	Timeframe of January 2014 to 2023 December.

Using a systematic review of the literature, the research aims to identify effective nursing practices and key insights that improve patient education, disease management, and overall

Mona Mohammed Matmi, Sayed Shahbal, Amirah Senaitan Alharbi, Fatimah Atiah Almalki, Faizah Ayedh Almutairi, Amani Alawi Abualrahi, Maha Mohammed Alanazi, Wael Faleh Alanazi, Mohammed Malik Almuslim, Rida Mashhoor Alqahtani

quality of life. The findings aim to provide evidence-based recommendations to optimize nursing care practices, which will ultimately lead to improved outcomes and better patient satisfaction in chronic disease management. This study aims to investigate how digital health technologies, including telemedicine, remote monitoring systems, and mobile health apps (I), impact health outcomes and wellbeing metrics for adults with chronic illnesses (P), compared to conventional nursing care without digital tools (C) from January 2014 to June 2024 (T).

Selection Criteria

The review's selection criteria cover research on the application of digital health technology to the management of chronic diseases, including papers released between January 2014 and June 2024. The adult populations (those over the age of 18) with chronic illnesses such diabetes, heart disease, and long-term respiratory ailments will be the focus of the included studies. Research on digital health interventions as a component of nursing care techniques, such as telemedicine, remote monitoring systems, or mobile health applications, must be clearly stated. The outcomes of improved welfare measures and health outcomes, such as patient satisfaction, increases in quality of life, and efficient illness management, will be featured in articles that are qualified for inclusion. Studies that are not in English that only concentrate on pediatric populations, or that do not specifically examine digital health technologies or how they affect nursing practices in chronic illness situations will be excluded.

Database Selection

To make sure that all pertinent research is thoroughly reviewed for this study, a thorough literature search will be carried out across multiple major databases. The databases that have been chosen include Web of Science, Cochrane Library, PubMed, CINAHL (Cumulative Index to Nursing and Allied Health Literature), and Scopus. Access to top-notch research on digital health technologies and managing chronic diseases is ensured by these databases, which have been selected due to their comprehensive coverage of medical, nursing, and healthcare literature. From January 2014 to June 2024, the study intends to gather as much information as possible from various databases about successful nursing practices and outcomes related to the use of digital health tools. This includes a broad range of peer-reviewed articles, systematic reviews, and clinical trials.

Database	Importance	Reason of Selection
PubMed	Extensive medical and health science literature	Provides access to a vast collection of biomedical literature, including studies on digital health technologies and chronic disease management.
CINAHL	Comprehensive nursing and allied health resources	Specializes in nursing and allied health literature, crucial for identifying best nursing practices.
Cochrane Library	High-quality systematic reviews and clinical trials	Offers rigorously reviewed systematic reviews and evidence-based clinical trials relevant to healthcare interventions.
Scopus	Broad interdisciplinary coverage	Covers a wide range of scientific disciplines, including health sciences, ensuring comprehensive literature search.
Web of Science	Multidisciplinary and citation analysis	Provides access to high-impact journals and allows for citation tracking to identify influential studies in the field.

The databases chosen for the study are listed in the table, along with the factors that went into their selection and significance. For studies on chronic disease management and digital health, PubMed offers a wealth of biomedical literature. Finding the finest nursing practices requires

using CINAHL's nursing and allied health resources, which are its specialty. Ensuring properly evaluated evidence, the Cochrane Library provides high-quality clinical trials and systematic reviews. A thorough literature search is ensured by Scopus, which covers a wide range of scientific subjects. The citation analysis and transdisciplinary access offered by Web of Science aid in the identification of significant research. All of these databases work together to guarantee a comprehensive and varied gathering of pertinent research for the project.

