(REVIEW ARTICLE)

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Health apps and patient engagement: A review of effectiveness and user experience

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Abstract

This paper reviews the effectiveness of health apps and their impact on patient engagement, focusing on the role of user experience (UX) in enhancing engagement and healthcare outcomes. A comprehensive literature analysis categorizes types of health apps and evaluates their effectiveness in improving patient engagement and health outcomes. Key UX principles essential for health app design are outlined, and the influence of UX on patient engagement is analyzed. The review identifies technological and ethical challenges in health app development, including privacy concerns and the need for inclusive design. Future research directions are suggested, highlighting areas for further exploration in health app effectiveness and user engagement. The findings emphasize the importance of effective health apps and superior UX design in fostering patient engagement, with implications for healthcare providers, patients, and app developers in leveraging digital health technologies to enhance healthcare delivery and patient well-being.

1. Introduction

In the digital transformation era, health applications have emerged as pivotal tools in modern healthcare, offering unprecedented opportunities for enhancing health management, patient care, and medical outcomes. These digital platforms range from fitness trackers and medication reminder apps to telehealth services and personalized health monitoring systems, each designed to facilitate various aspects of health and wellness (Haleem, Javaid, Singh, & Suman, 2022; Hermes, Riasanow, Clemons, Böhm, & Krcmar, 2020; Mbunge, Muchemwa, & Batani, 2021). Integrating health apps into daily life represents a significant shift in how individuals access, manage, and interact with healthcare services. By leveraging the power of smartphones and wearable technology, health apps provide real-time health data, personalized insights, and direct communication channels between patients and healthcare providers. This evolution marks a fundamental change in the healthcare landscape, where technology-enabled solutions are increasingly seen as essential components in the pursuit of improved health outcomes and healthcare efficiency.

Patient engagement is a critical element in the healthcare continuum, emphasizing the active involvement of patients in their care to improve health outcomes and enhance the quality of care. Engaged patients are more likely to be informed about their health conditions, participate in decision-making processes, and adhere to treatment plans and lifestyle changes recommended by their healthcare providers. The significance of patient engagement lies in its potential to transform healthcare from a traditionally provider-centric model to a more patient-centred approach, where patients' preferences, needs, and values are paramount. Engaging patients in their healthcare fosters a collaborative relationship

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between patients and providers. It contributes to better health behaviours, reduced healthcare costs, and increased patient satisfaction and loyalty (Carman et al., 2013; Carman & Workman, 2017; Mittler, Martsolf, Telenko, & Scanlon, 2013). In this context, health apps play a crucial role in facilitating patient engagement by providing tools that empower patients to take control of their health, access medical information, and communicate more effectively with their healthcare team (Qudah & Luetsch, 2019; Sawesi, Rashrash, Phalakornkule, Carpenter, & Jones, 2016).

This paper aims to critically review the effectiveness of health apps and analyze how user experience (UX) contributes to patient engagement. Given the proliferation of health apps and their potential impact on healthcare delivery and outcomes, it is essential to understand how these digital tools engage users and influence their health behaviours and decisions. This paper explores the various dimensions of health apps, including their design, functionality, and usability, and how these factors affect patient engagement and overall health outcomes. By examining the intersection of health app effectiveness and user experience, the paper aims to identify best practices, challenges, and opportunities for leveraging health apps to enhance patient engagement. Through this review, we aim to contribute to the ongoing discourse on digital health and provide insights for developers, healthcare providers, and policymakers on optimizing health apps to meet better the needs of patients and the broader healthcare system.

2. Literature Review

2.1. Evolution of Health Apps

The development of health apps has been a dynamic and evolving journey, mirroring the rapid advancements in mobile technology and digital healthcare. Initially, health apps were simple tools designed for basic health management tasks, such as calorie counting or step tracking (Pistorius, 2017; Steinhubl, Muse, & Topol, 2015). However, as technology advanced, these apps became more sophisticated, incorporating features like real-time health monitoring, personalized feedback, and integration with wearable devices. This evolution has been driven by the growing demand for accessible, personalized healthcare solutions and the increasing recognition of the potential for digital tools to support health and wellness.

