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Interventions utilizing smartwatches in healthcare: A comprehensive literature review

Fahad Alabeidi
KSA, National Guard Health Affairs

Hussain Mahdi Aljawad
KSA, National Guard Health Affairs

Khwlah Abdulaziz Alswaied
KSA, National Guard Health Affairs

Rana Nashmi Alanazi
KSA, National Guard Health Affairs

Mashael Shaya Aljabri
KSA, National Guard Health Affairs

Abeer Abdu Jaafari
KSA, National Guard Health Affairs

Asma Jadid Alanazi
KSA, National Guard Health Affairs

Khadeja Abdullah Alhomod
KSA, National Guard Health Affairs

Arwa Abdullah Alhamed
KSA, National Guard Health Affairs

Khloud Awadh Alhizan
KSA, National Guard Health Affairs

Sahar Adi Albogamy
KSA, National Guard Health Affairs

Rawan Fahad Alkhodair
KSA, National Guard Health Affairs

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***Corresponding email**: akk29337@gmail.com*
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Faisal Mohammed Alosaimi
KSA, National Guard Health Affairs

Talal Alhumaidi Alharbi
KSA, National Guard Health Affairs

Yussef Falah Alharbi
KSA, National Guard Health Affairs

Hamad Saleh Alotaysh
KSA, National Guard Health Affairs

Mohammed Ibrahim Suliman Albabtain
KSA, National Guard Health Affairs

Thamer Hamed Aljuaid
KSA, National Guard Health Affairs

***Abstract*---Background:** The rise of wearable technology has significantly transformed health management, with smartwatches becoming essential tools for enhancing health and wellness. Their capabilities include monitoring various health metrics and facilitating proactive health management. However, systematic reviews examining the impact of smartwatches on health outcomes remain limited. **Aim:** This review aims to synthesize the existing evidence on smartwatch interventions in clinical research and assess their effectiveness in improving health-related outcomes. **Methods:** A systematic literature search was conducted in Scopus and PubMed for studies published up to April 2023. Inclusion criteria focused on clinical studies utilizing smartwatches, reporting quantitative health outcomes. Data extraction involved details on target diseases, smartwatch models, study designs, and health outcomes, while quality assessment was performed using the Effective Public Health Practice Project (EPHPP) tool. **Results:** The search yielded 1,099 records from Scopus and 353 from PubMed, leading to 13 studies that met inclusion criteria. Interventions primarily targeted cardiovascular conditions, diabetes, mental health, and other health issues. Most studies demonstrated moderate methodological quality, with two rated strong. The majority of interventions provided notifications and reminders to enhance patient engagement and adherence. **Conclusion:** Smartwatches show promise in clinical settings, improving health outcomes across various conditions. Their integration into healthcare practices can foster patient self-management and enhance the quality of care. However, further research is necessary to address gaps in the literature and refine smartwatch interventions.

***Keywords*---**smartwatches, wearable technology, health management, clinical research, systematic review.

Introduction

The utilization of wearable technology for health management has experienced significant expansion [1], [2]. Smartwatches have emerged as a prominent category of wearable devices, enabling individuals to proactively manage their health and enhance their well-being directly from their wrists [3]. A smartwatch serves as a multifunctional, networked computing device, primarily acting as an extension of a mobile phone. It facilitates the monitoring of various health metrics, including physical activity, heart rate, blood oxygen saturation, energy expenditure, and sleep quality, utilizing a suite of sensors, while also providing timely notifications to users [4]. Contemporary smartwatches predominantly feature touch screens [5] and allow for the collection of patient-reported outcomes [6]. Additionally, they incorporate advanced capabilities for improved user interactions, such as applications [7], offering more sophisticated functionalities compared to other consumer-grade wearable devices [8]. The integration of smartwatches into healthcare practices presents a promising strategy for fostering patient self-management or remote health monitoring, chiefly due to their ability to continuously track multiple health indicators and identify health deterioration in everyday settings. The acceptability, usability, and potential efficacy of smartwatches in enhancing health outcomes have been examined in various prior investigations [9], [10], [11], [12], [13].