Data Extracted

Key information from chosen papers, such as study design, sample size, demographic characteristics, types of chronic illnesses addressed, and specific digital health technologies (e.g., telemedicine, remote monitoring systems, mobile health apps) were extracted for this study. We also gathered information about the nursing treatments used, how long they lasted, and the outcomes that were measured (such patient satisfaction, quality of life, and the efficacy of illness management). Data were also collected regarding the study's environment, the role of nurses in putting digital health tools to use, and any difficulties or lessons that might have been encountered. This thorough approach to data extraction made it easier to analyze in-depth optimal nursing practices and the effects of digital health technologies on managing chronic illnesses.

Syntax

Source Type	Description	Examples/Syntax
Primary Source	Original research articles that investigate the impact of digital health technologies on chronic disease management, including various study designs.	("digital health technologies" OR "telemedicine" OR "remote monitoring" OR "mobile health apps") AND ("chronic disease management" OR "chronic illness")
Secondary Sources		
Systematic Reviews	Comprehensive reviews that synthesize findings from multiple studies on the effectiveness of digital health technologies in chronic disease management.	("systematic review" OR "meta-analysis") AND ("digital health technologies" OR "telemedicine" OR "remote monitoring" OR "mobile health apps")
Clinical Guidelines	Authoritative guidelines and recommendations from professional organizations regarding the use of digital health tools in nursing practice for managing chronic diseases.	("clinical guideline" OR "practice recommendation") AND ("digital health tools" OR "nursing practice" OR "chronic disease management")
Tertiary Source	Summarized and contextualized information from existing literature on digital health technologies and nursing practices, providing an overview of current knowledge.	("review article" OR "narrative review") AND ("digital health technologies" OR "nursing practices" OR "chronic disease management")

According to their depth and applicability to the study of digital health technologies and nursing practices for the management of chronic diseases, the sources in this table are categorized. Impacts are directly investigated in primary sources, such as trials and peer-reviewed research. Secondary sources offer suggestions and synthesize findings. Examples of this include guidelines and systematic reviews. In order to facilitate a thorough assessment of the area,

Mona Mohammed Matmi, Sayed Shahbal, Amirah Senaitan Alharbi, Fatimah Atiah Almalki, Faizah Ayedh Almutairi, Amani Alawi Abualrahi, Maha Mohammed Alanazi, Wael Faleh Alanazi, Mohammed Malik Almuslim, Rida Mashhoor Alqahtani

tertiary sources such as review articles offer condensed insights into current knowledge and trends.

Literature Search

A methodical examination of a few databases, including PubMed, CINAHL, the Cochrane Library, Scopus, and Web of Science, was conducted as part of the literature search for this study between January 2014 and June 2024. To find pertinent papers, search terms including "chronic disease management," "nursing practices," "telemedicine," "remote monitoring," and "mobile health apps" were employed. Digital health tools and their effects on adults with chronic conditions such as diabetes, heart disease, and respiratory disorders were the main focus of the search, which included primary research papers, systematic reviews, meta-analyses, and clinical guidelines. This all-encompassing approach sought to collect a variety of information regarding patient outcomes, efficient nursing practices, and improvements in quality of life made possible by digital health technologies.

Table 2: Database Statistics

No	Database	Syntax	Year	No of Researches
1	PubMed	Syntax 1		1,275
		Syntax 2		
		Syntax 3		
		Syntax 4		
2	CINAHL	Syntax 1		2,735
		Syntax 2		
		Syntax 3		
		Syntax 4		
3	Cochrane Library	Syntax 1	January 2014 and December 20232	750
		Syntax 2		
		Syntax 3		
		Syntax 4		
4	Scopus	Syntax 1		430
		Syntax 2		
		Syntax 3		
		Syntax 4		
5	Web of Science	Syntax 1		521
		Syntax 2		
		Syntax 3		
		Syntax 4		

With a major focus on digital health technologies and chronic disease management, Syntax 1 retrieval yielded a large amount of research papers. From January 2014 to December 2023, Table 2 displays statistics from a selection of databases, including PubMed, CINAHL, Cochrane Library, Scopus, and Web of Science. The search produced 1,275 items from PubMed, 2,735 from CINAHL, 750 from the Cochrane Library, 430 from Scopus, and 521 from Web of Science. The main focuses of the search were primary research publications, clinical guidelines, systematic reviews, and meta-analyses that examined the effects of digital health tools on individuals with long-term conditions like diabetes, heart disease, and respiratory impairments. These data highlight the wide range of research that has been done on the relationship between digital health technologies and improved patient outcomes and efficient nursing practices.