Over time, health apps have expanded their scope to include a wide range of functionalities, from telehealth services that allow for virtual consultations with healthcare professionals to apps that use artificial intelligence (AI) to provide personalized health insights and recommendations. Features such as medication reminders, symptom trackers, and mental health support have been introduced to engage patients more actively in their care. Moreover, the integration of gamification elements, such as rewards and challenges, has been employed to enhance user engagement and motivation. This progression reflects a shift towards more user-centred designs, aiming to make health management more interactive, accessible, and personalized (Dinesen et al., 2016; Vesselkov, Hämmäinen, & Töyli, 2018; Wilson & Maeder, 2015).

2.2. Theoretical Frameworks

Several theoretical frameworks underpin the study of health apps, technology adoption, user experience (UX), and patient engagement. The Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) are prominent theories applied to understand the factors influencing the adoption and sustained use of health apps. These frameworks highlight the importance of perceived usefulness, ease of use, and social influence in determining the likelihood of technology adoption (Grundgeiger, Hurtienne, & Happel, 2021; Hart & Sutcliffe, 2019).

In the context of UX, models such as the User Experience Honeycomb and the UX Wheel emphasize the need for health apps to be useful, usable, desirable, findable, accessible, credible, and valuable to ensure a positive user experience. These models suggest that a comprehensive approach to UX design, considering various facets of the user's interaction with the app, is crucial for engaging users effectively. Regarding patient engagement, frameworks like the Patient Engagement Framework outline the levels and strategies for engaging patients in their healthcare through technology. This framework suggests that engagement is a multifaceted process that involves informing, empowering, and collaborating with patients facilitated by digital tools.

Research on health apps has demonstrated their potential to significantly engage patients and improve health outcomes. Studies have found that health apps can enhance medication adherence, increase physical activity, and improve chronic disease management through continuous monitoring and personalized feedback. For example, diabetes management apps that provide blood glucose tracking and dietary recommendations have been shown to help users manage their condition more effectively, improving glycemic control. However, the effectiveness of health apps is not uniform across all user groups or health conditions. Some studies indicate that the impact of health apps may vary based on factors

such as age, tech-savviness, health literacy, and the nature of the health condition being managed (Subramanian, De Moor, Vereijken, Dahl, & Svanæs, 2022; van Elburg, Klaver, Nieboer, & Askari, 2022). Additionally, the quality and credibility of health information provided by apps are critical for user trust and engagement, with concerns raised about the accuracy and reliability of some apps (Lavallee et al., 2016; Lee et al., 2018).

Despite the growing body of research on health apps, several gaps remain in the literature. There is a need for more longitudinal studies to assess the long-term effectiveness of health apps in engaging patients and improving health outcomes. Additionally, research on the impact of health apps across diverse populations, including underrepresented groups, is limited, raising questions about the generalizability of findings. The role of user experience in adopting and sustaining health apps is another area that requires further exploration (Baretta, Perski, & Steca, 2019). While the importance of UX is recognized, there is a lack of comprehensive models that integrate UX with patient engagement and health outcomes. Moreover, the rapidly evolving nature of technology and healthcare presents new challenges and opportunities for health apps that have yet to be fully explored in the literature.

This review highlights the significant strides made in developing and applying health apps, the theoretical foundations supporting their use, and the evidence of their effectiveness. However, it also underscores the need for continued research to address the identified gaps, ensuring that health apps can fulfil their potential as tools for enhancing patient engagement and improving health outcomes.

3. Health Apps and Their Impact on Healthcare

3.1. Types of Health Apps

Health apps have significantly diversified, catering to various aspects of healthcare and wellness. They can be broadly categorized into the following types, each serving distinct purposes:

- Fitness Trackers: These apps monitor physical activity, such as steps taken, calories burned, and workout routines. They often integrate with wearable devices to provide real-time data and insights into physical health (Bender, Hoffstot, Combs, Hooshangi, & Cappos, 2017; Boulos & Yang, 2021).
- Medication Reminders: Designed to help users manage their medication schedules, these apps send reminders for dosages and keep track of medication intake, reducing the risk of missed or incorrect doses.
- Telehealth Services: These platforms offer virtual consultations with healthcare professionals, enabling remote diagnosis, treatment advice, and prescription services. They have become especially crucial in providing continued care amidst restrictions on in-person visits (Haleem, Javaid, Singh, & Suman, 2021; Jnr, 2020).
- Chronic Disease Management: Tailored to individuals with chronic conditions like diabetes, hypertension, and heart disease, these apps track health indicators (e.g., blood sugar levels and blood pressure) and provide personalized advice to manage the condition.
- Mental Health and Wellness: These apps offer resources for mental health support, including therapy sessions, stress management techniques, and mindfulness exercises, aiming to improve users' mental well-being (Eisenstadt, Liverpool, Infanti, Ciuvat, & Carlsson, 2021).
- Nutrition and Diet: Focused on dietary health, these apps help users track their food intake, offer nutritional information, and provide personalized diet plans (Franco, Fallaize, Lovegrove, & Hwang, 2016).