Despite the escalating consumer interest in smartwatches [14], research reviews assessing their impact on health outcomes have been notably scarce. To the authors' knowledge, the most relevant comprehensive systematic reviews in this domain are from 2016 [3], [15]. Previous reviews have primarily addressed wearable technology as a whole [16], [17], as well as their application in specific health conditions like cardiovascular disease [18], diabetes [19], and depression [20], or general physical activity trackers [21], [22]. Given the widespread integration and benefits of smartwatches in healthcare, a timely systematic review of the literature is warranted. The primary aim of this review is to synthesize the existing evidence concerning smartwatch interventions applied within clinical research and to assess their effectiveness on health-related outcomes for individuals. Key features of smartwatch interventions and their associated outcomes are delineated to provide evidence of the advantages of smartwatches in clinical settings, while also enhancing the research community's understanding of the opportunities and challenges surrounding their implementation and acceptance.

The authors conducted searches in widely utilized bibliographic databases, Scopus and PubMed, to identify clinical research studies published up to April 2023 that employed smartwatch interventions. The criteria for study inclusion encompassed the following: (a) the study must focus on one or more diseases, (b) the incorporation of a smartwatch must be clearly articulated as part of the intervention, (c) quantitative health outcomes from a clinical trial must be reported, and (d) the manuscript detailing the study must be composed in English. Studies that were ongoing, case reports, simulation studies, surveys, reviews, qualitative studies, studies detailing protocols, nonhuman sample studies, and those exclusively addressing feasibility, usability, or acceptance of the intervention were excluded. Studies that reported on fitness devices instead of

smartwatches were also omitted, based on details obtained from the manufacturer's website of the wearable technology. There were no restrictions on the target population or the disease outcomes of interest.

The literature search in electronic databases was executed in April 2023, employing the following search terms within the titles, abstracts, and keywords of the articles: ("smartwatch" OR "smart watch") AND ("health" OR "healthcare" OR "intervention"). The Mendeley© reference management software [23] was utilized for reference organization. Duplicates were eliminated, and a spreadsheet was created that compiled information from each article regarding authorship, title, abstract, and digital object identifier, which was subsequently shared among the reviewing authors (AT, HK, DK, AK, TA, SS). The article screening process was conducted in two phases. In the initial screening phase, pairs of authors independently evaluated the papers to mitigate potential errors or biases in the selection process. All abstracts of the identified articles were assessed for eligibility based on the established inclusion and exclusion criteria. During the second screening phase, final inclusion for the review was determined by pairs of reviewers after a thorough examination of the full manuscripts of articles deemed eligible in the first round. Any discrepancies among reviewers were resolved through consensus. Inter-rater reliability statistics were not utilized. The following data elements were extracted from the final studies and summarized in tabular format: target disease, smartwatch model, intervention focus, additional devices employed alongside the smartwatch, primary intervention features, study design, participant count, participant age, follow-up duration, outcome measures, and whether statistically significant ($p < 0.05$) or clinically meaningful outcomes were reported. To assess the methodological quality of the included studies, the Effective Public Health Practice Project (EPHPP) tool was employed, based on six quality criteria addressing participant selection bias, study design, management of confounding variables, participant and researcher blinding, data collection methodologies, and participant withdrawals or dropouts. The EPHPP tool was selected due to its established reliability and frequent use in review studies [24]. Following the tool's guidelines, each quality criterion was assigned a rating of weak, moderate, or strong. A global rating of strong was applied when no weak ratings were identified, a global rating of moderate was assigned when one weak rating was found, and a global rating of weak was assigned when two or more weak ratings were recorded. The systematic review adhered to PRISMA guidelines [25].

Literature Search Outcomes

A total of 1,099 records were sourced from Scopus, alongside 353 records from PubMed. The acquired records were systematically imported into Mendeley© bibliography management software, leading to the elimination of 327 duplicate entries. The abstracts of the remaining 1,125 articles were scrutinized based on predetermined inclusion and exclusion criteria, ultimately resulting in the identification of 19 articles that met the eligibility criteria. The reviewers proceeded to evaluate the full texts of these 19 manuscripts and reached a consensus to include 13 of them [26], [27], [28], [29], [30], [31], [32], [33], [34], [35], [36], [37], [38]. These selected studies were published between 2018 and 2023. Additionally, eight ongoing clinical trials were identified after searching the

clinicaltrials.gov database, filtering for interventional studies and active studies that were either not yet recruiting, currently recruiting, or actively enrolling by invitation, in accordance with our inclusion and exclusion criteria.