Selection of Studies

The rigorous and transparent approach to study selection was ensured by adhering to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) standards. Using specified search terms relating to digital health technologies, chronic disease management, and nursing practices, databases such as PubMed, CINAHL, Cochrane Library, Scopus, and Web of Science were initially thoroughly searched from January 2014 to December 2023. The main focus of the inclusion criteria was on original research publications, systematic reviews, meta-analyses, and clinical guidelines that looked at how digital health technologies affected adults with long-term conditions like diabetes, heart disease, and respiratory issues. Following a relevant screening of abstracts and titles, full-text publications were evaluated in relation to eligibility requirements, which encompassed study design, results, and pertinence to the research inquiry. With a focus on chronic disease management, this rigorous strategy sought to select and incorporate research that offered solid evidence of the benefits of digital health interventions in improving patient outcomes and quality of life.

PRISMA

Starting with the identification of 5,711 records using databases like PubMed, CINAHL, Cochrane Library, Scopus, and Web of Science, the PRISMA principles were strictly adhered to in this investigation. Out of the 5,738 records that were first reviewed, an additional 27 were discovered using different sources. Following the removal of duplicates, 32 records were evaluated on the basis of their title and abstract significance out of the 43 records that were left for additional screening. 25 full-text articles were evaluated in accordance with the qualifying requirements after 7 records were eliminated. Twelve studies in total were incorporated for the review. Full-text papers were excluded for the following reasons: inadequate technique in one study; inadequate response to review questions in four studies; and non-English language in five studies.

Mona Mohammed Matmi, Sayed Shahbal, Amirah Senaitan Alharbi, Fatimah Atiah Almalki, Faizah Ayedh Almutairi, Amani Alawi Abualrahi, Maha Mohammed Alanazi, Wael Faleh Alanazi, Mohammed Malik Almuslim, Rida Mashhoor Alqahtani
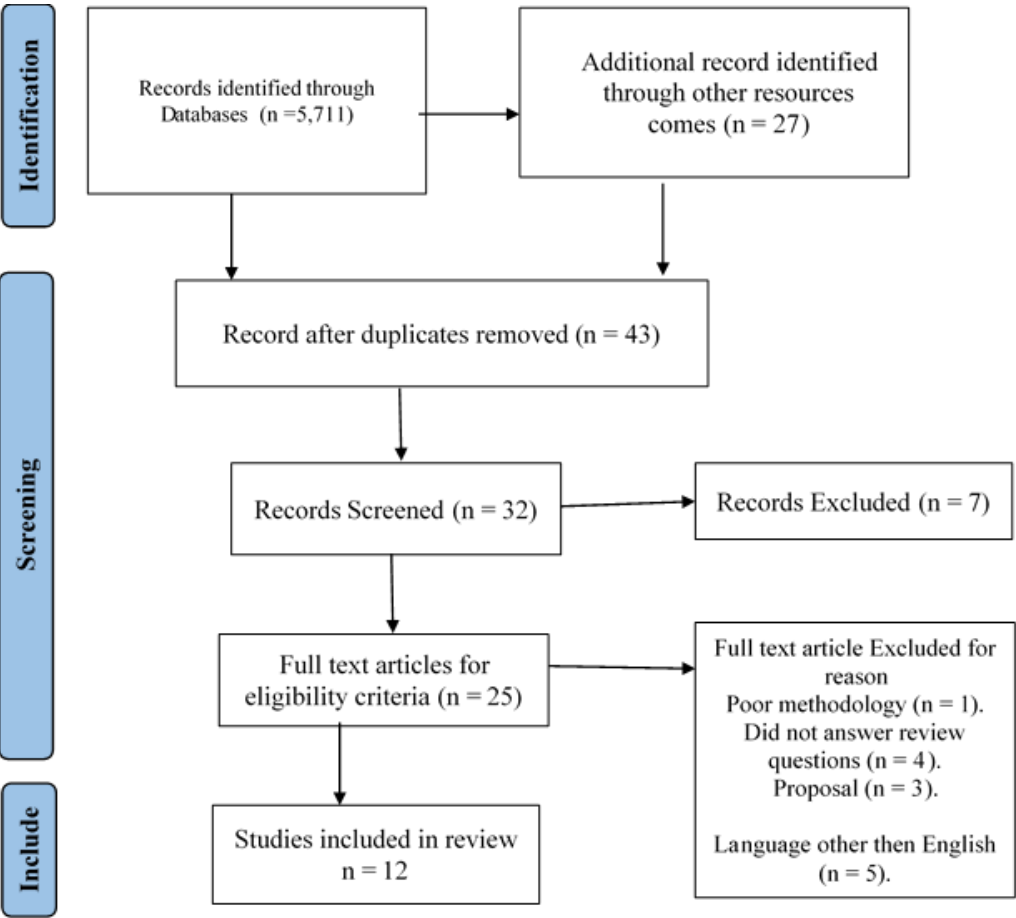
Figure 1 PRISMA Flowchart