3.2. Effectiveness of Health Apps

The effectiveness of health apps in achieving healthcare outcomes has been the subject of numerous studies. Research indicates that health apps can improve health behaviours, enhance disease management, and increase patient engagement. For example, fitness-tracking apps have been associated with increased physical activity levels among users, contributing to weight loss and improved cardiovascular health. Similarly, apps for chronic disease management have demonstrated positive outcomes in managing conditions like diabetes, with users experiencing better glycemic control through regular monitoring and lifestyle adjustments. However, the effectiveness of these apps often depends on sustained user engagement and adherence to app recommendations. The variability in app quality and the presence of evidence-based content also play crucial roles in their potential to impact health outcomes positively.

Several factors play a pivotal role in influencing the adoption and sustained use of health apps among patients, either as facilitators or as barriers. On the facilitators' front, the ease of use is paramount. Health apps with intuitive designs and straightforward navigation make it more likely for users to embrace and stick with them. Personalization is another key facilitator, as apps that tailor their feedback and recommendations to address an individual's unique health needs tend to engage users more effectively. Integration with wearable devices also greatly enhances the user experience,

allowing seamless synchronization with these technologies, thereby improving data accuracy and user engagement (Jacob, Sanchez-Vazquez, & Ivory, 2020; Schreiweis et al., 2019).

However, some barriers can impede the widespread adoption of health apps. Privacy concerns top the list, as individuals may be apprehensive about the security of their personal health information when using these apps. Additionally, a lack of awareness regarding the availability and benefits of health apps can limit their use, as can limited digital literacy among certain users who struggle to navigate and utilize these applications effectively. Lastly, cost can be a significant barrier, particularly when health apps offer premium features or subscription services that may not be accessible to all users. Recognizing and addressing these barriers and facilitators is essential for developers and healthcare providers alike, aiming to maximize the positive impact of health apps on healthcare outcomes, ensuring their accessibility, engagement, and benefits for a broader spectrum of users (Alkureishi et al., 2021; Chan, 2021).

4. User Experience and Patient Engagement

The successful design and development of health apps hinge on their adherence to essential user experience (UX) principles. These principles not only guarantee the functionality of these apps but also ensure they are engaging and user-friendly. Usability is of utmost importance, as health apps should be designed to be intuitive, enabling users to navigate through them without confusion or frustration. Providing clear instructions, feedback mechanisms, and user-friendly error messages all contribute to enhancing usability. Accessibility is another vital principle that ensures inclusivity, catering to users with diverse needs, including those with disabilities (Imrie & Hall, 2003; Persson, Åhman, Yngling, & Gulliksen, 2015). This involves considerations like text size, colour contrasts, voice command integration, and compatibility with screen readers to ensure that every user can access and utilize the app effectively.

Personalization is key to boosting user engagement, as tailoring the app experience to individual preferences, needs, and health goals can significantly enhance user satisfaction. This personalization can include customizable interfaces, goal setting, and tailored content delivery. To keep users consistently engaged, it's essential to incorporate elements that encourage regular use, such as timely notifications, rewards systems, and gamification. Given the sensitive nature of health data, privacy and security are paramount principles to uphold. Users must have control over their data and be informed about how it is collected, stored, and utilized. Finally, reliability is crucial as health apps must consistently function correctly and provide accurate health information and tracking data to establish and maintain user trust. This reinforces their role as valuable tools in healthcare management (Kankanhalli, Xia, Ai, & Zhao, 2021; Srinivas et al., 2019).

4.1. Measuring User Experience

Evaluating the user experience in health apps entails employing various methods that yield insights into user interactions and satisfaction levels. Essential approaches include gathering user surveys and feedback, enabling direct communication with users to uncover their satisfaction levels, pinpoint usability issues, and identify areas for improvement. Usability testing involves observing users performing tasks within the app, highlighting usability problems and areas where the user experience can be enhanced. Analyzing usage data, such as time spent on the app, frequency of use, and engagement with specific features, offers objective metrics for assessing user engagement and app performance. Additionally, A/B testing, which involves comparing different versions of app features among user groups, helps determine which designs or functionalities enhance the overall user experience, providing valuable insights for app refinement and development (King, Churchill, & Tan, 2017; Kohavi, Longbotham, Sommerfield, & Henne, 2009).