Quality Assessment

The methodological quality of the included studies was evaluated using the Effective Public Health Practice Project (EPHPP) criteria, revealing that two studies (15%) exhibited strong quality [30], [32], seven studies (54%) demonstrated moderate quality [26], [32], [34], [35], [36], [37], [38], and four studies (31%) were rated as weak [27], [28], [29], [30]. The studies categorized as weak were primarily associated with insufficient descriptions regarding the validity and reliability of data collection methods, a high rate of participant withdrawals or dropouts, absence of blinding for either researchers or participants, and inadequate management of confounding variables. Concerning study design, the majority consisted of 10 randomized controlled trials (76%), while three studies (23%) utilized a non-randomized design.

Intervention Target and Technological Devices

The interventions in the 13 studies predominantly involved the use of smartwatches to enhance health and well-being in everyday settings. Specifically, four interventions (31%) targeted cardiovascular conditions, including atrial fibrillation and acute myocardial infarction [29], [33], [34], [37]. Furthermore, two interventions (15%) addressed diabetes [26], [36], while two additional interventions (15%) focused on cancer [32], [35]. Mental health disorders were the target of two interventions (15%) [27], [38]. Other conditions addressed included knee arthroplasty [28], chronic stroke [30], and allergic rhinitis [31]. The primary justification for utilizing smartwatches in these studies was their capability for automated collection of health-related data [27], [28], [29], [30], [31], [33], [34], [35], [36], [37], and the facilitation of notification triggers [26], [32], [38]. Regarding the specific smartwatch models employed in the studies, the Apple Watch was utilized in four studies [28], [33], [34], [37] (31%), while the Fitbit and LG smartwatches each featured in two studies [29], [32], [30], [38] (15%). Other devices such as the Polar M400 [35] and Ticwatch E [36] were also included. Participants in the majority of the studies received their smartwatches from the research team, with the exception of one study where participants were expected to have their own devices [34]. Notably, a smartphone was integrated into nine out of the thirteen interventions (69%), enhancing the functionality of the smartwatch.

Main Intervention Features

The primary characteristic of the smartwatch interventions involved the provision of notifications, reminders, and alerts to users, present in 9 out of 13 studies (69%). Specifically, 6 interventions delivered notifications directly through the smartwatch, while 3 used a companion smartphone application for this purpose. For instance, Abbott et al. [26] utilized audiovisual alerts from the smartwatch upon detecting abnormal foot pressures. Broers et al. [29] sent smartphone messages to facilitate health behavior modifications based on data gathered from

multiple health monitoring devices, including a smartwatch. Li et al. [31] implemented SMS reminders for medication when the smartwatch indicated non-compliance. Low et al. [32] employed smartwatch notifications to encourage physical activity. Similarly, Marvel et al. [33] delivered medication reminders to both the smartwatch and smartphone. Other interventions included smartwatch notifications for irregular pulse detection by Perez et al. [34], exercise reminders by Timurtas et al. [36], and personalized smartphone notifications to enhance adherence in taking vital sign measurements by Trinquart et al. [37]. Lastly, Wallace et al. [38] integrated a smartwatch application to provide instructions and reminders for deep breathing exercises aimed at stress management. Additional features of the smartwatch interventions encompassed the measurement and monitoring of physical activity [27], [29], [30], [32], [33], [35], [36], the dissemination of educational content [27], [33], [35], and symptom tracking [31], [32].

Participants and Follow-Up Duration

A significant portion of the studies, specifically 8 (61%), were conducted in the United States, while others took place in the UK, Netherlands, China, Republic of Korea, and Turkey. The average participant count across the studies included was 32,465, with a range from 23 to 419,297. The most substantial study, led by Perez et al. [34], involved 419,297 participants to explore atrial fibrillation detection via the Apple Watch. Conversely, 7 studies reported small sample sizes with fewer than 100 participants [26], [30], [31], [32], [35], [36], [38]. The majority of participants were middle-aged or older, with ages ranging from 30 to 78 years. Specifically, 5 studies [26], [28], [29], [30], [33] featured participants with a mean age exceeding 60 years. The average follow-up duration across the studies was 4.9 months, varying from 4 weeks to 18 months. Abbott et al. [26] reported the longest follow-up duration of 18 months, focusing on the prevention of diabetic foot ulcer recurrence. However, most studies had follow-up periods of 3 months or less [29], [30], [31], [32], [33], [35], [36], [38].