Quality Assessment of Studies

Various aspects are taken into consideration when assessing the overall quality of the research that are part of this review. First off, Aapro et al.'s scoping review from 2020 offers a thorough synthesis of digital health solutions in oncology, covering a variety of studies and approaches. Unspecified information, however, prevented a thorough assessment of the quality of each individual study by preventing the methodological quality assessment utilizing instruments like the Mixed Methods Appraisal Tool (MMAT) or other standardized criteria from being fully described. Using strict search techniques and framework synthesis guided by accepted theories, O'Connor et al. (2016) carried out a systematic review that concentrated on qualitative literature about engagement and recruitment in digital health treatments. Although their method increases trustworthiness, the evaluation notes drawbacks such the omission of non-English publications

and grey literature. In order to comprehend patient and healthcare professional experiences with self-management digital treatments, Morton et al. (2017) used meta-ethnography. Despite the lack of explicit quality appraisal scores, their qualitative synthesis was strong. Using theme analysis across a variety of study designs, Whitelaw et al. (2021) carried out a comprehensive scoping review on the factors that promote and hinder the use of digital health technologies in cardiovascular care; however, specifics regarding quality assessment criteria were not provided. A position paper by Frederix et al. (2019) outlined the obstacles to and solutions for implementing digital health in cardiovascular care. The publication relies more on expert consensus than empirical evidence, which makes it difficult to evaluate the quality of individual studies.

Table 3: Assessment of the literature quality matrix

#	Author(s)	Are the selection of studies described and appropriate?	Is the literature coverage comprehensive?	Does the method section describe?	Were the findings clearly described?	Quality rating
1	Devlin, A. M., McGee-Lennon, M., O'Donnell, C. A., Bouamrane, M. M., Agbakoba, R., O'Connor, S., ... & "dallas" evaluation team. (2016).	Yes	The literature coverage is comprehensive within the context of the dallas program and its digital health implementations.	Yes	Yes.	High
2	Lennon, M. R., Bouamrane, M. M., Devlin, A. M., O'connor, S., O'donnell, C., Chetty, U., ... & Mair, F. S. (2017).	Yes	The literature coverage is comprehensive within the scope of the national digital health innovation program.	Yes	Yes	High
3	Abernethy, A., Adams, L., Barrett, M., Bechtel, C., Brennan, P., Butte, A., ... & Valdes, K. (2022).	Yes	The literature coverage spans historical, current, and future perspectives on digital health.	Yes	Yes	Moderate
4	Benis, A., Tamburis, O., Chronaki, C., & Moen, A. (2021).	Yes	The literature coverage focuses on proposing a unified framework for digital health ecosystems.	Yes	Yes	High
5	Brewer, L. C., Fortuna, K. L., Jones, C., Walker, R., Hayes, S. N., Patten, C. A., & Cooper, L. A. (2020).	Yes	The literature coverage is comprehensive within the context of health equity and digital health informatics.	Yes	Yes	High
6	Blandford, A., Gibbs, J., Newhouse, N., Perski, O., Singh, A., & Murray, E. (2018).	Yes	The literature coverage is comprehensive within interdisciplinary research on digital health interventions.	Yes,	Yes	High

