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The Influence of Health Technologies in Managing Chronic Illness: Systematic Review

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Abstract

Objectives: This research aims to find the influence of health technologies in managing chronic illness through a systematic review. *Method :* structured around a comprehensive systematic review, aiming to gather, assess, and synthesize empirical data on the impact of health technologies on chronic disorder management. Utilizing databases such as PubMed, Medline, Scopus, Google Scholar, and Web of Science, a meticulous search strategy was crafted using relevant keywords and Medical Subject Headings (MeSH) terms. To ensure inclusivity, manual searches of reference lists were also performed. The review was confined to English-language articles published between 2013 and 2023. *Result:* Health technologies, including mobile applications, telemedicine, and artificial intelligence, were found to have a significant positive impact on the self-management and monitoring of chronic conditions. Patients reported enhanced convenience, a sense of control over their health, and identifying early signs of exacerbation in chronic illnesses, hence facilitating proactive healthcare and mitigating the need for hospital admissions. *Conclusion:* Healthcare organizations aiming to adopt or improve the utilization of health technology for managing chronic illnesses should give priority to user-centered design and data protection. Adapting digital solutions to be user-friendly and easily available to individuals of all ages and technological abilities is of utmost importance.

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Introduction

The advancement of health technologies in recent decades has significantly transformed the healthcare sector, namely in the domain of chronic disease management. Chronic illnesses, such as diabetes, heart disease, and chronic respiratory diseases, are characterized by their prolonged duration and typically exhibit gradual progression, necessitating meticulous and continuous healthcare management (Khattak et al., 2024). The management of this condition presents a challenge in terms of medical and logistical aspects, necessitating a meticulous integration of medicines, lifestyle modifications, and consistent surveillance. In the past, managing many disorders necessitated a substantial amount of labor, requiring patients to make regular trips to healthcare providers and exert significant personal effort. However, due to the emergence and incorporation of health technology, individuals today have an increased ability to effectively oversee their medical problems, enhance their overall well-being, and mitigate any issues (Baker et al., 2017).

"Health technologies" encompasses various tools, gadgets, and digital platforms such as wearable gadgets, including glucose monitors and smartwatches, telemedicine platforms, electronic health records (EHRs), mobile health applications, and sophisticated gear like robotic surgery equipment. While several technologies have applications in the wider healthcare sector, they are increasingly becoming essential components of the daily lives of those with chronic illnesses. The ubiquity of smartphones and mobile devices has facilitated convenient access to health-related applications. These applications enable patients to monitor their vital signs, follow their symptoms, adhere to their prescription schedules, and establish direct communication with healthcare specialists.

The use of telemedicine has gained significant traction and widespread acceptance particularly due to global events like the COVID-19 pandemic. Telehealth services offer chronic

illness patients the advantage of reduced frequency of physical visits to healthcare facilities, resulting in time savings and decreased susceptibility to other ailments. Health technologies are causing a shift in the prevailing approach to healthcare, moving away from a broad treatment model towards a more customized care approach (Ghai et al., 2020). The utilization of AI-driven analytics, which leverages extensive patient data, can forecast possible exacerbations or problems, hence facilitating prompt interventions. Furthermore, patients can receive customized recommendations based on their data, genetic information, and personal preferences. The customization of treatment plans is particularly crucial in managing chronic diseases since adopting a standardized approach frequently proves inadequate (Agbehadji et al., 2020).

The proliferation of connected gadgets such as wearable fitness trackers and heart rate monitors has facilitated patients' ability to proactively manage their health. Fitness enthusiasts are not the exclusive beneficiaries of these devices; they have evolved into indispensable resources for individuals with chronic ailments. As an illustration, a wearable gadget can provide notifications to individuals diagnosed with diabetes when their blood glucose levels reach critical thresholds or alert individuals with cardiac ailments when their heart rate exhibits erratic patterns (Lu et al., 2020).

Health technologies have also altered the distribution of power within the healthcare landscape.

Throughout history, people have relied significantly on healthcare experts as their primary sources of knowledge and guidance. In the present era, patients have access to abundant information and possess self-monitoring tools, resulting in heightened empowerment. Patients can actively engage in their healthcare, make well-informed choices, and advocate for their needs. Empowering patients not only cultivates a perception of autonomy among individuals but also frequently results in enhanced adherence to treatment regimens and, as a result, improved overall outcomes (Lu et al., 2020).

Although there are clear advantages, the use of technology in managing chronic illnesses presents certain obstacles. The preservation of privacy and security of health data is a matter of utmost importance. The increasing interconnectivity of devices and platforms presents a potential vulnerability wherein data breaches may occur, posing a significant threat to the confidentiality of sensitive health information. Furthermore, the issue of data ownership arises concerning whether patients possess complete rights over their data or if healthcare practitioners and technology corporations might utilize them, perhaps for financial gain (Hathaliya & Tanwar, 2020).