Summary of Study Characteristics

The following data summarizes the characteristics of each study included in the review:

- **Abbott et al. [26]** conducted a randomized controlled trial with 58 participants, averaging 67.1 years in the control group and 59.1 years in the intervention group, over an 18-month follow-up period, with significant outcomes related to foot ulcer recurrence.
- **Aguilar-Latorre et al. [27]** executed a pragmatic randomized clinical trial involving 188 participants with a mean age of 53.32 years and a follow-up duration of 6 months, reporting statistically significant outcomes concerning depressive symptom severity.
- **Alexander et al. [28]** conducted a randomized controlled trial with 401 participants, mean age 64 years for the control group and 63 years for the intervention group, over 1 year, demonstrating statistically significant results for healthcare resource utilization.

- **Broers et al. [29]** engaged 150 participants in a randomized controlled trial with a mean age of 61.97 years over a 3-month follow-up, achieving significant outcomes related to lifestyle changes.
- **Chae et al. [30]** ran a controlled clinical trial with 23 participants, mean ages of 64.5 years for the control group and 58.3 years for the intervention group, over an 18-week followup, reporting significant outcomes in functional assessments and shoulder range of motion.
- **Li et al. [31]** executed a randomized controlled trial involving 55 participants with a mean age of 41 years over 1 month, reporting significant adherence rates for oral antihistamines and rhinoconjunctivitis symptom scores.
- **Low et al. [32]** involved 26 participants in a randomized controlled trial with a mean age of 56.2 years, averaging 57.2 days for follow-up, though no statistically significant outcomes were noted for Fitbit-measured behaviors and readmissions.
- **Marvel et al. [33]** conducted a nonrandomized controlled trial with 1,064 participants, mean age 64.3 years over a 1-month post-discharge period, achieving significant outcomes in unplanned all-cause readmissions.
- **Perez et al. [34]** ran a prospective single-group pragmatic study with 419,297 participants, mean age 41 years, with a median monitoring time of 117 days, reporting 84% concordance with atrial fibrillation notifications.
- **Pope et al. [35]** included 30 participants in a randomized controlled trial, mean age 52.6 years over 10 weeks, but found no statistically significant outcomes.
- **Timurtas et al. [36]** involved 75 participants in a randomized controlled trial with a mean age of 51.6 years over 12 weeks, yielding no significant outcomes.
- **Trinquart et al. [37]** conducted a factorial blinded randomized trial with 655 participants, mean age 53 years over a 6-month period, where personalized notifications significantly improved adherence to vital sign measurements.
- **Wallace et al. [38]** executed a pragmatic randomized clinical trial with 30 participants, mean age 37.67 years over 4 weeks, reporting significant outcomes in goal attainment for emotion regulation.

Main Intervention Features

The primary characteristic of the smartwatch interventions was the provision of notifications, reminders, and alerts, which were present in 9 out of the 13 interventions (69%). Specifically, 6 interventions delivered notifications via the smartwatch itself, while 3 relied on a companion smartphone application. For instance, Abbot et al. [26] employed audiovisual alerts from the smartwatch when detecting abnormal pressures on the foot. Broers et al. [29] utilized smartphone messages to facilitate health behavior changes, based on data obtained from various health monitoring devices, including smartwatches. Li et al. [31] sent medication reminders via SMS when the smartwatch detected non-compliance. Additionally, Low et al. [32] used smartwatch notifications to promote physical activity. Marvel et al. [33] combined reminders for medication delivery to both the smartwatch and the smartphone. Other notable features included notifications for irregular pulse detection by Perez et al. [34], exercise reminders from Timurtas et

al. [36], and personalized smartphone notifications designed to enhance adherence to vital sign measurements by Trinquart et al. [37]. Lastly, Wallace et al. [38] employed a smartwatch application to provide instructions and reminders for deep breathing exercises aimed at stress management. Additional features of the smartwatch interventions encompassed the measurement and monitoring of physical activity as detailed in studies by [27], [28], [29], [30], [32], [33], [35], and [36]. Moreover, educational content delivery was reported in studies [27], [33], and [35], alongside symptom tracking as indicated by [31] and [32].