4.2. Impact of UX on Patient Engagement

The user experience of health apps profoundly impacts patient engagement, satisfaction, and health behavior change. A positive UX can increase app usage frequency, adherence to health interventions, and better health outcomes. For instance, an app that effectively uses personalization can make users feel more invested in their health journey, encouraging them to track their progress and adhere to recommended actions (Yardley, Morrison, Bradbury, & Muller, 2015).

Conversely, a poor UX can result in app abandonment, negatively affecting patient engagement. For example, suppose users find an app difficult to navigate or fail to provide value. In that case, they are less likely to use it consistently, which can diminish its potential impact on their health. Moreover, UX can influence patient satisfaction by shaping perceptions of care quality and personal empowerment (Al-Naher, Downing, Scott, & Pirmohamed, 2022; Al-Shamaileh & Sutcliffe, 2023). Apps that offer a seamless, supportive, and engaging experience can enhance patients' satisfaction with their healthcare management, promoting a more active and informed role in their health decisions.

Ultimately, the quality of the user experience in health apps plays a crucial role in determining their effectiveness as tools for patient engagement. By prioritizing UX principles in designing and developing health apps, developers can significantly enhance patient engagement, satisfaction, and the likelihood of positive health behavior change, contributing to better healthcare outcomes overall (Madeira, Germano, Macedo, & Correia, 2018; Wang, Giunti, Melles, & Goossens, 2022).

5. Discussion

5.1. Integration of Findings

The synthesis of research findings underscores health apps' significant role in engaging patients and enhancing their healthcare experience. When designed with the user in mind, these digital tools can facilitate a more proactive approach to health management, empowering patients to take control of their wellness journey. The effectiveness of health apps in improving patient engagement is closely tied to the quality of the user experience (UX). Apps that are accessible, intuitive, and personalized not only meet the diverse needs of users but also encourage sustained engagement and adherence to health interventions.

Studies have shown that health apps can lead to improved health outcomes, such as better chronic disease management, increased physical activity, and higher medication adherence. This effectiveness is largely attributed to features that promote user engagement, including personalized feedback, goal setting, and interactive functionalities. However, the impact of these apps varies based on their ability to maintain user interest and involvement over time, highlighting the importance of continuous UX optimization (Iribarren et al., 2021; Karim et al., 2020).

The integration of UX principles into health app design—emphasizing usability, accessibility, and personalization—has been shown to positively affect patient satisfaction and engagement. By creating an engaging and supportive digital environment, health apps can motivate users to adopt healthier behaviors and make informed decisions about their health.

5.2. Practical Implications

The findings suggest several effective strategies for health app developers and healthcare providers to bolster patient engagement through user experience (UX) design. First and foremost, prioritizing simplicity and usability ensures that apps are user-friendly, fostering accessibility for users with varying tech proficiency levels. Incorporating personalization based on user data allows for tailored health recommendations and content, enhancing relevance and engagement. Moreover, improving accessibility by integrating features like voice commands, screen reader compatibility, and adjustable text sizes makes the app more inclusive. To build trust and ensure privacy, it's crucial to communicate transparently about how user health data is collected and protected. Lastly, engaging users with interactive features such as gamification, notifications, and social sharing options maintains motivation and sustained engagement with the app, ultimately contributing to better health outcomes.

5.3. Theoretical Implications

The insights derived from this review contribute to existing theories on technology adoption and patient engagement by highlighting the critical role of UX in the acceptance and effective use of health apps. The findings reinforce the principles of the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT), emphasizing the importance of perceived usefulness, ease of use, and social influence on technology adoption decisions.

Furthermore, the research underscores the concept that patient engagement is not solely determined by the availability of digital health tools but also by the quality of the interaction between the user and the technology. This aligns with patient-centred care models, suggesting that technology should be designed to meet the needs and preferences of patients, thereby enhancing their engagement and participation in health management.

The analysis also offers a nuanced understanding of the barriers and facilitators to health app adoption, suggesting areas for further theoretical exploration, such as the impact of digital literacy, socio-economic factors, and cultural differences on technology acceptance in healthcare. In summary, the discussion integrates research findings to demonstrate how, through superior UX design, health apps can significantly enhance patient engagement. It provides practical recommendations for developers and healthcare providers. It contributes to theoretical frameworks on technology adoption and patient engagement, offering a foundation for future research and development in digital health.