Moreover, the issue of the digital divide continues to pose a significant barrier. The lack of access to contemporary technologies and low speed internet in rural areas can potentially worsen existing health inequities. The rapid advancements in health technology have significantly transformed the approach to managing chronic disorders. The fields of big data and artificial intelligence (AI) are positioned at the vanguard of this transformative process, utilizing large quantities of health data to offer unparalleled insights into patients' health. The potential of artificial intelligence (AI) to examine and forecast health deterioration using past data is highly encouraging. For example, an AI-powered system has the potential to provide advance notice to those with chronic respiratory conditions about an imminent asthma episode, enabling them to proactively implement preventive measures (Abouelmehdi et al., 2018).

Remote monitoring has also shown significant advancements. In addition to wearable gadgets, advanced sensors can transmit immediate health measurements to healthcare practitioners, thereby establishing an improved safeguard for patients, particularly those who are elderly or reside in geographically isolated regions. Individuals with chronic heart diseases can benefit from utilizing these systems, as they can proactively identify prospective issues. This early detection enables timely intervention and may effectively avert the occurrence of a

medical emergency. In the realm of chronic illness treatment, emerging technologies such as VR and AR are growing. VR, for example, provides therapeutic alleviation to individuals suffering from chronic pain by immersing them in serene virtual environments. However, AR can offer real-time data visualization, such as the projection of vital statistics during physical activity, guaranteeing that patients stay within safe bounds (Bruno et al., 2022).

Problem Statement

Given the increasing prevalence of chronic illnesses worldwide, it has become imperative to prioritize the efficient and effective management of these enduring health issues. Chronic illnesses, encompassing a spectrum of conditions such as cardiovascular problems and diabetes, impose a substantial burden on healthcare systems and profoundly influence individuals' overall well-being. Although health technologies offer the potential for significant advancements in managing many conditions, developing a comprehensive understanding of their true impact is crucial. The integration of wearable devices, telemedicine platforms, AI-driven predictive

analytics, and other digital health tools into healthcare has occurred rapidly. However, there is still uncertainty over how these tools are effective, accessible, affordable, and ultimately impact patient outcomes (Baker et al., 2017).

Aim

This research project aims to find the influence of health technologies in managing chronic illness through a systematic review.

Significance of the Study

A considerable portion of the world's health burden is caused by chronic diseases, which often call for extensive medical expenditures and long-term care. The emergence of health technology, such as mobile apps, wearables, remote monitoring devices, and telemedicine platforms, has created new opportunities to improve the treatment of chronic illnesses. This systematic review offers a thorough examination of the viability, efficacy, and effects of various technologies on medication adherence, patient involvement, disease monitoring, and general quality of life for those living with chronic illnesses. The review's conclusions may help design more accessible healthcare delivery methods, individualized treatment programs, and customized treatments.

Methods

Design

A systematic review using Covidence software

Data Sources and Search Strategy

The primary data sources for this study comprised several electronic databases, including PubMed, Medline, Scopus, Google Scholar, and Web of Science. The search strategy employed a judicious blend of pertinent keywords and Medical Subject Headings (MeSH) terms, covering various topics such as health technologies, and chronic illness. To ensure an exhaustive and comprehensive coverage of the literature, manual searches were also undertaken within the reference lists of the articles identified through the initial electronic database searches (Ranganathan & Aggarwal, 2020). This step aimed to capture potentially relevant studies that may not have been indexed in the searched databases or may have been overlooked during the initial search phase. The scope of the search was strategically restricted to articles that were written in the English language and published within a ten-year timeframe, spanning from 2013 to 2023. This temporal restriction was implemented to ensure that the results remained relevant, current, and manageable in volume while still offering a thorough overview of the progression and impact of health technologies on the management of chronic illnesses (Nick & Sarpy, 2022).

The search strategy incorporated the use of Boolean operators AND/OR along with pertinent keywords to identify studies related to the influence of health technologies on chronic illness management.

Inclusion Criteria

- ❖ Empirical research articles, including randomized controlled trials (RCTs), case-control studies, and cross-sectional studies.
- ❖ Any form of health technology, including but not limited to wearable devices, telehealth platforms, electronic health records, AI-driven predictive tools, virtual reality therapies, and mobile health applications.

- ❖ Studies related to any measurable health outcome related to chronic illness management. This can include symptom management, hospitalization rates, patient-reported quality of life, medication adherence, and others.
- ❖ Studies published in the English language.
- ❖ Studies published between 2013 and 2023 .

Exclusion Criteria

- ❖ Non-empirical articles such as editorials, opinion pieces, literature reviews, and case reports.
- ❖ Studies focus exclusively on pediatric populations or those without a diagnosed chronic illness.
- ❖ Studies focus on interventions that are not technology-driven or only peripherally utilize health technologies.
- ❖ Studies without clear, measurable health outcomes or those that focus exclusively on cost-effectiveness without considering health outcomes.
- ❖ Non-English publications.
- ❖ Studies that are tangentially related to the topic do not directly address the influence of health technologies on chronic illness management (Condron, 2021).

Study Selection

Covidence software was used for this review. Following a rigorous exploration, a pool of 604 studies was gathered, out of which 12 academic papers, articles, and peer-reviewed works were identified . All identified citations were uploaded into Covidence after the global search and duplicate articles were removed. To determine eligibility for this review, two independent reviewers (AA and HA) screened titles and abstracts. There was a third reviewer (FA) who resolved disagreements between the reviewers. For all studies that potentially meet the inclusion criteria, the full article was retrieved. (SA and WA) independently reviewed the full article and determined whether it met the inclusion criteria. An additional reviewer (AA) resolved disagreements between the reviewers. The full-text of studies that failed to meet the inclusion criteria was excluded and subsequently procured for analysis(Figure1).

