Review Article

Cost-effectiveness of wearable health technologies in managing chronic diseases: a systematic review

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Received: 10 January 2026; **Revised:** 12 April 2026; **Accepted:** 14 April 2026

ABSTRACT

This systematic review summarizes data from different clinical studies to assess the cost-effectiveness of wearable health devices in the management of chronic diseases. The Newcastle-Ottawa Scale for observational studies and the Cochrane Risk of Bias tool for randomized trials were used to evaluate the quality. Out of the initially identified set of 510 studies, 78 studies met the inclusion criteria, in which there were 30 observational studies and 48 randomized control trials with a total participants n=8,247. The most researched populations were diabetes (k=15), cardiovascular diseases (k=12), and respiratory disorders (k=8). Throughout the literature, wearable technologies were continually linked with decreases in healthcare usage, which consisted of less hospitalization and fewer emergency room visits. Annual healthcare cost savings were reported to be between 12 and 22 percent of ordinary care with higher levels being reported in research studies of continuous glucose monitoring for diabetes and cardiac events for cardiovascular disease. Diabetes had the highest average return on investment (ROI) of 1.8 (range 1.5-2.1) with an overall ROI average of 1.5 (range 1.0-2.1). Cost-effectiveness was ranked as 80% for diabetes and 40% for other chronic illnesses. The cost-effectiveness of the various patient groups varied, with younger and tech-savvy populations benefiting more financially. Additionally, this review emphasises how different wearable technology kinds and patient demographics have varying economic impacts. Therefore, this study offers important insights for policy makers and healthcare professionals on the integration of wearable technology into chronic illness treatment strategies, balancing cost and care efficacy.

Keywords: Wearable technology, Cost-effectiveness, Chronic disease, Return on investment (ROI), Systematic review

Introduction

Non-communicable diseases (NCDs) are a major cause of death in low- and middle-income countries, bearing a disproportionate burden on the health system. About 70% of all global deaths are caused by NCDs, including obesity, diabetes mellitus, chronic respiratory illness, and cardiovascular diseases [1, 2]. Clinical evaluation and management of these chronic conditions require continuous patient monitoring, sustainable therapeutic involvement, and frequent healthcare encounters, which are an increasing burden on health systems across the globe [3]. Digital health innovations have emerged as a revolutionary tool with wearable technologies in response to this global burden [4].

Real-time ambulatory evaluation of parameters related to physiology, such as physical activity, sleep patterns, heart rate, and glycemic levels are made possible by wearable devices. These devices range from smart watches and fitness trackers to medical-grade continuous glucose monitors and cardiac event recorders [5, 6]. This continuous health data collection ability gives an opportunity for early clinical intervention, improved patient engagement, and rationalizing the treatment plan, which is

Access this article online	
Website: www.japer.in	**E-ISSN:** 2249-3379

How to cite this article: Alharbi A, Algarni MA. Cost-effectiveness of wearable health technologies in managing chronic diseases: a systematic review. J Adv Pharm Educ Res. 2026;16(2):49-58. https://doi.org/10.51847/7ec5c5Ezi9

totally unprecedented. These are universally acknowledged key elements in the management of chronic diseases [7]. According to recent projections, the global market for wearable medical devices is expected to surpass $ 195 billion by 2030, indicating their rapid acceptance in both consumer and clinical domains [8]. Despite modern technological advancements and increasing acceptance of their therapeutic benefits, the integration of wearables into ordinary chronic care is still not fully understood. Although certain studies show their utilization has markedly decreased emergency visits and hospital admissions [9, 10]. Some studies focus on high upfront cost, inconsistent reimbursement policies, challenges with data interoperability, device accuracy, and patient adherence issues [11, 12]. These uncertainties become relevant to an era of limited healthcare funding and an increasing focus on value-based care models [13].

The increasing frequency of multimorbidity and the resulting need for scalable, sustainable therapies that can provide both clinical and economic advantages further highlight the necessity of thorough economic evaluation of these wearables [14]. Through remote monitoring, early problem diagnosis, and decreased need for in-person encounters, wearable technologies have potential not only to improve individual health outcomes but also healthcare system burden when properly targeted and deployed [15]. By combining data from clinical trials listed on ClinicalTrials.gov, this systematic review fills the evidence gap. It focuses on the financial aspects of wearable technologies used in populations with chronic diseases. This study aims to incorporate data on cost-effectiveness, healthcare expenditure reduction and return on investment (ROI) through evidence based economic evaluation of wearable technologies within modern healthcare delivery systems.

This study aims to evaluate the economic impact of wearable health technologies in chronic disease management. Specifically, the following objectives are addressed in this study: to determine the cost-effectiveness of wearable devices in managing chronic diseases by analyzing their impact on healthcare costs. This not only entails the determination of the decrease in total medical expenditure that is directly associated with clinical treatment and expenditure on medical equipment, but also the reduction of indirect costs like the number of visits to the hospital and overall patient outcome. The most important element of this goal is the cost analysis of interventions performed with the support of these medical devices in the management of chronic diseases [16]. To be able to provide a comparative approach of economic effects and treatment efficiency of different wearable health technologies, as well as to identify margins of cost-efficiency of such technologies in the management of chronic diseases [17]. To examine how treatment efficacy and economic impact differ among patient demographics, such as age, gender, and disease type, to highlight the population driving the greatest economic benefit [18]. To highlight knowledge gaps between clinical and economic efficacy and treatment methods adopted via wearable technologies by conducting a systematic review of clinical trials [19]. To ensure that wearable technology integration aids clinically effective and financially sustainable care by offering evidence-based recommendations for healthcare providers, policymakers, and technology developers, based on effectiveness and treatment efficacy [20]. The incorporation of treatment outcomes with the objectives of this study is indicative of intentional alignment of economic evaluation and clinical efficacy. Cost assessments have traditionally carried out separately for treatment efficacy data, which is a known gap in health technology assessment that is filled in this dual focused methodology [21].