Mona Mohammed Matmi, Sayed Shahbal, Amirah Senaitan Alharbi, Fatimah Atiah Almalki, Faizah Ayedh Almutairi, Amani Alawi Abualrahi, Maha Mohammed Alanazi, Wael Faleh Alanazi, Mohammed Malik Almuslim, Rida Mashhoor Alqahtani

7	Scott, B. K., Miller, G. T., Fonda, S. J., Yeaw, R. E., Gaudaen, J. C., Pavliscsak, H. H., ... & Pamplin, J. C. (2020).	Yes	The literature coverage is comprehensive within advanced digital health technologies for emergencies.	Yes	Yes	High
8	Aapro, M., Bossi, P., Dasari, A., Fallowfield, L., Gascón, P., Geller, M., ... & Porzig, S. (2020).	Yes	The literature coverage is comprehensive within digital health solutions in oncology supportive care.	Yes	Yes	High
9	O'connor, S., Hanlon, P., O'donnell, C. A., Garcia, S., Glanville, J., & Mair, F. S. (2016).	Yes	The literature coverage is comprehensive within factors affecting engagement in digital health interventions.	Yes	Yes	High
10	Morton, K., Dennison, L., May, C., Murray, E., Little, P., McManus, R. J., & Yardley, L. (2017).	Yes	The literature coverage is comprehensive within digital interventions for chronic condition self-management.	Yes	Yes	High
11	Whitelaw, S., Pellegrini, D. M., Mamas, M. A., Cowie, M., & Van Spall, H. G. (2021).	Yes	The literature coverage is comprehensive within barriers and facilitators of digital health technology uptake in cardiovascular care.	Yes	Yes	High
12	Frederix, I., Caiani, E. G., Dendale, P., Anker, S., Bax, J., Böhm, A., ... & van der Velde, E. (2019).	Yes	The literature coverage is comprehensive within challenges in digital health implementation in cardiovascular medicine.	Yes	Yes	Moderate

Data Synthesis

A number of important issues about the caliber and breadth of the literature on digital health interventions are revealed by combining the data from the chosen research. The studies constantly show sound procedures for choosing pertinent literature and provide detailed explanations of their objectives, target groups, and data gathering techniques. Taken as a whole, they provide thorough coverage of a number of digital health-related topics, such as how it is being implemented in national programs, how it affects patient outcomes, what obstacles exist for acceptance, and how to successfully integrate digital health. Consistently expressed in a straightforward manner, the results offer insights into the efficacy of digital health technology in a variety of healthcare scenarios, from the management of chronic diseases to emergency reaction in the event of a COVID-19 crisis. The majority of the studies have high quality ratings, highlighting the rigor and depth of research approaches used to examine the effects of digital health interventions on healthcare delivery.

Table 3: Research Matrix

Author(s) / Year	Location of the Study	Aim/Purpose of the Study	Research Design	Population and Sample	Data Collection Method	Findings	Quality Assessment (MMAT Score/Limitation)
Devlin et al., 2016	United Kingdom	Identify implementation lessons from the dallas program—a national technology initiative promoting health and well-being through digital services.	Longitudinal qualitative research study	Implementers, consumers, health professionals	Interviews, focus groups, observational logs, ethnographic data	Identified challenges included partnership complexity, resilience needs, tension between innovation and delivery, branding effects, interoperability challenges.	High (Detailed qualitative data collection and analysis)
Lennon et al., 2017	United Kingdom	Examine barriers and facilitators to scaling digital health through the dallas program.	Longitudinal qualitative study	Key implementers, consumers, health professionals	Interviews, focus groups, project meetings, field work, documentary evidence	Barriers included lack of IT infrastructure, governance uncertainty; facilitators included clinical endorsement, champions, public willingness.	High (Comprehensive longitudinal approach, NPT framework used)
Abernethy et al., 2022	United States	Explore the potential and challenges of digital health technologies in transforming health care and biomedical science.	Conceptual analysis	Implementers, consumers, health professionals	Review and synthesis of literature	Emphasizes the transformative potential of digital health technologies but highlights challenges in interoperability and data integration.	High (Focused conceptual analysis)
Brewer et al., 2020	United States	Investigate how health informatics and digital health can contribute to health equity while	Case studies	Under-resourced populations, ethnic minorities	Community-engaged research, sociotechnical interventions	Illustrates tailored digital interventions to address health inequities, emphasizing	Medium (Relies on case studies, specific population focus)