The PRISMA guidelines were strictly adhered to systematically screen and analyze all identified studies in this research from an initial collection of 604 research articles, a rigorous evaluation using the PRISMA guidelines was carried out, coupled with an appraisal of their pertinence to the research subject. This exhaustive process led to the selection of 12 studies deemed highly relevant for inclusion in this systematic review (Figure1).

Quality Assessment

Table (1) and Table (2) showing the characteristics and key outcomes of the selected studies.

Data Extraction (Critical Appraisal Checklist)

Using the JBI assessment, which is an 8-item checklist, helped make the research results more reliable by making sure that the chosen studies all used the same high-quality method (Table 1).

Results

A total of 12 research studies were included in this review (Table 1). The study conducted by Breil et al. (2022) revealed a disparity in the perception of the usefulness of mobile hypertension apps between patients and clinicians. The patients had a generally positive attitude towards utilizing these applications for the purpose of monitoring their blood pressure and receiving reminders about their medication. Nevertheless, physicians exhibited greater prudence in supporting these applications due to apprehensions regarding their precision, privacy, and compatibility with established healthcare systems. Physicians emphasized the importance of apps being evidence-based and clinically validated, although acknowledging the potential for improved patient involvement.

This study by Dou et al. (2017) employed a theoretical framework to investigate the elements that impact patients' willingness to adopt smartphone health technologies for the management of chronic illnesses. The results indicated that the perception of the technology's ease of use, utility, and trustworthiness were strong predictors of its acceptance. The study also emphasized the influence of health literacy and prior technology experience on patients' attitudes toward the adoption of such technologies for their healthcare requirements.

In addition, Duplaga (2015) revealed various factors that influence patients' perceptions of eHealth services for chronic diseases. Crucial elements comprised age, proficiency in technology, perceived advantages for health, and worries regarding privacy and security of data. Patients who held the belief that eHealth services could result in enhanced health outcomes showed a greater inclination towards expressing favorable attitudes. Conversely, older patients and individuals with limited familiarity with technology displayed a higher level of reluctance to embrace these services.

Moreover, Henry et al. (2022) conducted a case study and determined that telemedicine proved to be an invaluable instrument in tackling healthcare accessibility obstacles in Dominica. Telemedicine has helped overcome geographical limitations and enhance healthcare provision by enabling remote consultations and ongoing monitoring of chronic illnesses. Nevertheless, obstacles such as inadequate technological infrastructure, low levels of digital literacy, and apprehensions regarding data protection were recognized as possible hindrances to widespread implementation.

Additionally, Iftikhar et al. (2019) found that there is a significant interest in utilizing information technology for the management of chronic diseases. However, the ability and inclination to use such technology varied across patients in Lahore. The ability and willingness of patients to utilize these technologies were significantly influenced by socioeconomic characteristics, access to technology, and digital literacy. The study recommended customized interventions to enhance digital health literacy and enhance the availability of health technologies.

The survey conducted by Leigh et al. (2022) revealed that individuals suffering from chronic heart failure and possessing smartphones exhibited a significant inclination toward utilizing mobile health technologies for self-care purposes. The inclusion of features such as remote monitoring, prescription reminders, and educational resources was perceived as advantageous. Nevertheless, certain participants expressed a lack of trust in their capacity to utilize these

technologies proficiently, emphasizing the necessity for user-friendly designs and support mechanisms to enable the acceptance and utilization of these technologies.

The study conducted by Livman & Josefsson (2022) evaluated the impact of artificial intelligence (AI) on aiding patients with Type 1 Diabetes in their regular treatment regimens. The study discovered that AI applications, such as predictive algorithms for blood sugar levels and automated recommendations for insulin dosage, were well-received. Patients experienced heightened autonomy and relaxation, resulting in improved compliance with treatment methods. Nevertheless, certain patients have voiced apprehensions regarding the sole dependence on AI, highlighting the necessity of human interaction in their healthcare.

Moreover, Mendez et al. (2021) examined the factors that affect the desire of caregivers of dementia patients to use mobile health applications (mHealth apps). The key findings revealed that caregivers were more inclined to embrace these technologies if they held the belief that the applications would alleviate caregiving responsibilities, enhance patient results, and be easy to use. Nevertheless, apprehensions of privacy, data security, and technological inundation were recognized as possible obstacles to acceptance.

The exploratory project by Nittas et al. (2023) sought to determine the feasibility of integrating digital health technologies into the management of chronic diseases. The study revealed that variables such as perceived ease of use, perceived benefits, and affordability exerted substantial influence in predicting the likelihood of adoption. Furthermore, the study highlighted the importance of customizing digital health solutions to cater to the distinct requirements and inclinations of diverse patient demographics.