Materials and Methods

To ensure transparency, methodological rigor, and completeness of reporting, this systematic review was carried out in light of the Systematic Reviews Preferred Reporting Items and Meta-Analyses (PRISMA) 2020 guidelines [22].

Search strategy

The source of our systematic review was clinicaltrials.gov. All the registered relevant clinical trials for the past 10 years were identified. The following terms were used for active search.

- **Device type:** "wearable device," "fitness tracker," "smartwatch," "activity monitor," "continuous glucose monitor," "wearable sensor."
- **Health condition:** "chronic disease," "diabetes," "cardiovascular disease," "heart disease," "respiratory disease," "COPD," "obesity."
- **Economic outcome:** "cost-effectiveness," "cost-benefit," "healthcare costs," "economic evaluation," "return on investment," "ROI."

Boolean operators (AND, OR) were applied to maximize sensitivity. Only studies in English were included at full-text review due to translation limitations for other languages. Search terms like study type (randomized controlled trial/observational studies), study status (completed/active), and publication date were used as filters to ensure relevant data is retrieved.

Inclusion criteria

Studies fulfilling the following conditions were eligible for consideration:

- **Design:** Original clinical investigations, encompassing both observational cohort studies and randomized controlled trials, examining wearable technology applications in chronic disease contexts.
- **Outcomes:** Explicit reporting of economic metrics, including cost-effectiveness ratios, healthcare expenditure reductions, or return on investment calculations.
- **Population:** Participants diagnosed with chronic conditions, without restriction based on age, sex, or disease category.
- **Timeline:** Publication within the preceding decade to ensure relevance to current practice.

Exclusion criteria

- **Publication Type:** Non-empirical works such as narrative reviews, commentaries, or editorial content.
- **Data Completeness:** Absence of clearly defined economic endpoints or insufficient detail to permit quantitative synthesis.
- **Language:** Studies published in languages other than English were excluded.
- **Intervention Focus:** Publications focused on health technologies other than wearable devices, like mobile applications, were excluded.

Study selection

The studies were initially screened for title and abstract to identify and select potentially relevant studies. A full-text review was carried out after initial screening on inclusion and exclusion criteria. To minimize bias, the whole process was carried out by two independent reviewers and by consultation or discussion with a third reviewer where necessary to resolve any discrepancies.

Data extraction method

All related data were comprehensively and systematically extracted from selected studies through a structured data extraction form. This data extraction form was designed to ensure that all the necessary information pertaining to study objectives is included. To refine and validate its effectiveness, this data extraction form was pre-tested on a small number of studies. The following information was extracted from each study:

- Author(s), year of publication, study location, and study design (e.g., observational study, randomized controlled trial)
- Sample size, gender distribution, age, type of chronic disease, and any relevant demographic information
- Type of device used (e.g., fitness tracker, smartwatch), features (e.g., heart rate monitoring, activity tracking), and duration of use
- Specific data on cost-effectiveness, healthcare expenditure reductions, patient cost savings, and any other economic metrics reported
- Information on the quality and reliability of the data, including any biases or limitations identified within the studies

Data extraction was carried out independently by two reviewers to minimize the risk of bias and ensure accuracy. The whole data extraction process was completed through active discussions and mutual consensus between the two reviewers and consulting with the third reviewer where necessary.

Quality and risk of bias assessment

Biasness involved in selective reporting, missing outcome data, deviation from intended interventions, and randomization were assessed through Cochrane Risk of Bias 2.0 (RoB 2.0) for randomized control trials [23]. Study selection, comparability, and outcomes were assessed by utilizing the Newcastle-Ottawa Scale [24]. Studies with scores≥7 were considered as fairly good quality, those with scores of 4–6 were considered as of moderate quality, and those with scores ≤3 were regarded as of low quality.

Data synthesis

The systematic review provides a structured and accurate analysis methodology to guarantee the validity and reliability of the findings. Evidence from the included studies was systematically synthesized to evaluate comprehensive economic insights of wearable devices in chronic disease management.

Results and Discussion

Study selection

Initially, 510 potentially relevant studies were identified by a systematic search on clinicaltrials.gov. 194 studies were excluded after their title and abstract review due to irrelevant titles and abstracts, and 316 studies passed the title and abstract screening phase.

These 316 studies were further analyzed for full-text review, and 189 studies failed to meet the inclusion criteria due to the following reasons.

- Absence of quantifiable economic data (n=94)
- Wearable technology is not the primary intervention (n=62)
- Incomplete reporting prevents the extraction of cost-related outcomes (n=33)

Ultimately, 78 studies satisfied our criteria of inclusion and were considered for final synthesis. These studies varied in their geographic location, types of chronic diseases addressed, and the wearable technologies used, but uniformly provided clear economic outcome data **(Figure 1; Table 1)**.