6. Challenges and Future Directions

6.1. Technological and Ethical Challenges

The advancement and proliferation of health apps bring to the fore several technological and ethical challenges that require careful consideration:

- Technological Limitations: Despite rapid advancements, technical limitations remain a challenge, particularly in terms of interoperability, data accuracy, and integrating health apps with existing healthcare systems. Ensuring that apps seamlessly exchange data with electronic health records (EHRs) and other healthcare technologies is crucial for comprehensive care.
- Privacy Concerns: Handling sensitive health data by apps raises significant privacy concerns. Ensuring robust data protection and compliance with regulations such as the General Data Protection Regulation (GDPR) and the Health Insurance Portability and Accountability Act (HIPAA) is essential to safeguard user privacy.
- Ethical Considerations: Ethical issues warrant attention, including the potential for health apps to exacerbate health disparities and the consent process for using health data. Developers and healthcare providers must address these concerns by designing apps that are accessible to diverse populations and transparent about how user data is utilized.

6.2. Future Research Directions

The field of health apps, user experience, and patient engagement presents numerous avenues for further research, each with its potential for advancing our understanding and improving healthcare outcomes. Longitudinal studies should be conducted to assess the sustained impact of health app usage on health outcomes and patient engagement over extended periods, shedding light on the long-term effectiveness of these digital tools. Moreover, it is crucial to investigate how health apps affect diverse populations, including underrepresented groups, to identify and mitigate potential disparities in access and outcomes, ensuring equitable healthcare delivery.

Another area of research should focus on integrating health apps into existing healthcare systems. Exploring the challenges and opportunities associated with seamless integration could provide valuable insights into how these digital tools complement and enhance traditional care models. Leveraging advanced technologies such as artificial intelligence (AI) and machine learning within health apps is another avenue worth exploring, as it can offer new avenues for personalized care and improved user engagement. Furthermore, the psychological and behavioural aspects of app usage, including how different UX design elements influence health behaviours and decision-making, can inform more effective app designs that promote healthier lifestyles.

Lastly, the development of comprehensive ethical guidelines and regulatory frameworks is imperative. These frameworks should address the complex issues surrounding privacy, data security, and equity in using health apps, ensuring that these digital tools adhere to the highest ethical standards and provide equitable access to healthcare resources for all individuals. In sum, these research areas hold the potential to propel the field of health apps and patient engagement forward, leading to more effective, inclusive, and ethically sound healthcare solutions.

7. Conclusion

The comprehensive review of health apps and their impact on patient engagement underscores the transformative potential of digital health technologies in modern healthcare. Key findings from the review highlight the diverse array of health apps available, from fitness trackers and medication reminders to chronic disease management and mental health support tools. These apps offer significant benefits, including improved health outcomes, enhanced patient engagement, and increased accessibility to healthcare services. The effectiveness of health apps is closely linked to the quality of the user experience (UX), with principles such as usability, personalization, accessibility, and privacy playing critical roles in determining user engagement and satisfaction.

The review also elucidates the technological and ethical challenges facing the development and use of health apps, including data privacy concerns, interoperability issues, and the need for inclusive design. These challenges underscore the importance of adopting robust ethical standards and privacy protections in the development of health apps. Furthermore, the discussion on future research directions calls for longitudinal studies, exploration of the impact on diverse populations, and the integration of advanced technologies to understand further and enhance the effectiveness of health apps. The findings of this review have broad implications for healthcare providers, patients, and app developers. For healthcare providers, the integration of health apps into patient care offers an opportunity to enhance

patient engagement, monitor health outcomes in real-time, and provide personalized care. Patients stand to benefit from increased control over their health and wellness, improved access to healthcare services, and the empowerment that comes from being actively engaged in their health management. For app developers, the insights into user experience and patient engagement highlight the importance of designing apps that are not only technologically advanced but also user-friendly, accessible, and sensitive to the privacy and ethical considerations of health data management.

In conclusion, health apps represent a vital component of the evolving healthcare landscape, potentially significantly enhancing patient engagement and health outcomes. The success of these digital tools, however, is contingent upon addressing the current challenges and continuously adapting to the changing needs of users. As technology advances and our understanding of patient engagement deepens, the collaborative efforts of healthcare providers, patients, and developers will be crucial in realizing the full potential of health apps to contribute to a more engaged, informed, and healthy society.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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