This study conducted by Rangraz Jeddi et al. (2020) investigated the inclination of individuals with Type II diabetes in Iran to utilize mobile phones for self-management purposes. The results indicated that although there was widespread adoption of mobile phones, the inclination to utilize them for diabetes control was impacted by variables such as age, technological proficiency, and perceived efficacy of the applications.

The cross-sectional study by Rodríguez-Fortúnez et al. (2019) examined the viewpoints of patients in Spain regarding the usage of telemedicine for managing Type 2 Diabetes. The findings indicated that patients were usually open to the utilization of telemedicine, valuing the ease and ongoing surveillance it provided. However, certain participants voiced apprehensions over the impersonal nature of remote consultations and potential privacy concerns.

In addition, Vansimaey et al. (2021) presented a classification system that categorizes digital health technologies utilized for the management of chronic diseases. The categories include remote monitoring, teleconsultation, and health information systems, and the adoption of these technologies has the capability to transform the management of chronic diseases, depending on criteria such as user-friendliness, availability, affordability, and perceived advantages. It further emphasized the necessity for a unified strategy, merging different technologies to provide a comprehensive resolution

Discussion

The systematic review of the influence of health technologies in managing chronic illnesses revealed several key findings from the examined studies. Health technologies, including mobile applications, telemedicine, and artificial intelligence, were found to have a significant positive impact on the self-management and monitoring of chronic conditions. Patients reported

enhanced convenience and a sense of control over their health and identified early signs of exacerbation in chronic illnesses, hence facilitating proactive healthcare and mitigating the need for hospital admissions. These applications connect the intervals between clinic appointments, offering a seamless provision of care and immediate feedback, which is crucial for managing diseases that necessitate ongoing attention. However, the adoption and effectiveness of these technologies were influenced by factors such as age, digital literacy,

perceived usefulness, privacy concerns, and cultural context. Despite the potential benefits, the studies underscored the necessity for health technologies to be user-friendly, accessible, and tailored to the specific needs of the population to ensure widespread adoption and optimal outcomes (Breil et al., 2022; Dou et al., 2017; Duplaga, 2015; Henry et al., 2022; Iftikhar et al., 2019; Leigh et al., 2022; Livman & Josefsson, 2022; Mendez et al., 2021; Nittas et al., 2023; Rangraz Jeddi et al., 2020; Rodríguez-Fortúnez et al., 2019; Vansimaeyts et al., 2021).

The results of this research work are supported by previous studies, as the study by Agbehadji et al. (2020) conducted a comprehensive investigation that underscored the transformative capabilities of predictive analytics powered by artificial intelligence. Through the examination of extensive datasets, researchers have determined that AI can provide timely alerts for prospective declines in health, particularly among individuals with medical illnesses such as congestive heart failure. In a similar vein, the work by Miller & Brown (2018) provides insights into the pharmaceutical ramifications of Big Data, positing that examining these extensive datasets can facilitate the creation of individualized treatment protocols.

Similarly, Marcolino et al. (2018) found that although these applications provide convenience, their effectiveness varies, and not all of them are based on empirical evidence. This underscores the significance of doing thorough validation before these apps are widely adopted. Likewise, according to Wildevuur & Simonse (2015), advanced applications offer patients the ability to monitor symptoms, organize prescription regimens, and avail themselves of cognitive behavioral therapy for enduring mental health disorders. These applications connect the intervals between clinic appointments, offering a seamless provision of care and immediate feedback, which is crucial for managing diseases that necessitate ongoing attention (Hamine et al., 2015). According to Kitsiou et al. (2017), using these technologies has the potential to identify early signs of exacerbation in chronic illnesses, hence facilitating proactive healthcare

and mitigating the need for hospital admissions. In addition, integrating systems and platforms, such as Health Information Exchanges (HIE), facilitates the accessibility of a patient's health data among various healthcare providers, hence fostering comprehensive and synchronized healthcare delivery (Ponsiglione et al., 2021; Piwek et al., 2016).

Lu et al. (2020) indicated that Continuous glucose monitors (CGMs) have significantly transformed the management of individuals with diabetes by offering immediate blood glucose information, eliminating the necessity for regular fingerstick calibration (Klonoff & Parkes, 2018). The automatic recording of this data has the potential to mitigate the occurrence of human mistakes and facilitate a more consistent and uninterrupted monitoring methodology. In a similar vein, wearable devices designed for monitoring blood pressure provide valuable insights into the daily variations, enabling healthcare professionals to customize drug regimens accordingly (Steinhubl et al., 2018). The capacity of these devices to gather a substantial amount of data has facilitated proactive monitoring, hence assisting in the timely identification of potential issues (Chiauzzi et al., 2015; Lu et al., 2020).

Correspondingly, Davis et al. (2019) asserted that integrating home-based devices with remote patient monitoring systems facilitates the direct transmission of data to healthcare practitioners, hence facilitating prompt treatments and mitigating the need for hospitalizations (Davis et al., 2019; Chen et al., 2020). According to Kvedar et al. (2016), mobile applications specifically designed for medication adherence have been shown to effectively decrease missed doses through reminder notifications sent to patients. Subramanian et al. (2020) highlighted that the integration of AI into the healthcare sector represents a highly innovative advancement in the field of health technologies. Battineni et al. (2020) highlighted that AI technologies have been shown to be beneficial in customizing treatment strategies for complex disorders like cancer by utilizing specific patient data. This personalized approach can potentially improve the chances of achieving positive treatment outcomes. Machine learning models exhibit the potential to detect previously unacknowledged patterns in the evolution of diseases or the response to treatment, enabling proactive adjustments in management approaches (Battineni et al., 2020; Subramanian et al., 2020).