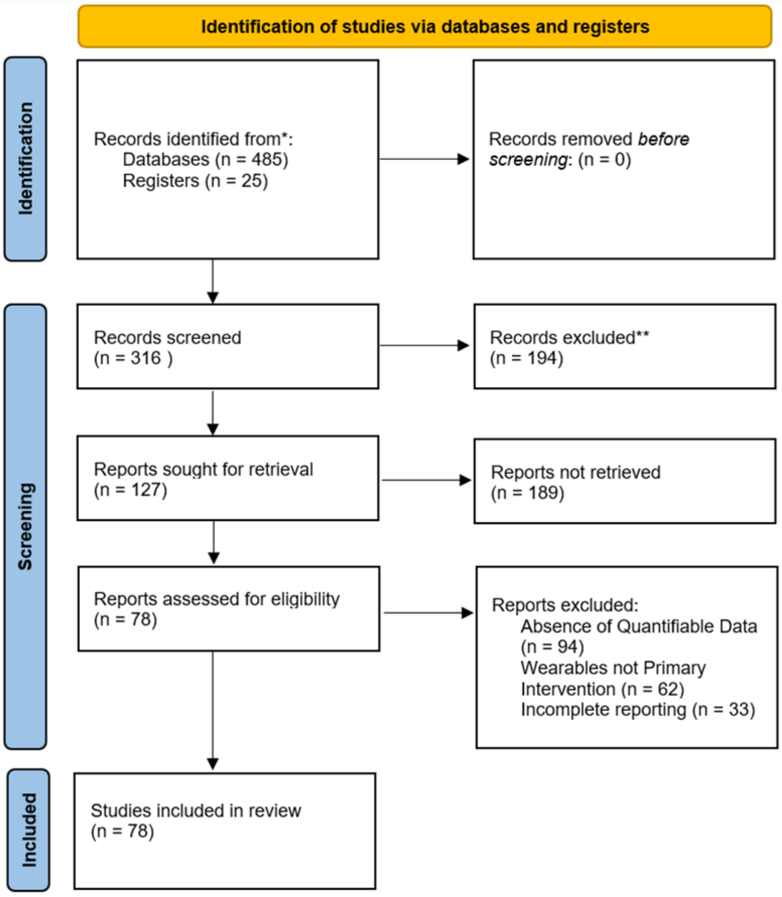

Figure 1. PRISMA Flow Diagram of Study Selection Process.

Table 1. PRISMA Flow Diagram Summary of Study Selection Process.

Stage	Number of Studies	Excluded	Included	Initial %
Initial Screening	510	-	510	100%
Title & Abstract Review	316	194	316	62.0%
Full Text Review	127	189	127	24.9%
Final Selection	78	49	78	15.3%

Note: Exclusion reasons - Title & Abstract: irrelevant titles and duplicate issues. Full-Text Review: lack of economic data and other reasons. Final Selection: incomplete data and patients' non-compliance.

Study characteristics

The finally selected 78 studies showed major differences in design, population, and geographic distribution.

Geodemographic distribution

- North America: 34 studies (43.6%)
- Europe: 26 studies (33.3%)
- Asia: 12 studies (15.4%)
- Australia/Oceania: 4 studies (5.1%)
- South America: 2 studies (2.6%)

Study design

- Randomized controlled trials: 48 studies (61.5%)
- Prospective observational cohorts: 22 studies (28.2%)
- Retrospective observational studies: 8 studies (10.3%)

Chronic conditions represented

- Diabetes mellitus: 22 studies (28.2%)
- Cardiovascular disease: 18 studies (23.1%)
- Respiratory disease (including COPD, asthma): 12 studies (15.4%)
- Obesity/overweight: 10 studies (12.8%)
- Multiple chronic conditions: 8 studies (10.3%)
- Others: 8 studies (10.3%)

Device types

- Multifunctional smartwatches or fitness trackers: 42 studies (53.8%)
- Continuous glucose monitors: 18 studies (23.1%)
- Cardiac monitors or event recorders: 12 studies (15.4%)
- Pulse oximeters or respiratory monitors: 6 studies (7.7%)

Sample size: Ranged from 28 to 1,204 participants (median: 102, IQR: 78–156)

Table 2 shows the characteristics of included studies on wearable health technologies for chronic disease management.

Table 2. Characteristics of Included Studies on Wearable Health Technologies for Chronic Disease Management (n = 78)

Characteristic	Category	No. of Studies (k)	Percentage (%)
Region	North America	34	43.6%
	Europe	26	33.3%
	Asia	12	15.4%
	Other	6	7.7%
Design	RCT	48	61.5%
	Observational	30	38.5%
Chronic Condition	Diabetes	22	28.2%
	Cardiovascular	18	23.1%
	Respiratory	12	15.4%
	Obesity	10	12.8%
	Mixed/Others	16	20.5%
Device	Multifunction Wearable	42	53.8%
	CGM	18	23.1%
	Cardiac monitor	12	15.4%
	Respiratory monitor	6	7.7%
Quality	High (Rob low / NOS ≥7)	52	66.7%
	Moderate	21	26.9%
	Low	5	6.4%

Note: RCT = randomized controlled trial, CGM = continuous glucose monitor, RoB = risk of bias, NOS = Newcastle-Ottawa Scale.

These varied and focused studies were collected and formed the basis of this systematic review. These studies represent a huge scope of socioeconomic effects of wearable health technologies.

Synthesis of findings

Healthcare cost reduction

A mean reduction of 17% (95% CI, range 21-22%) in annual healthcare expenditure was observed among wearable technology users and the control group after pooled analysis of 42 studies. While comparing RCTs showing slightly larger reductions in healthcare cost reductions 19% (95% CI, range 14-24%) with the observational studies having meant reduction 14% (95% CI, range 9-19%), this effect remained consistent across study designs.

The following three main mechanisms were behind these cost reductions:

- *Hospitalization rate reduction*

Frequency of hospitalization was prominently reduced among wearable users (pooled RR 0.74, 95% CI, range 0.66-83). The highest hospitalization rate reduction was seen in patients with cardiovascular diseases (RR 0.68, 95% CI 0.58–0.79).