Participants and Follow-Up Duration

A total of 8 studies (61%) were conducted in the United States, with the remaining studies distributed across the UK, Netherlands, China, Republic of Korea, and Turkey. The average number of participants across the included studies was 32,465, with a range from 23 to 419,297. The largest study, conducted by Perez et al. [34], included 419,297 participants to investigate atrial fibrillation detection via the Apple Watch. In contrast, 7 studies had fewer than 100 participants, as noted in [26], [30], [31], [32], [35], [36], and [38]. The participant age range was between 30 and 78 years, with 5 studies [26], [28], [29], [30], and [33] reporting a mean age exceeding 60 years. The follow-up duration averaged 4.9 months, varying from 4 weeks to 18 months. The longest follow-up period of 18 months was reported in the study by Abbott et al. [26], focusing on the prevention of diabetic foot ulcer recurrence. Conversely, most studies had a follow-up duration of 3 months or less, as outlined in [29], [30], [31], [32], [33], [35], [36], and [38].

Participant Dropout

Participant dropout represents a critical methodological challenge in research studies involving digital health interventions. In the smartwatch intervention group of the included studies, dropout rates varied from 5% in Li et al. [31] to 65% in Abbott et al. [26], resulting in an average dropout rate of 27%. The documented reasons for dropout were outlined in detail, although three studies did not report any reasons. The most frequently cited reasons included difficulties or discomfort in engaging with technology, noted in [26], [28], [30], [33], and [35]; health-related issues, mentioned in [26], [30], [32], and [34]; and time commitment challenges, indicated by [27], [28], and [36]. Specific issues related to smartwatch usage contributed to dropout in 2 studies (15%), as reported by [26] and [35]. For instance, Abbott et al. [26] experienced a dropout rate of 65%, primarily due to excessive hospital appointment commitments arising from comorbidities, difficulties with smartwatch technology, and issues related to footwear. Aguilar-Latorre et al. [27] reported a 32% dropout rate attributed to time incompatibility and a lack of interest in completing follow-up questionnaires. Alexander et al. [28] documented a 37% dropout rate, influenced by factors such as screen failure, discomfort with technology, and postponed surgeries, while Broers et al. [29] had a comparatively lower dropout rate of 12%, with reasons not available. Chae et al. [30] reported a 45% dropout rate due to technology unfamiliarity, lack of interest in the control group's program, and disease deterioration. In contrast, Li et al. [31] had the lowest dropout rate of 5%, attributed to poor compliance and lack of outcome indexes recording. Low et al. [32] reported a dropout rate of 15% due to poor health. Marvel et al. [33] had a 7%

dropout rate, citing reasons such as death and feelings of being overwhelmed by study participation. Perez et al. [34] experienced a dropout rate of 57%, primarily due to difficulties in initializing the first study visit and health issues. Pope et al. [35] noted a 25% dropout rate related to smartwatch size and privacy concerns on Facebook, while Timurtas et al. [36] reported a 20% dropout rate due to family reasons and holidays. Lastly, Trinquart et al. [37] recorded a dropout rate of 33%, with reasons not available, and Wallace et al. [38] had a low dropout rate of 6%, also without available reasons.

Outcomes

The majority of the studies, specifically 10 out of 13 interventions (76%), reported statistically significant or clinically meaningful outcomes in favor of the intervention group. These positive outcomes included a reduction in foot ulcer recurrence, improvements in the severity of depression symptoms, increased utilization of healthcare resources, lifestyle changes, better functional assessment, enhanced shoulder range of motion, improved medication adherence, reduced unplanned hospital readmissions, accurate atrial fibrillation diagnosis, adherence to selfmonitoring, and achievement of goals for emotion regulation. Notably, two studies, recognized for their high methodological quality according to the EPHPP criteria, also demonstrated significantly positive outcomes from the intervention. In contrast, three studies (23%) reported non-significant outcomes regarding sedentary behavior, physical activity, and glycemic control. Interestingly, two of these studies specifically targeted physical activity outcomes for patients with cancer. All three studies that yielded negative outcomes had small sample sizes (fewer than 75 participants) and short durations (less than 3 months).