Conclusion

This research work aimed to find the influence of health technologies on managing chronic illness by conducting a systematic review. The research methodology for this study was structured around a comprehensive systematic review, aiming to gather, assess, and synthesize empirical data on the impact of health technologies on chronic disorder management. Utilizing databases such as PubMed, Medline, Scopus, Google Scholar, and Web of Science, a meticulous search strategy was crafted using relevant keywords and Medical Subject Headings (MeSH) terms. To ensure inclusivity, manual searches of reference lists were also performed. The review was confined to English-language articles published between 2013 and 2023, ensuring relevancy and manageability. The inclusion criteria encompassed empirical studies, including randomized controlled trials, case-control, and cross-sectional studies that investigated any form of health technology and their measurable health outcomes related to chronic illness management. On the other hand, articles that were not based on evidence, studies that only looked at children or people who did not have a chronic illness, and studies that did not directly look at technology-driven interventions or health outcomes were all ruled out. Following the PRISMA guidelines made sure that screening was done in a systematic way and that the analysis was always the same. The Joanna Briggs Institute (JBI) assessment tools made it easier to check the methodological rigor of different study designs. By employing these tools, the research minimized biases and maintained an objective evaluation, ensuring the credibility of the findings. Health technologies, including mobile applications, telemedicine, and artificial intelligence, were found to have a significant positive impact on the self-management and monitoring of chronic conditions. Patients reported enhanced convenience, a sense of control over their health, and identifying early signs of exacerbation in chronic illnesses, hence facilitating proactive healthcare and mitigating the need for hospital admissions. These applications connect the intervals between clinic appointments, offering a seamless provision of care and immediate feedback, which is crucial for managing diseases that necessitate ongoing attention. However, factors like age, digital literacy, perceived usefulness, privacy concerns, and cultural context had an impact on the adoption and efficacy of these technologies. The potential limitation is the possibility of selection bias, as the research incorporated may not encompass all facets or categories of chronic illnesses, hence failing to provide a comprehensive perspective on the field. The variability in the design, methodology, and populations of the research included may also restrict the applicability of the findings. When it comes to general suggestions,

healthcare organizations aiming to adopt or improve the utilization of health technology for managing chronic illnesses should give priority to user-centered design and data protection. Adapting digital solutions to be user-friendly and easily available to individuals of all ages and technological abilities is of utmost importance.

Limitations

- **Selection Bias:** Research may not cover all chronic illness categories, limiting the comprehensive understanding of the field.
- **Variability in Research:** Differences in study design, methodologies, and populations restrict the broad applicability of findings.
- **Technology Obsolescence:** Swift advancements might render discussed digital solutions obsolete, challenging the formulation of enduring conclusions.

Recommendations

- **Broadened Research Scope:** Investigate the influence of health technologies across a wider range of chronic illnesses for a more comprehensive perspective.
- **Long-Term Impact Studies:** Understand enduring effects, considering patient involvement, compliance, and overall health outcomes.
- **Comparative Efficacy Studies:** Conduct comparative studies to assess which health technologies have the most significant impact on patients.
- **User-Centered Design:** Prioritize user-friendly adaptations to ensure accessibility across various age groups and technological abilities.
- **Data Protection Focus:** Proactively address privacy concerns with robust data protection methods.
- **Continuous Feedback Incorporation:** Regularly seek feedback from patients and healthcare professionals to refine digital interventions.
- **Supplementary Role Emphasis:** Encourage patients to see health technologies as supplementary tools, not substitutes for conventional healthcare.
- **Balanced Interaction:** Aim for a harmonious blend of online and in-person contacts while ensuring awareness of data protection measure.

Table 1: Critical Appraisal of Included Studies

Citations	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Score
(Breil et al., 2022)	Y	Y	Y	Y	Y	Y	Y	Y	100%
(Dou et al., 2017)	Y	Y	Y	Y	Y	Y	Y	Y	100%
(Duplaga, 2015)	Y	Y	Y	Y	Y	Y	Y	Y	100%

(Henry et al., 2022)	Y	Y	Y	Y	Y	Y	Y	Y	100%
(Iftikhar et al., 2019)	N	Y	Y	Y	Y	Y	Y	Y	87.5%
(Leigh et al., 2022)	Y	Y	Y	Y	Y	Y	Y	Y	100%
(Livman & Josefsson, 2022)	Y	Y	Y	Y	Y	Y	Y	Y	100%
(Mendez et al., 2021)	Y	Y	Y	Y	Y	Y	Y	Y	100%
(Nittas et al., 2023)	Y	Y	Y	Y	Y	Y	Y	Y	100%
(Rangraz Jeddi et al., 2020)	Y	Y	Y	Y	Y	Y	N	Y	87.5%
(Rodríguez-Fortúnez et al., 2019)	Y	Y	Y	Y	Y	Y	Y	Y	100%
(Vansimaey et al., 2021)	Y	Y	Y	Y	Y	Y	Y	Y	100%