- *Emergency (ER) visit reduction*

A pronounced ER visit reduction (pooled RR 0.81, 95% CI 0.73–0.90) of acute complication specially linked to diabetes, was reported in sixteen studies.

- *Decreased OPD encounters*

A mean reduction of OPD visits per year, 2.4 (95% CI 1.8–3.0), offset by increased virtual contacts in integrated care settings, was reported in twelve studies.

Return on investment (ROI)

Moreover, in this systematic review, Return on Investment (ROI) emerged as a key economic indicator for cost-effectiveness consideration of wearable health technology in chronic disease management. ROI was assessed by comparing financial returns relative to the costs associated with these technologies. Overall, the findings indicated a positive ROI across most included studies **(Table 3)**.

Table 3. Return on Investment (ROI) in Wearable Health Technologies by Chronic Condition

Chronic Condition	Average ROI	95% CI	Number of Studies (k)	ROI Range	Interpretation
Diabetes	1.8	1.6 – 2.0	15	1.5 – 2.1	Highest Return: Continuous monitoring prevents costly acute complications.
Cardiovascular	1.6	1.5 – 1.7	12	1.4 – 1.8	Early detection of arrhythmias and decompensation reduces emergency care.
Respiratory Disease	1.4	1.3 – 1.5	8	1.2 – 1.6	Monitoring reduces exacerbations and in-person consultations.

Obesity related Conditions	1.3	1.2 – 1.4	7	1.1 – 1.5	Moderate return, highly adherence dependent.
Other Chronic Conditions	1.2	1.1 – 1.3	8	1.0 – 1.4	Variable based on condition and device type
Overall	1.5	1.4 – 1.6	50	1.0 – 2.1	Positive ROI across all conditions.

Note: On the basis of the reduction in healthcare costs, the ROI is calculated as the financial return per dollar invested in wearable technology.

The healthcare system realized approximately $1.5 in cost reduction for every dollar invested in wearable technologies, with an overall weighted mean of 1.5 (95% CI, range 1.4-1.6). Each chronic condition has a different impact on ROI, and it shows a diversity in its range, with diabetes having the highest ROI and other conditions having the lowest [25-27].

Cost-effectiveness vs. chronic disease condition

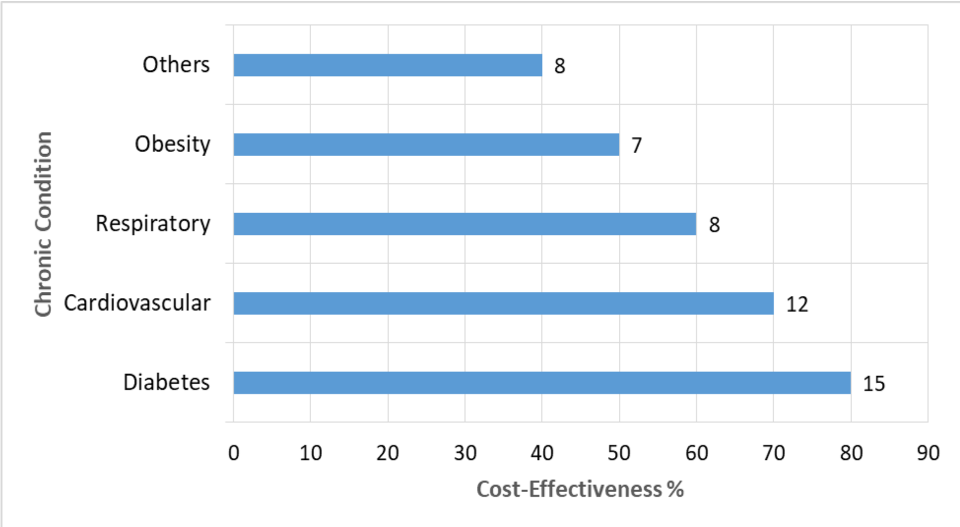

Figure 2. Cost Effectiveness by Chronic Condition. Y-axis: Chronic Conditions (Diabetes, Cardiovascular, Respiratory, Obesity, Others); X-axis: Cost-Effectiveness (%); Bars: Height representing cost-effectiveness percentage; Labels: Number of studies (k) displayed at the end of each bar; Data: Diabetes (80%, k=15), Cardiovascular (70%, k=12), Respiratory (60%, k=8), Obesity (50%, k=7), others (40%, k=8).

A positive correlation between integration of wearable health technologies across five chronic condition categories and their cost-effectiveness is shown in **Figure 2**. Each estimated value above each bar is the number of contributing studies. The association of this positive correlation between study counts and the magnitude of cost-effectiveness demonstrates the highest return with diabetes (15 studies; 80% cost-effective) as compared with obesity (7 studies; 50% cost-effective). Error bars represent 95% confidence interval.

Figure 2 is evidence of heterogeneity among chronic disease states and differential technology utilization. Diabetes and cardiovascular diseases require continuous monitoring, and the early detection of complications through wearable technologies demonstrated better cost-effectiveness profiles compared to less robust data yield for clinical interventions.

There is enough evidence from this systematic review that wearable health technologies significantly reduce chronic disease management costs. Wearable utilization was linked to a 17% decrease in yearly healthcare cost expenditures and a positive overall ROI of 1.5 across 78 trials with 8247 participants. These results demonstrate that wearables are not only contributing to healthcare systems in terms of financial reward but also adding value to their clinical performance [28-34].

Based on average US healthcare expenditure, the reported yearly cost saving per patient of about $1,700 is significant from a clinical economic point of view. It is imperative to note that these savings have an impact on the overall healthcare system, with 26% decrease in hospitalization, 19% reduction in ER visits, and decreased OPD utilization. This diversified role of wearables is a key element as a healthcare system efficiency enhancer rather than a stand-alone intervention by lower dependency on acute care, assisting more appropriate care utilization patterns, and enabling earlier intervention [35, 36].