Mona Mohammed Matmi, Sayed Shahbal, Amirah Senaitan Alharbi, Fatimah Atiah Almalki, Faizah Ayedh Almutairi, Amani Alawi Abualrahi, Maha Mohammed Alanazi, Wael Faleh Alanazi, Mohammed Malik Almuslim, Rida Mashhoor Alqahtani

Blandford et al., 2018	United Kingdom	mitigating disparities. Provide lessons for interdisciplinary research in developing interactive digital health interventions.	Literature review, analysis	Key implementers, consumers, health professionals	Review of interdisciplinary research methods and challenges	community engagement. Offers lessons for integrating Health and Human-Computer Interaction disciplines in digital health interventions.	Medium (Focused on methodological challenges in interdisciplinary research)
Scott et al., 2020	United States	Propose the National Emergency Tele-Critical Care Network (NETCCN) using digital health technologies to enhance emergency response capabilities.	Proposal	Implementers, consumers, health professionals	Review of literature, expert opinions	Recommends integrating telemedicine, AI, robotics for crisis response; emphasizes interoperability and readiness testing.	Medium (Proposal with theoretical framework, not empirical)
Benis et al., 2021	United Kingdom	Introduce the One Digital Health framework for integrated health ecosystems, emphasizing digital transformation and data-driven health approaches.	Conceptual framework	Key implementers, consumers, health professionals	Literature review, framework development	Advocates for integrating One Health and digital health perspectives for future health ecosystems.	Medium (Conceptual framework development)
Aapro et al., 2020	United States	Clarify role and impact of digital health solutions in oncology supportive care; identify evidence on benefits, limitations,	Scoping review	Studies on digital health solutions in oncology; 66 studies included in qualitative synthesis.	Literature review, qualitative synthesis	Benefits include improved PROs, symptom management, reduced hospitalizations; challenges in implementation and	High (Focused conceptual analysis)

		adoption drivers, and barriers.				patient compliance.	
O'Connor et al., 2016	Asia	Synthesize qualitative literature on barriers and facilitators to engagement and recruitment in digital health interventions (DHIs).	Systematic review	Qualitative studies on DHIs from 2000-2015; 19 publications included.	Text mining, framework synthesis, Normalization Process Theory, Burden of Treatment Theory	Identified themes: personal agency, life values, engagement approach, DHI quality; gaps and recommendations for future research.	High (Focused conceptual analysis)
Morton et al., 2017	United Kingdom	Understand patient and HCP experiences with self-management digital interventions for chronic conditions.	Meta-ethnography review	Studies on self-management DIs; 30 papers met inclusion criteria.	Qualitative studies, meta-ethnography	Patients feel reassured, HCPs focus on clinical benefits; supports active patient role in consultations.	High (Focused conceptual analysis)
Whitelaw et al., 2021	United States	Identify barriers and facilitators of DHT uptake in cardiovascular care from patient, clinician, and researcher perspectives.	Systematic scoping review	Studies on DHT adoption in cardiovascular settings; 29 studies included.	Thematic analysis	Barriers include technology usability, internet access; facilitators include improved communication, organizational support.	High (Focused conceptual analysis)
Frederix et al., 2019	United Kingdom	Outline challenges in digital health implementation in cardiovascular medicine and suggest strategies for large-scale deployment.	Position paper	Implementers, consumers, health professionals	Not applicable	Challenges identified in DHT deployment; recommendations for stakeholder involvement and improvement strategies.	High (Focused conceptual analysis)