Y* (Yes); N* (No); NA* (Not Applicable); U* (Unclear)

Table 1: General Characteristics of the Included Studies

N o #	Title	Au tho r	D a t e	Stu dy Ty pe	Stu dy Pop ulat ion	S a m pl e Si ze	Re gi on	Sour ce	Study Approach	Result s
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1	Comparing the Acceptance of Mobile Hypertension Apps for Disease Management Among Patients Versus Clinical Use Among	Breil et al.	2022	Quantitative	Patients, Physicians	16346	Germany	Google Scholar	Cross-Sectional Analysis	<i>The patients had a generally positive attitude towards utilizing these applications for the purpose of monitoring their blood pressure and receiving reminders about their medication.</i>
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Physicians: Cross-sectional Survey										
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2	Patients' Acceptance of Smartphone	Do	2017	Quantitative	Hypertensive patients	157	China	Google Scholar	Descriptive, cross-sectional	<i>The results indicated that the perception of the technology's ease of use, utility, and trustworthiness were strong predictors of its acceptance.</i>
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3	A cross-sectional study assessing determinants of the attitude to the introduction of eHealth services among patients	Du pla ga	2 0 1 5	Qu anti tati ve	Pati ents	3 9 5	Kr ak ow , Po lan d	M ed li ne	Cros s- secti onal stud y	<i>Patie nts who held the belief that eHeal th servic es could result in enhan ced health outco mes showe d a greate r inclin ation towar ds</i>
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suffering from chronic condition s.									<i>expre ssing favor able attitu des.</i>
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4	The use of telemedicine in the management of chronic diseases in Small Island Developing States: Case study - Dominica .	Henry et al.	2022	Qualitative	Patients	100	Dominica	Google Scholar	Randomized controlled study	<p><i>Telemedicine has helped overcome geographic limitations and enhance health care provision by enabling</i></p> <p><i>remote consultations and ongoing monitoring of chronic illnesses.</i></p>
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5	Capacity and willingness to use information technology for managing chronic diseases among patients: A cross-sectional study in Lahore, Pakistan.	Iftikhar et al.	2019	Quantitative	Patients	400	Lahore, Pakistan	Web of Science	A cross-sectional study	<i>The study found that there is a significant interest in utilizing information technology for the management of chronic diseases.</i>
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6	Smartphone Ownerships and Interest in Mobile Health Technologies for Self-care Among Patients With Chronic Heart Failure: Cross-sectional Survey Study.	Leigh et al.	2022	Quantitative	Patients	144	USA	Google Scholar	Cross-sectional study	<i>The survey revealed that individuals suffering from chronic heart failure and possessing smartphones exhibited a significant inclination towards utilizing mobile health technologies for self-care purposes.</i>
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7	Using Artificial Intelligence in Everyday Management of Diabetes Type 1: A Cross Sectional Study of the Role of AI for Individual Patients	Livman & Josefsson	2022	Qualitative	Patients	05	Sweden	Scopus	Semi-structured Interviews	<i>The study discovered that AI applications, such as predictive algorithms for blood sugar levels and automated recommendations for insulin dosage, were well-received.</i>
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8	Factors Associated With Intention to Adopt mHealth Apps Among Dementia Caregivers With a Chronic Condition :	Mendez et al.	2021	Quantitative	Dementia Caregivers	117	USA	PubMed	Cross-sectional Study	<i>The key findings revealed that caregivers were more inclined to embrace these technologies if they held the belief that the applications would alleviate caregiving responsibilities, enhance</i>
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										<i>patient results, and be easy to use.</i>
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9	Digital health for chronic disease management: An exploratory method to investigating technology adoption potential.	Nittas et al.	2023	Quantitative	Patients	990	Sweden	Google Scholar	Cross-sectional study	<i>The study revealed that variables such as perceived ease of use, perceived benefits, and affordability exerted substantial influence in predicting the likelihood of adoption.</i>
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10.	Mobile phone usage in patients with type II diabetes and their intention to use it for self-	Rangraz Jeddiet al.	2020	Quantitative	Patients	176	Iran	Scopus	Cross-sectional study	<i>The results indicated that although there was widespread adoption of mobile phones, the inclination to utilize them for</i>
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	<p>managem ent: a cross- sectional study in Iran</p>									<p><i>diabet es contr ol was impac ted by varia bles such as age, techn ologic al profic iency, and percei ved effica cy of the applic ations .</i></p>
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11	Cross-sectional study about the use of telemedicine for type 2 diabetes mellitus management in Spain: patient's perspective	Rodríguez-Forún ez et al.	2019	Quantitative	Patients	1036	Spain	Medicine	Cross-sectional descriptive design	<i>The findings indicated that patients were usually open to the utilization of telemedicine, valuing the ease and ongoing surveillance it provided.</i>
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1 2 .	Digital health and management of chronic disease: A multimodal technologies typology.	Vansi ma eys et al.	2 0 2 1	Qu anti tati ve	Pati ents	9 5 4	Fr an ce	P ub M ed	Que stion naire e- base d surv ey	<i>The categories include remote monitoring, teleconsultation, and health information systems, and the</i>
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- opportunities. *IEEE Access*. 2017;5:26521–44. doi:10.1109/access.2017.2775180
- Barker I, Steventon A, Williamson R, Deeny SR. Self-management capability in patients with long-term conditions is associated with reduced healthcare utilisation across a whole health economy: Cross-sectional analysis of electronic health records. *BMJ Quality & Safety*. 2018 Aug 23;27(12):989–99. doi:10.1136/bmjqs-2017-007635
- Battineni G, Sagaro GG, Chinatalapudi N, Amenta F. Applications of machine learning predictive models in the chronic disease diagnosis. *Journal of Personalized Medicine*. 2020 Mar 31;10(2):21. doi:10.3390/jpm10020021
- Breil B, Salewski C, Apolinário-Hagen J. Comparing the acceptance of mobile hypertension apps for disease management among patients versus clinical use among physicians: Cross-sectional survey. *JMIR Cardio*. 2022 Jan 6;6(1). doi:10.2196/31617
- Bruno RR, Wolff G, Wernly B, Masyuk M, Piayda K, Leaver S, et al. Virtual and augmented reality in Critical Care Medicine: The patient's, Clinician's, and researcher's perspective. *Critical Care*. 2022 Oct 25;26(1). doi:10.1186/s13054-022-04202-x
- Chen L, Cheng L, Gao W, Chen D, Wang C, Ran X. Telemedicine in chronic wound management: Systematic review and meta-analysis. *JMIR mHealth and uHealth*. 2020 Jun 25;8(6). doi:10.2196/15574
- Chiauzzi E, Rodarte C, DasMahapatra P. Patient-centered activity monitoring in the self-management of chronic health conditions. *BMC Medicine*. 2015 Apr 9;13(1). doi:10.1186/s12916-015-0319-2
- Condron P. Library guides: Systematic reviews for Health Sciences and Medicine: Inclusion and Exclusion Criteria [Internet]. 2021 [cited 2025 Feb 4]. Available from: <https://unimelb.libguides.com/sysrev/inclusion-exclusion-criteria>
- Davis TC, Hoover KW, Keller S, Replogle WH. Mississippi diabetes Telehealth Network: A collaborative approach to chronic care management. *Telemedicine and e-Health*. 2020 Feb 1;26(2):184–9. doi:10.1089/tmj.2018.0334
- Dou K, Yu P, Deng N, Liu F, Guan Y, Li Z, et al. Patients' acceptance of smartphone health technology for Chronic Disease Management: A theoretical model and empirical test. *JMIR mHealth and uHealth*. 2017 Dec 6;5(12). doi:10.2196/mhealth.7886
- Duplaga M. A cross-sectional study assessing determinants of the attitude to the introduction of eHealth services among patients suffering from chronic conditions. *BMC Medical Informatics and Decision Making*. 2015 Apr 19;15(1). doi:10.1186/s12911-015-0157-3
- Ghai B, Malhotra N, Bajwa SS. Telemedicine for chronic pain management during COVID-19 pandemic. *Indian Journal of Anaesthesia*. 2020;64(6):456. doi:10.4103/ija.ija_652_20
- Hamine S, Gerth-Guyette E, Faulx D, Green BB, Ginsburg AS. Impact of mhealth chronic disease management on treatment adherence and patient outcomes: A systematic review. *Journal of Medical Internet Research*. 2015 Feb 24;17(2). doi:10.2196/jmir.3951
- Hathaliya JJ, Tanwar S. An exhaustive survey on security and privacy issues in healthcare 4.0. *Computer Communications*. 2020 Mar;153:311–35. doi:10.1016/j.comcom.2020.02.018
- Henry, B., Laudat, T., Richards, S., Morebise, O., Phillip, C., & Toussaint, D. (2022). The use of telemedicine in the management of chronic diseases in Small Island Developing States: Case study -Dominica. [https://www.itu.int/itu-d/sites/connect2recover/wp-content/uploads/sites/31/2022/12/C2R_RC_13_The-use-](https://www.itu.int/itu-d/sites/connect2recover/wp-content/uploads/sites/31/2022/12/C2R_RC_13_The-use-of-telemedicine-in-the-management-of-chronic-diseases-in-Small-Island-Developing-)