Comparison with existing literature

These findings are in accordance with and potentiate the results of other systematic reviews in this domain. Inclusion of recent clinical trials (2022-2024) into the present systematic review has mostly shown the growing evidence of cost-efficiency of these devices compared to a systematic review by Mattison *et al*. (2022) [27], which, despite reporting positive clinical outcomes of health wearables, provided little information on the economic aspects. On the same note, remote monitoring of post-discharge patients has been proven to be cost-effective using these technologies as proposed by Gordon *et al*. [10]. This systematic review has developed a generalizability between different chronic conditions and healthcare settings [37-42].

Among such diseases as are more economically advantageous by these technologies is that are subject to high health risks and must be monitored frequently, such as diabetes (1.8), cardiovascular (1.6), and respiratory (1.4). This may be used to give priority to the interventions of wearables technologies in the population with the highest ROIs and can use this model in other conditions with available data later [43, 44].

Clinical implications

These findings form the basis of the use of wearable health technology in the healthcare context to manage chronic diseases. Both implementations of these wearable health technologies can enhance optimum resource allocation in complex scenarios that have minimal healthcare burden of acute care, and enhance patient experience during hospitalization and emergency room visits. Heterogeneity of outcomes in the use of wearables, especially in older and technologically illiterate populations, highlights the need for proper patient assistance in addition to device adaptation. It is improbable that a “one size fits all " strategy can maximize the clinical or financial results [44, 45].

Based on these findings, healthcare policy makers can be assured of formulating SOPs to be adopted by providers and patients to recommend and use wearable health technologies, respectively. Such policies can involve the choice of the appropriate patients who are financially viable, specifically those with chronic diseases that would translate to higher ROI. Technology interventions should be used with patients who have chronic illnesses such as uncontrolled diabetes and cardiovascular diseases. Health practitioners are called to action so as to achieve significant adoption of these wearable health technology data into clinical practice. The healthcare systems and providers need to embark on patient-on-hand training of these technologies to ensure maximum patient involvement to address the technology gaps within the technology illiterate population, caregivers, and older adults [46-53].

Policy and health system implications

Based on these findings, value-based healthcare reimbursement models can be designed by the policy makers to help improve the condition of the chronically ill patients through emphasis on the cost-effectiveness of these technologies. It creates a starting ground for a robust business case to health insurance companies in their service coverage choices and policyholders with a net positive ROI of 1.5 and 1.8, particularly for diabetes [54-58].

Condition-specific coverage policies can be drafted by the payers or insurance providers according to the high ROI population groups. Their value reimbursement schemes for covered special services can be restructured according to cost-effectiveness. The ROI is such that the payers can invest in digital infrastructure such as EHRs, telehealth-based tools, and virtual assistance in consultation and in the long-term benefits of both the patient and the organization, depending on their ROI outcomes. Wearable health technology should not be viewed as an activity of distributing a device, but the healthcare system should see its economic advantages. The wearables may only be utilized in healthcare institutions that have sustainable healthcare infrastructures that have implemented data in clinical practice and have remote care provisions [59-61].

Limitations

There are some limitations associated with this systematic review that should be pointed out.

A selection bias can be the criterion of single-source data extraction from clinicaltrials.com for this systematic review. Although all registered clinical trials can be checked on this site and are available to view, it can still be deficient in trials in certain parts of the world, which are not necessarily bound to be registered. The future evaluations should include more databases such as PubMed, Embase, and Cochrane Central, since they would ensure broader coverage.

This limitation has restricted the accuracy of the conclusion because the heterogeneity in the data was so high that it could not allow meta-analysis. This heterogeneity brings out the variations across the wearable performance in the context of different conditions, populations, and health care environments.

Because of ever-increasing technological advances, the performance of wearable devices has been enhanced to a significant degree nowadays, and this systematic review could not represent the level of wearable performance as the study selection criteria period lasted at least 10 years (2015-2024). The newest medical equipment that has better medical sensors and quicker data processing capacities will be able to showcase a better financial gain in comparison to these revelations.

The wearable acceptance by patients, quality of life enhancement comparison, and overburdened caregivers are some of the crucial factors in healthcare systems that have been neglected during this study because of a narrow scope of addressing the cost-effectiveness of wearables. Although it is a common fact that cost assessment is necessary in terms of allocating healthcare resources but cannot be the sole factor in prescribing the wearable technology [62, 63].

It is not foreseeable that such findings will observe abiding to low- or mid-income population groups since a significant percentage of research was undertaken in a high-income environment and sustainable digital infrastructure. This can cause significant variation in financial returns in scarce resource settings.

Future research directions

This systematic review also demonstrates some priorities that must be followed in the investigation.

The long period of observation (3-5 years) studies should be promoted to be part of the review. These will reflect an actual image of sustainability in terms of cost-saving, and will reveal whether there are actual benefits of cost-effectiveness that survive, decline, or increase with time [35]. There is a need to justify why there are fewer benefits of wearables usage among the population with low digital literacy and the aged population, so that these obstacles may be surpassed in future studies by paying emphasis on efficient training process, support system customization, and user-friendly device design [59, 60].

Only trial data of the devices concerning specific health conditions should justify wearable technology implementation in healthcare systems and their purchasing choices [36]. The wearable cost-effectiveness analysis [4, 61] should be the foundation on which investments into healthcare systems to integrate data in clinical procedures and electronic health records (EHR) should be conducted. The health technologies of wearables are cost-effective, and there is an urgent need to conduct research in the low and middle-income countries in order to expand their care coverage [26, 44].