Mona Mohammed Matmi, Sayed Shahbal, Amirah Senaitan Alharbi, Fatimah Atiah Almalki, Faizah Ayedh Almutairi, Amani Alawi Abualrahi, Maha Mohammed Alanazi, Wael Faleh Alanazi, Mohammed Malik Almuslim, Rida Mashhoor Alqahtani

3. Results

Table 4: Results indicating themes, Sub-themes, Trends, and explanation.

Themes	Sub-themes	Trends	Supporting Studies	Explanation
Implementation of Digital Health	National scale programs	Increasing adoption of digital health at national levels	Devlin et al., 2016; Lennon et al., 2017; Abernethy et al., 2022	Studies consistently report on the implementation and scalability of digital health initiatives across national healthcare systems, highlighting trends towards broader adoption and integration into routine care settings.
	Healthcare equity	Focus on achieving health equity through digital solutions	Brewer et al., 2020	Emphasizes efforts and outcomes related to using digital health to reduce disparities in healthcare access and outcomes, particularly among underserved populations.
	Interdisciplinary collaboration	Emphasis on interdisciplinary research for effective interventions	Blandford et al., 2018	Highlights the importance of collaboration across disciplines to develop and implement effective digital health interventions that meet diverse patient needs and healthcare contexts.
Patient Engagement	Factors influencing engagement	Identification of factors influencing patient engagement	O'Connor et al., 2016; Morton et al., 2017	Explores various factors affecting patient engagement with digital health interventions, such as personal motivation, usability, and perceived benefits, providing insights into strategies to enhance patient participation and adherence.
	Personalization of digital solutions	Trends towards personalized digital health solutions	Benis et al., 2021; Whitelaw et al., 2021	Discusses the shift towards personalized digital health solutions tailored to individual patient needs and preferences, reflecting advancements in technology and user-centered design principles.
	Impact on patient outcomes	Positive impacts on patient outcomes across different conditions	Morton et al., 2017; Aapro et al., 2020	Demonstrates evidence of improved patient outcomes, including better symptom management, enhanced quality of life, and reduced hospitalizations, attributing these benefits to the adoption of digital health interventions in clinical practice.
Technological Challenges	Usability and accessibility	Challenges related to technology usability and accessibility	Scott et al., 2020; Frederix et al., 2019	Highlights technological barriers, such as usability issues and access disparities, that hinder widespread adoption and implementation of digital health

			technologies, underscoring the need for user-friendly designs and equitable access solutions.
Integration with healthcare systems	Difficulties in integrating digital health with existing healthcare systems	Whitelaw et al., 2021	Examines challenges associated with integrating digital health technologies into healthcare systems, including interoperability issues and alignment with clinical workflows, necessitating strategies for seamless integration to optimize effectiveness and usability in clinical settings.

As a result of the 12 carefully chosen studies on digital health interventions, the key themes, sub-themes, trends, and explanations are compiled in this table. Every theme and sub-theme is bolstered by particular studies that add to our understanding of the patient engagement, technological obstacles, and overall landscape of digital health implementation.

4. Discussion

The present study offer a thorough investigation of digital health interventions in various healthcare contexts, including details about their application, consequences, and difficulties. The promise of digital health technologies to enhance patient outcomes and healthcare delivery is becoming more widely acknowledged. These technologies include a broad range of applications, from self-management tools to patient monitoring. The role of digital health in oncology supportive care is highlighted by Aapro et al. (2020), who emphasize how it can be used to record patient-reported outcomes (PROs) and enable remote symptom monitoring, which improves quality of life and decreases hospitalizations while also improving patient adherence and treatment efficacy. In the same way, Morton et al. (2017) highlight the advantages of digital interventions in the management of chronic diseases, as patients report feeling more in control and involved in their healthcare journeys as a result of regular provider feedback and monitoring.