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- Iftikhar S, Saqib A, Sarwar MR, Sarfraz M, Arafat M, Shoaib Q. Capacity and willingness to use information technology for managing chronic diseases among patients: A cross-sectional study in Lahore, Pakistan. *PLOS ONE*. 2019 Jan 10;14(1). doi:10.1371/journal.pone.0209654
- Kitsiou S, Paré G, Jaana M, Gerber B. Effectiveness of mhealth interventions for patients with diabetes: An overview of Systematic Reviews. *PLOS ONE*. 2017 Mar 1;12(3). doi:10.1371/journal.pone.0173160 (Kitsiou et al., 2017)
- Kvedar JC, Fogel AL, Elenko E, Zohar D. Digital Medicine's March on chronic disease. *Nature Biotechnology*. 2016 Mar;34(3):239–46. doi:10.1038/nbt.3495
- Leigh JW, Gerber BS, Gans CP, Kansal MM, Kitsiou S. Smartphone ownership and interest in Mobile Health Technologies for self-care among patients with chronic heart failure: Cross-sectional Survey Study. *JMIR Cardio*. 2022 Jan 14;6(1). doi:10.2196/31982
- Livman S, Josefsson B. Using artificial intelligence in everyday management of diabetes type 1 : A Cross Sectional Study of the role of AI for individual patients [Internet]. 2022 [cited 2025 Feb 4]. Available from: <https://www.diva-portal.org/smash/record.jsf?pid=diva2:1635278&dswid=28>
- Lu L, Zhang J, Xie Y, Gao F, Xu S, Wu X, et al. Wearable Health Devices in health care: Narrative systematic review. *JMIR mHealth and uHealth*. 2020 Nov 9;8(11). doi:10.2196/18907
- Marcolino MS, Oliveira JA, D'Agostino M, Ribeiro AL, Alkmim MB, Novillo- Ortiz D. The impact of mhealth interventions: Systematic review of Systematic Reviews. *JMIR mHealth and uHealth*. 2018 Jan 17;6(1). doi:10.2196/mhealth.8873
- Mendez KJ, Budhathoki C, Labrique AB, Sadak T, Tanner EK, Han HR. Factors associated with intention to adopt mHealth apps among dementia caregivers with a chronic condition: Cross-sectional, correlational study. *JMIR mHealth and uHealth*. 2021 Aug 31;9(8). doi:10.2196/27926
- Miller DD, Brown EW. Artificial Intelligence in medical practice: The question to the answer? *The American Journal of Medicine*. 2018 Feb;131(2):129–33. doi:10.1016/j.amjmed.2017.10.035
- Nisar Khattak, M., Al-Taie, M. Z., Ahmed, I., & Muhammad, N. (2024). Interplay between servant leadership, leader-member-exchange and perceived organizational support: a moderated mediation model. *Journal of Organizational Effectiveness: People and Performance*, 11(2), 237-261.
- Nick JM, Sarpy NL. An analysis of data sources and study registries used in systematic reviews. *Worldviews on Evidence-Based Nursing*. 2022 Nov 15;19(6):450–7. doi:10.1111/wvn.12614
- Nittas V, Zecca C, Kamm CP, Kuhle J, Chan A, von Wyl V. Digital Health for Chronic Disease Management: An exploratory method to investigating technology adoption potential. *PLOS ONE*. 2023 Apr 13;18(4). doi:10.1371/journal.pone.0284477 Piwek L, Ellis DA, Andrews S, Joinson A. The Rise of Consumer Health Wearables: Promises and barriers. *PLOS Medicine*. 2016 Feb 2;13(2). doi:10.1371/journal.pmed.1001953
- Ponsiglione AM, Ricciardi C, Improta G, Orabona GD, Sorrentino A, Amato F, et al. A Six sigma DMAIC methodology as a support tool for health technology assessment of two antibiotics. *Mathematical Biosciences and Engineering*. 2021;18(4):3469–90. doi:10.3934/mbe.2021174
- Ranganathan P, Aggarwal R. Study designs: Part 7 – systematic reviews.