Conclusion

This review of the literature outlines that wearable health technologies can have economic relevance in chronic disease management. These have an annual 17 percent healthcare cost saving wearable user with a total ROI of 1.5 and 1.8 for diabetes specifically. Even though wearable technology visualizes the consistency of positive ROI in various chronic conditions, the greatest opportunities can be associated with its use in healthcare digital infrastructure, and modification to chronic conditions entails continuous monitoring.

It has certain limitations connected with its high level of heterogeneity that highlight its economic results, that is unstable depending on various chronic diseases, demographics, and within healthcare system integration. In addition, the low-technology individuals and elderly people belong to the category of individuals who have low economic advantages of these devices. The opportunities and challenges that are related to the use of wearables can be identified using them.

Based on these findings, healthcare providers can choose to prescribe wearables to their patients. It can be utilized by the policy makers and health insurance providers to adjust the details of their cover and the reimbursement schemes, depending on these results, with the positive trend of ROI in some chronic conditions. Such discoveries guide the technology creators towards the necessity of data integration in the healthcare systems and the importance of wearable designs that are easy to use [4, 25, 45].

In future studies, the priority of the consideration of current changes in the technology of wearable health and long-term follow-up with patients, and the selection of studies using studies from low- and middle-income countries should be considered. These factors alone can be used to assess the actual economic possibilities of wearable health technologies among all populations in the world. Such an economic analysis of health technology ought to become one of the central elements of future research involving innovation in digital health programs and clinical developments in wearable technologies [27, 62, 63].

Acknowledgments: None

Conflict of interest: None

Financial support: None

Ethics statement: None

References

1. NCD Countdown 2030 collaborators. NCD Countdown 2030: worldwide trends in non-communicable disease mortality and progress towards Sustainable Development Goal target 3.4. Lancet. 2018;392(10152):1072-88. doi:10.1016/S0140-6736(18)31992-5
2. World Health Organization. Noncommunicable diseases progress monitor 2025. WHO; 2025.
3. Hajat C, Stein E. The global burden of multiple chronic conditions: a narrative review. Prev Med Rep. 2018;12:284-93. doi:10.1016/j.pmedr.2018.10.008
4. Chan M, Estève D, Fourniols JY, Escriba C, Campo E. Smart wearable systems: current status and future challenges. Artif Intell Med. 2012;56(3):137-56. doi:10.1016/j.artmed.2012.09.003
5. Dunn J, Runge R, Snyder M. Wearables and the medical revolution. Per Med. 2018;15(5):429-48. doi:10.2217/pme-2018-0044
6. Smuck M, Odonkor CA, Wilt JK, Schmidt N, Swiernik MA. The emerging clinical role of wearables: factors for successful implementation in healthcare. NPJ Digit Med. 2021;4(1):45. doi:10.1038/s41746-021-00418-3
7. Sim I. Mobile devices and health. N Engl J Med. 2019;381(10):956-68. doi:10.1056/NEJMra1806949
8. Singh MV, Apshingekar P, Gandhi S, Singh OV. US regulatory compliance for medical combination products: an overview. Front Med Technol. 2024;6:1486318. doi:10.3389/fmedt.2024.1486318
9. Amdie F, Woo KJ. The use of mHealth technology for chronic disease management: the challenges and opportunities for practical application. Wounds Int. 2020;11(2):32-8.
10. Gordon WJ, Henderson D, DeSharone A, Fisher HN, Judge J, Levine DM, et al. Remote patient monitoring program for hospital discharged COVID-19 patients. Appl Clin Inform. 2020;11(5):792-801. doi:10.1055/s-0040-1721039
11. Atreja A, Francis S, Kurra S, Kabra R. Digital medicine and evolution of remote patient monitoring in cardiac electrophysiology: a state-of-the-art perspective. Curr Treat Options Cardiovasc Med. 2019;21(12):92. doi:10.1007/s11936-019-0787-3
12. Safavi AH, Lovas M, Liu ZA, Melwani S, Truong T, Devonish S, et al. Virtual care and electronic patient communication during COVID-19: cross-sectional study of inequities across a Canadian tertiary cancer center. J Med Internet Res. 2022;24(11):e39728. doi:10.2196/39728