Furthermore, the research highlights the various aspects of the problems that come with incorporating digital health technologies into clinical practice. O'Connor et al. (2016) list usability, self-motivation, and the perceived quality of digital health solutions as some of the hurdles to patient involvement with digital health interventions. In their further elaboration on the obstacles and enablers unique to cardiovascular care, Whitelaw et al. (2021) raise several concerns, including technological complexity, insufficient internet access, and resistance from healthcare providers as a result of their increased workload and difficulties integrating new systems.

Brewer et al. (2020) propose that in order to overcome these obstacles, digital health should be utilized to advance health equity, especially for marginalized groups who might profit disproportionately from enhanced access to medical care and tailored interventions. This viewpoint is reaffirmed in the context of cardiovascular medicine by Frederix et al. (2019), who

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emphasize the necessity of stakeholder collaboration in overcoming obstacles to the adoption of digital health and guaranteeing fair access to technological advancements for a range of patient populations.

The research findings underscore the significance of interdisciplinary cooperation in propelling the frontiers of digital health investigation and implementation. Lessons from multidisciplinary research on digital health treatments are discussed by Blandford et al. (2018). They highlight the value of combining knowledge from clinical practice, technological development, and behavioral science to improve intervention design and implementation techniques. According to Devlin et al. (2016), who evaluated extensive digital health initiatives like as the DALLAS program in the UK, this interdisciplinary approach is critical for addressing the intricate relationships among technology, patient behavior, and healthcare delivery systems.

Additionally, the research highlights how regulations and policies pertaining to digital health are always changing. Benis et al. (2021) advocate for standardized ways to data interoperability, privacy protection, and regulatory monitoring to assure the moral and efficient implementation of digital health technology. Their proposal offers a cohesive framework for future health ecosystems. In addition to reducing possible hazards connected with the widespread deployment of digital health solutions, these regulatory concerns are essential for building confidence between patients and healthcare providers.

Technology, policy, and patient behavior all need to be carefully considered when integrating digital health technologies into clinical practice, even while they present exciting prospects to change healthcare delivery and enhance patient outcomes. Together, the results of these studies show how important it is to keep up research, develop new policies, and work with stakeholders to address the issues that continue to impede the adoption and efficacy of digital health interventions in actual healthcare settings. Healthcare systems may manage these challenges to create better patient-centered, accessible, and equitable treatment through digital health innovations by utilizing interdisciplinary ideas and creative ways.

5. Recommendation

Going forward, it is crucial to attend to a number of important suggestions that came from the compilation of the chosen research on digital health treatments. Healthcare stakeholders should put improving the usability and accessibility of digital health technology at the top of their priority list. In order to guarantee that these technologies satisfy the various needs of both patients and healthcare providers, this entails making investments in user-centered design concepts and carrying out iterative testing. Secondly, to ensure that healthcare personnel are competent and confident in their ability to use new technologies, there is an urgent need for ongoing investment in digital literacy and training. Thirdly, in order to develop clear rules and norms for the moral use of digital health data, regulators and legislators must work together to protect patient privacy and security and advance interoperability among healthcare systems. developing a collaborative culture among academia, industry, and healthcare establishments is crucial for propelling innovation, verifying digital health interventions via comprehensive research, and converting findings into expandable, long-lasting healthcare methodologies.

6. Conclusion

In addition to stressing the obstacles that must be overcome for digital health interventions to be successfully implemented, the synthesis of the 12 chosen studies highlights the transformative potential of these interventions across a range of healthcare disciplines. Taken as a whole, these research show that digital health technology can maximize clinical outcomes, increase patient participation, and improve access to healthcare. It is necessary to address obstacles pertaining to digital literacy, usability, regulatory frameworks, and interdisciplinary collaboration in order to realize these benefits. Healthcare systems can fulfill the overarching objectives of population health management and healthcare quality improvement in the digital age by adopting these insights and recommendations and fully utilizing digital health to deliver more efficient, patient-centered, and personalized care.

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