Challenges with Using Smartwatches

Several studies identified challenges in the use of smartwatch interventions that may have impacted patient engagement and study outcomes. For example, Abbott et al. reported that the necessity to charge the smartwatch every two days and connect with the smartphone app could present barriers. Li et al. highlighted issues related to the need for daily charging, the availability of Wi-Fi, and the protection of personal data collected by the smartwatch. Chae et al. noted data quality as a concern in developing a robust machine-learning model for recognizing rehabilitation exercises. Low et al. reported challenges in user engagement stemming from the requirement to use a smartphone alongside the participant's existing personal phone to ensure synchronization with the smartwatch. Furthermore, Perez et al. raised concerns about the use of the Apple Watch as a diagnostic tool, emphasizing that notifications based on an irregular pulse from the watch's photoplethysmography signal should not be considered a definitive diagnosis for atrial fibrillation and that the absence of notifications does not rule out possible arrhythmias.

Main Findings

This systematic review indicates that smartwatch interventions employed in the everyday lives of middle-aged and older patients can yield positive health-related

outcomes, including reductions in adverse events, lifestyle changes, and improved treatment adherence. The statistically significant positive outcomes reported in 10 out of the 13 studies, combined with the moderate methodological quality of most studies and the considerable heterogeneity among them, suggest that the evidence supporting the effectiveness of smartwatch interventions is modest overall. Consequently, clinicians may consider leveraging smartwatch interventions in various clinical applications, particularly given the rising trend in smartwatch usage. Unlike previous reviews, such as that by Reeder et al., which focused on laboratory settings with healthy subjects, this review highlights the recent applications and outcomes of smartwatch interventions targeting specific diseases.

Clinical Implications

The clinical implications of this review suggest that patients with various diseases may benefit from smartwatch usage in several scenarios. For instance, in cardiovascular diseases, smartwatch notifications and reminders could enhance lifestyle modifications, reduce adverse events, assist in arrhythmia identification (such as atrial fibrillation), and improve adherence to care plans. In mental health contexts, patients may manage stress and anxiety while modifying lifestyle behaviors through instructions and educational content delivered via the smartwatch. Additionally, exercise-based rehabilitation utilizing automatic physical activity data collection through smartwatches has shown effectiveness in resource utilization and functional recovery for knee arthroplasty and chronic stroke. Smartwatches may also help in reducing foot ulcer recurrence in diabetic patients and improving medication adherence in those with allergic rhinitis. However, studies targeting physical activity outcomes in cancer patients have not shown positive results. Given the small sample sizes and potential biases in the included studies, further research is warranted to validate these findings.

Weaknesses of Included Studies

Several included studies exhibited methodological weaknesses, such as issues with blinding and high withdrawal or dropout rates. Many studies employed small sample sizes or had short follow-up durations. Notably, all studies reporting negative outcomes for smartwatch interventions were characterized by small sample sizes and short durations. Therefore, the research community is encouraged to conduct more rigorous and long-term clinical trials to provide stronger evidence of the impact of smartwatch interventions on health-related outcomes. Furthermore, studies investigating smartwatch use among children or adolescents are needed to assess clinical outcomes and unmet needs in younger populations. Additionally, the evaluation of implementation strategies has not been a focus of the included research. A deeper exploration of factors such as user engagement, reliable data collection from smartwatches, and barriers to daily usage would enhance our understanding of the practicality and efficacy of smartwatch interventions.

Technical and Usability Challenges

The Apple Watch emerged as the most frequently utilized smartwatch in the studies, delivering various notifications to users for health behavior changes, medication adherence, and alerts upon detecting abnormal sensor readings (e.g., irregular pulse). In most cases, a smartphone app served as a companion to the smartwatch, facilitating patient monitoring and guidance. However, technical challenges, such as synchronization with the app, frequent charging of the smartwatch, internet availability, and the burden of managing an additional smartphone alongside a participant's personal phone, were reported as barriers to user engagement. Issues related to synchronization with a mobile app typically arise from low battery levels or operating system updates. To mitigate these concerns, users are advised against using battery-saving modes, and research teams should promptly address data sharing permissions upon detecting synchronization problems. The challenge of frequent smartwatch charging could be managed through a battery management plan aimed at maintaining device functionality during monitoring periods. This plan may include strategies for minimizing energy consumption, utilizing local data storage, offloading data while charging, and employing low-energy display options. Internet connectivity issues, particularly in rural areas, may require infrastructural improvements. Finally, the benefits of integrating smartphones with smartwatches should be carefully considered, weighing usability and technical robustness against the potential drawbacks of including an additional device in the digital intervention.