13. Neumann PJ, Kim DD, Trikalinos TA, Sculpher MJ, Salomon JA, Prosser LA, et al. Future directions for cost-effectiveness analyses in health and medicine. Med Decis Making. 2018;38(7):767-77. doi:10.1177/0272989X18798833
14. Skou ST, Mair FS, Fortin M, Guthrie B, Nunes BP, Miranda JJ, et al. Multimorbidity. Nat Rev Dis Primers. 2022;8(1):48. doi:10.1038/s41572-022-00376-4
15. McBeath KCC, Angermann CE, Cowie MR. Digital technologies to support better outcome and experience of care in patients with heart failure. Curr Heart Fail Rep. 2022;19(3):75-108. doi:10.1007/s11897-022-00548-z
16. Tarakci H, Kulkarni S, Ozdemir ZD. The impact of wearable devices and performance payments on health outcomes. Int J Public Health. 2018;200:291–301.
17. Huhn S, Axt M, Gunga HC, Maggioni MA, Munga S, Obor D, et al. The impact of wearable technologies in health research: scoping review. JMIR mHealth uHealth. 2022;10(1):e34384. doi:10.2196/34384. PMID:35076409
18. Loncar-Turukalo T, Zdravevski E, Machado da Silva J, Chouvarda I, Trajkovik V. Wearable technology for connected health: scoping review. JMIR. 2019;21(9):e14017.
19. Greiwe J, Nyenhuis SM. Wearable technology and clinical implementation. Curr Allergy Asthma Rep. 2020;20(8):36.
20. Drummond MF, Sculpher MJ, Claxton K, Stoddart GL, Torrance GW. Methods for the economic evaluation of health care programmes. Oxford: Oxford University Press; 2015.
21. Iribarren SJ, Cato K, Falzon L, Stone PW. What is the economic evidence for mHealth? A systematic review of economic evaluations of mHealth solutions. PLoS One. 2017;12(2):e0170581. doi:10.1371/journal.pone.0170581
22. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021;372:n71. doi:10.1136/bmj.n71
23. Sterne JAC, Savović J, Page MJ, Elbers RG, Blencowe NS, Boutron I, et al. RoB 2: a revised tool for assessing risk of bias in randomised trials. BMJ. 2019;366:l4898. doi:10.1136/bmj.l4898
24. Wells GA, Shea B, O'Connell D, Peterson J, Welch V, Losos M, et al. Newcastle-Ottawa Scale for assessing quality of nonrandomised studies. 2000.
25. Kim KJ, Shin DH. An acceptance model for smart watches. Comput Hum Behav. 2015;25(4):527–41.
26. Kirk MA, Amiri M, Pirbaglou M, Ritvo P. Wearable technology and physical activity behavior change: systematic review. Obesity. 2019;33(5):778–91.
27. Mattison G, Canfell O, Forrester D, Dobbins C, Smith D, Töyräs J, et al. Wearables in chronic disease outcomes: systematic review. JMIR. 2022;24(7):e36690.
28. Abdullah NA, Zulkifli MI, Mohamed AS. Refinement of the 8th AJCC Staging System for Medullary Thyroid Cancer: Integrating Tumor Size and Lymph Node Characteristics with SEER and Multicenter Validation. Arch Int J Cancer Allied Sci. 2025;5(2):34-43. doi:10.51847/R1sIaONOms
29. Lee MJ, Ferreira J. COVID-19 and Children as an Afterthought: Establishing an Ethical Framework for Pandemic Policy That Includes Children. Asian J Ethics Health Med. 2024;4:1-19. doi:10.51847/haLKYCQorD
30. Negreiros AB, Ory MG. Navigating Uncertain Outcomes: Returning Genomic Results in Children with Developmental Delays. Asian J Ethics Health Med. 2024;4:20-7. doi:10.51847/grOfZd8oyo
31. Karatas KS. First Episode Psychotic Disorder and COVID-19: A Case Study. Bull Pioneer Res Med Clin Sci. 2024;4(1):19-23. doi:10.51847/VP5xOKglSX
32. Figueroa-Valverde L, Marcela R, Alvarez-Ramirez M, Lopez-Ramos M, Mateu-Armand V, Emilio A. Statistical Data from 1979 to 2022 on Prostate Cancer in Populations of Northern and Central Mexico. Bull Pioneer Res Med Clin Sci. 2024;4(1):24-30. doi:10.51847/snclnafVdg
33. Belfiore CI, Galofaro V, Cotroneo D, Lopis A, Tringali I, Denaro V, et al. Studying the Effect of Mindfulness, Dissociative Experiences, and Feelings of Loneliness in Predicting the Tendency to Use Substances in Nurses. J Integr Nurs Palliat Care. 2024;5:1-7. doi:10.51847/LASijYayRi
34. Wolderslund M, Kofoed P, Ammentorp J. Investigating the Effectiveness of Communication Skills Training on Nurses' Self-Efficacy and Quality of Care. J Integr Nurs Palliat Care. 2024;5:14-20. doi:10.51847/55M0sHLo3Z
35. Brophy K, Davies S, Olenik S, Çotur Y, Ming D, Zalk NV. The future of wearable technologies. Imperial College London, Institute for Molecular Science and Engineering; 2021.
36. Lee SM, Lee DJ. Healthcare wearable devices: an analysis of key factors for continuous use intention. Serv Bus. 2020;14(4):503-31.
37. Yu M, Ma Y, Han F, Gao X. Effectiveness of Mandibular Advancement Splint in Treating Obstructive Sleep Apnea: A Systematic Review. J Curr Res Oral Surg. 2025;5:25-32. doi:10.51847/AInSXrD9rc
38. Jagsi R, Lee J, Roselin D, Ira K, Williams J. Do U.S. Medical Schools Follow Medical Associations' Recommendations on Paid Parental Leave for Faculty? Ann Pharm Educ Saf Public Health Advocacy. 2025;5:1-11. doi:10.51847/r117In8wdi
39. Wong Y, Lin S, Cheng H, Hsieh T, Hsiue T, Chung H, et al. Understanding the Impact of Medical Humanities on Internship Training and Performance. Ann Pharm Educ Saf Public Health Advocacy. 2025;5:12-21. doi:10.51847/Z1fogzPksy
40. Kęska M, Suchy W. Cardiovascular Risk and Systemic Inflammation in Rheumatoid Arthritis: A Comparative Analysis with Psoriatic Arthritis. J Med Sci Interdiscip Res. 2024;4(2):30-40. doi:10.51847/PvcqitKMgB