- Perspectives in Clinical Research. 2020;11(2):97. doi:10.4103/picr.picr_84_20 Rangraz Jeddi F, Nabovati E, Hamidi R, Sharif R. Mobile phone usage in patients with type II diabetes and their intention to use it for self-management: A cross-sectional study in Iran. BMC Medical Informatics and Decision Making. 2020 Feb 7;20(1). doi:10.1186/s12911-020-1038-y
- Rodríguez-Fortúnez P, Franch-Nadal J, Fornos-Pérez JA, Martínez-Martínez F, de Paz HD, Orera-Peña ML. Cross-sectional study about the use of telemedicine for type 2 diabetes mellitus management in Spain: Patient's perspective. The ENREDA2 Study. BMJ Open. 2019 Jun;9(6). doi:10.1136/bmjopen-2018-028467
- Subramanian M, Wojtusciszyn A, Favre L, Boughorbel S, Shan J, Letaief KB, et al. Precision medicine in the era of Artificial Intelligence: Implications in chronic disease management. Journal of Translational Medicine. 2020 Dec;18(1). doi:10.1186/s12967-020-02658-5
- Tanwar S, Parekh K, Evans R. Blockchain-based Electronic Healthcare Record System for healthcare 4.0 applications. Journal of Information Security and Applications. 2020 Feb;50:102407. doi:10.1016/j.jisa.2019.102407
- Vansimaey C, Benamar L, Balagué C. Digital Health and management of chronic disease: A multimodal technologies typology. The International Journal of Health Planning and Management. 2021 Mar 30;36(4):1107–25. doi:10.1002/hpm.3161
- Wildevuur SE, Simonse LW. Information and communication technology– enabled person-centered care for the “big five” chronic conditions: Scoping review. Journal of Medical Internet Research. 2015 Mar 27;17(3). doi:10.2196/jmir.3687.