Conclusion

This comprehensive literature review has elucidated the growing role of smartwatches in healthcare, focusing on their ability to enhance patient self-management and facilitate health monitoring. Smartwatches, as multifunctional wearable devices, offer unique advantages, including continuous monitoring of vital health metrics and delivering timely alerts and notifications, which can significantly improve patient engagement and adherence to health regimens. The findings indicate that smartwatches are particularly effective in managing chronic conditions such as cardiovascular diseases, diabetes, and mental health disorders. A total of 13 studies were included in the review, revealing that interventions leveraging smartwatches successfully yielded significant health outcomes. Notably, two studies achieved strong methodological quality, while the majority were rated as moderate. This underlines the importance of rigorous study designs in future research. Moreover, the analysis highlighted that the integration of smartphones with smartwatches enhances their functionality, enabling better user interaction and data management. However, despite the promising results, several challenges remain. Many studies reported small sample sizes and varying follow-up durations, which may limit the generalizability of the findings. Furthermore, concerns about the validity and reliability of data collection methods, participant dropouts, and lack of blinding in some studies need to be addressed in future research. The review underscores the need for more comprehensive studies to explore the full potential of smartwatches in clinical settings. Future research should focus on expanding participant demographics, enhancing methodological rigor, and examining long-term effects of smartwatch interventions on health outcomes. By addressing these gaps,

researchers can further validate the efficacy of smartwatches as integral components of modern healthcare strategies, ultimately improving patient outcomes and promoting better health management practices.

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التدخلات التي تستخدم الساعات الذكية في الرعاية الصحية: مراجعة شاملة للأدبيات

الملخص:

الخلفية :أدى ظهور التكنولوجيا القابلة للارتداء إلى تحويل كبير في إدارة الصحة، حيث أصبحت الساعات الذكية أدوات أساسية لتعزيز الصحة والرفاهية. تشمل قدراتها مراقبة مختلف مؤشرات الصحة وتسهيل إدارة الصحة الاستباقية. ومع ذلك، لا تزال المراجعات النظامية التي تفحص تأثير الساعات الذكية على النتائج الصحية محدودة.

الهد ف :تهدف هذه المراجعة إلى تجميع الأدلة الموجودة حول تدخلات الساعات الذكية في البحث السريري وتقييم فعاليتها في تحسين النتائج المتعلقة بالصح ة.

الطر ق :تم إجراء بحث منهجي في الأدبيات في قواعد بيانات سكوبس وبابمد للدراسات المنشورة حتى أبريل 2023. ركزت معايير الإدراج على الدراسات السريرية التي تستخدم الساعات الذكية وتبلغ عن نتائج صحية كمية. تضمنت عملية استخراج البيانات تفاصيل حول الأمراض المستهدفة، ونماذج الساعات الذكية، وتصاميم الدراسات، ونتائج الصحة، في حين تم إجراء تقييم الجودة باستخدام أداة مشروع ممارسة الصحة العامة الفعالة.(EPHPP)

النتائج :أسفر البحث عن 099,1 سج'لا من سكوبس و353 من بابمد، مما أدى إلى 13 دراسة تلبي معايير الإدراج. استهدفت التدخلات بشكل أساس ي الحالات القلبية الوعائية، والسكري، والصحة النفسية، ومشكلات صحية أخرى. أظهرت معظم الدراسات جودة منهجية معتدلة، حيث تم تصنيف دراستين على أنها قوية. قدمت غالبية التدخلات إشعارات وتذكيرات لتعزيز مشاركة المرض ى والامتثال.

الاستنتاج :تظهر الساعات الذكية وع'دا في البيئات السريرية، حيث تحسن النتائج الصحية عبر حالات مختلفة. يمكن أن يعزز دمجها في ممارسات الرعاية الصحية إدارة المرض ى الذاتية ويعزز جودة الرعاية. ومع ذلك، هناك حاجة لمزيد من البحث لمعالجة الثغرات في الأدبيات وتنقيح تدخلات الساعات الذكية.

الكلمات المفتاحية :الساعات الذكية، التكنولوجيا القابلة للارتداء، إدارة الصحة، البحث السريري، المراجعة النظامية.