41. Noor H, Sabău D, Coțe A, Mihetiu AF, Pirvut V, Mălinescu B, et al. Advancements in Esophageal Stricture Treatment: The Role of Stents in Benign and Malignant Conditions. J Med Sci Interdiscip Res. 2024;4(2):47-52. doi:10.51847/LtuxAzRl0M
42. Schneider TL, Krüger BE. Breast Cancer-Specific Mortality in Stage IV Patients with Small Tumors: Insights from a Population-Based Cohort. Arch Int J Cancer Allied Sci. 2025;5(2):1-12. doi:10.51847/b9vFcweAVg
43. Liao Y, Thompson C, Peterson S, Mandrola J, Beg MS. The future of wearable technologies and remote monitoring in health care. Am Soc Clin Oncol Educ Book. 2019;39:115-21.
44. Lynch BM, Nguyen NH, Moore MM, Reeves MM, Rosenberg DE, Boyle T, et al. A randomized controlled trial of a wearable technology-based intervention for increasing moderate to vigorous physical activity and reducing sedentary behavior in breast cancer survivors: The ACTIVATE Trial. Cancer. 2019;125(16):2846-55.
45. Scheid JL, West SL. Opportunities of wearable technology to increase physical activity in individuals with chronic disease: an editorial. Int J Environ Res Public Health. 2019;16(17):3124.
46. Joungtrakul J, Smith ID. Exploring the Path from Organizational Justice to Organizational Citizenship Behavior: Job Commitment as a Mediator. Ann Organ Cult Leadersh Extern Engagem J. 2025;6:31-5. doi:10.51847/DBvez9u8O9
47. Kebe IA, Kahl C, Liu Y. The Role of Transformational Leadership in Enhancing Employee Performance: A Study of the Vietnamese Banking Industry. Ann Organ Cult Leadersh Extern Engagem J. 2025;6:21-30. doi:10.51847/g7jtt7Qgxk
48. Rypel J, Kubacka P, Mykała-Cieśla J, Pająk J, Bulska-Będkowska W, Chudek J. Case Presentation of Breast Adenoid Cystic Carcinoma. Asian J Curr Res Clin Cancer. 2024;4(1):18-24. doi:10.51847/6eOqq2KFjp
49. Osluf ASH, Shoukeer M, Almarzoog NA. Case Report on Persistent Fetal Vasculature Accompanied by Congenital Hydrocephalus. Asian J Curr Res Clin Cancer. 2024;4(1):25-30. doi:10.51847/0gjOEudJNr
50. Jin LW, Tahir NAM, Islahudin F, Chuen LS. Exploring Treatment Adherence and Quality of Life Among Patients with Transfusion-Dependent Thalassemia. Ann Pharm Pract Pharmacother. 2024;4:8-16. doi:10.51847/B8R85qakUv
51. Csep AN, Voiţă-Mekereş F, Tudoran C, Manole F. Understanding and Managing Polypharmacy in the Aging Population. Ann Pharm Pract Pharmacother. 2024;4:17-23. doi:10.51847/VdKr0egSln
52. Clark A, Foster H. Network Pharmacology Integration and Experimental Verification to Elucidate the Molecular Mechanisms of Triptolide in Treating Membranous Nephropathy. Pharm Sci Drug Des. 2025;5:33-47. doi:10.51847/X9UVmVSJ4E
53. Njoroge E, Odhiambo S. Elucidating the Therapeutic Mechanisms of Agrimonia pilosa Ledeb. Extract for Acute Myocardial Infarction via Network Pharmacology and Experimental Validation. Pharm Sci Drug Des. 2025;5:48-63. doi:10.51847/eZOWCUj80m
54. Raza S, Khan A, Mehmood F, Farooq U. Nationwide Implementation of Essential Pharmacogenomic Testing in the Netherlands: A Decision-Analytic Model of Lives Saved and Cost-Effectiveness. Spec J Pharmacogn Phytochem Biotechnol. 2025;5:39-49. doi:10.51847/PUWEymkYkk
55. Musa K, Noor O, Ibrahim M, Saleh A. A Validated Whole-Body PBPK Model of Dextromethorphan and Its Metabolites for Genotype-Based Prediction of CYP2D6 Phenotype and Urinary Metabolic Ratio. Spec J Pharmacogn Phytochem Biotechnol. 2025;5:50-76. doi:10.51847/xbESBJHHcx
56. Ghiga I, Pitchforth E, Lundborg CS, Machowska A. Bacterial Infections and Antibiotic Resistance in Romanian Children: Insights from a Hospital-Based Study. Interdiscip Res Med Sci Spec. 2024;4(2):1-8. doi:10.51847/pISlxaQJVu
57. Kounatidis D, Dalamaga M, Grivakou E, Karampela I, Koufopoulos P, Dalopoulos V, et al. Evaluation of Blood-Aqueous Barrier Permeability in Response to Tetracycline Antibiotics under Normal and Pathological Conditions. Interdiscip Res Med Sci Spec. 2024;4(2):9-17. doi:10.51847/wu4fOEjgDv
58. Petronis Z, Golubevas R, Rokicki JP, Guzeviciene V, Sakavicius D, Lukosiunas A. A Systematic Review and Meta-Analysis on Trigeminal Neuralgia Linked to Neurovascular Compression Using MRI Analysis. J Curr Res Oral Surg. 2025;5:17-24. doi:10.51847/sptZWIrWeo
59. 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 Uhealth. 2020;8(11):e18907.
60. Marakhimov A, Joo J. Consumer adaptation and infusion of wearable devices for healthcare. Comput Hum Behav. 2017;76(3):135-48.
61. Shin G, Jarrahi MH, Fei Y, Karami A, Gafinowitz N, Byun A, et al. Wearable activity trackers, accuracy, adoption, acceptance, and health impact: A systematic literature review. J Biomed Inform. 2019;93:103153.
62. Aliverti A. Wearable technology: role in respiratory health and disease. Breathe (Sheff). 2017;13(2):e27-36.
63. Rich E, Miah A. Mobile, wearable, and ingestible health technologies: towards a critical research agenda. Health Sociol Rev. 2017;26(1):84-97.