Supplementary

Table S1 Full database search strategies, filters, dates, and retrieval counts

Database	Search string (exact)	Filters applied	Date searched	Records retrieved, n
PubMed	((“wearable electronic device*” OR “wearable sensor*” OR smartwatch* OR “fitness tracker*” OR biosensor* OR “smart band*” OR “wearable technolog*”)) AND (“artificial intelligence”[MeSH] OR “machine learning”[MeSH] OR “deep learning”[tiab] OR “predictive analytic*”[tiab] OR “neural network*”[tiab]) AND (“predictive value of tests”[MeSH] OR “diagnosis, computer-assisted”[MeSH] OR “early diagnosis”[tiab] OR “disease prediction”[tiab] OR “remote monitoring”[tiab]) Filters applied: English; humans; publication date from 2016/01/01 to 2025/07/19	English; 2016–2025; peer-reviewed	21 November 2025	174
JSTOR	(“wearable technology” OR “AI-integrated wearable*” OR “AI-enabled wearable*” OR “smartwatch*” OR “fitness tracker*” OR “biosensor*” OR “smart band*”) Refined by: academic content: journals, book chapters, research reports. Date: from 2016 CE to 2025 CE. Language: English. Access type: content I can access	English; 2016–2025; peer-reviewed	21 November 2025	757
ProQuest	(“wearable technology” OR “AI-integrated wearable*” OR “AI-enabled wearable*” OR “smartwatch*” OR “fitness tracker*” OR “biosensor*” OR “smart band*”) AND (“artificial intelligence” OR “machine learning” OR “deep learning” OR “predictive analytic*”) AND (“predictive healthcare” OR “early diagnosis” OR “disease prediction” OR “remote monitoring” OR “personalized medicine” OR “chronic disease management” OR “digital health”) Filters: scholarly journals; from 2016-01-01 to 2025-07-19; artificial intelligence AND machine learning AND algorithms AND deep learning; article; English	English; 2016–2025; peer-reviewed	21 November 2025	4,095
Google Scholar	Advanced research: this exact phrase: “wearable technology” OR “AI-integrated wearables” OR “AI-enabled wearables” OR “smartwatch” OR “fitness tracker” OR “biosensor” OR “smart band” AND (“artificial intelligence” OR “machine learning” OR “deep learning” OR “predictive analytics”) AND (“predictive healthcare” OR “early diagnosis” OR “disease prediction” OR “remote monitoring” OR “personalized medicine” OR “digital health”) Filters: this exact phrase; in the title of the article; search for articles dated from 2016 to 2025	English; 2016–2025 (top 200 results screened); peer-reviewed	21 November 2025	5

Boolean syntax adjusted to each database. Boolean operators and field tags (e.g., TITLE-ABS-KEY in Scopus, TS = in Web of Science) were adapted to the syntax of each database. Searches limited to peer-reviewed English-language articles (1 January 2016 to 19 July 2025). Searches were limited to peer-reviewed journal articles published in English between 1 January 2016 and 19 July 2025. Google Scholar restricted to first 200 results by relevance. Google Scholar screening was limited to the first 200 most relevant results due to ranking algorithms. Grey literature and conference abstracts were excluded. No grey literature, conference abstracts, or dissertations were included. Total retrieved records across all databases (n=5,031) correspond to the identification stage in *Figure 1* (PRISMA 2020 flow diagram). Boolean syntax was adapted per database. AI, artificial intelligence.

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Table S2 Risk of bias assessment of included studies

Study	Study design/ methodology	Risk of bias domains assessed	Overall risk of bias (low/moderate/high)	Key limitations and notes
Boukenze *et al.* (1)	Experimental (C4.5 decision tree)	Sample selection, reporting completeness, validation	Moderate	Small, non-representative dataset; no external validation
Nwaimo *et al.* (2)	Narrative review	Not applicable	Not applicable	No primary data; narrative synthesis only
Mondal (23)	Survey	Sample selection, measurement validity	Moderate	Small purposive sample; self-report bias
Beg *et al.* (33)	Meta-analysis	Study selection, heterogeneity	Moderate	Heterogeneous included studies
LaBoone and Marques (27)	Narrative review	Not applicable	Not applicable	Narrative only; no quantitative assessment
Shajari *et al.* (11)	Systematic review	Study selection, reporting completeness	Moderate	No empirical data
Shei *et al.* (9)	Narrative review	Sample selection, measurement reliability	Moderate	Small samples; inconsistent device validation
Channa *et al.* (4)	Systematic review	Study selection, reporting completeness	Moderate	Early-stage tech; limited validation
Shang (34)	Literature analysis	Not applicable	Not applicable	Secondary data only
Huhn *et al.* (28)	Scoping review	Sample selection, reporting completeness	Moderate	Mostly observational; limited causal inference
Obianyo *et al.* (5)	Narrative review	Not applicable	Not applicable	Secondary literature
Kaewkannate and Kim (24)	Experimental (7 users)	Sample selection, measurement validity	High	Very small sample size
Shin *et al.* (35)	Systematic review	Study selection, reporting completeness	Moderate	Limited to 2017; possible topic modeling bias
Iqbal *et al.* (36)	Literature review	Not applicable	Not applicable	Secondary data
Verma *et al.* (37)	Systematic review	Study selection, reporting completeness	Moderate	No clinical validation
Escobar-Linero *et al.* (38)	Systematic review	Study selection, reporting completeness	Moderate	No empirical trials
Jegan and Nimi (39)	Literature survey	Not applicable	Not applicable	Theoretical study
Vo and Trinh (10)	Narrative review	Not applicable	Not applicable	Secondary literature
Guk *et al.* (40)	Literature review	Not applicable	Not applicable	Secondary data
Taherdoost (41)	Systematic numerical review	Study selection, reporting completeness	Moderate	No real-world validation
Chakraborty *et al.* (42)	Narrative review	Not applicable	Not applicable	Conceptual only
Badawy *et al.* (26)	Survey of 40 papers	Not applicable	Not applicable	Secondary data
Aliferis and Simon (43)	Narrative review	Not applicable	Not applicable	Conceptual review
Yenikaya *et al.* (21)	Experimental (1,680 images)	Sample selection, measurement validity	Moderate	Small dataset; no external validation
Rashid *et al.* (44)	Experimental (1,680 images)	Sample selection, measurement validity	Moderate	Same dataset as above
Rahman *et al.* (45)	Literature survey	Not applicable	Not applicable	Secondary data
Alam *et al.* (25)	Meta-analysis (37 studies)	Study selection, reporting completeness	Moderate	Privacy and bias issues
Gabriel *et al.* (22)	Observational clinical	Sample selection, measurement validity	Moderate	Specific patient group; moderate sample size
Khalifa and Albadawy (46)	Systematic review	Study selection, reporting completeness	Moderate	Fragmented data; no standardization
Alowais *et al.* (47)	Literature review	Not applicable	Not applicable	Secondary data
Hirani *et al.* (48)	Narrative review	Not applicable	Not applicable	Early-stage AI tools
Grout *et al.* (3)	Observational EHR data	Sample selection, reporting completeness	Moderate	Limited external validation
Sozib (6)	Narrative review	Not applicable	Not applicable	Secondary data
Hiremath (49)	Narrative review	Not applicable	Not applicable	Secondary data
Jena *et al.* (50)	Narrative review	Not applicable	Not applicable	Secondary data
Nechita *et al.* (31)	Narrative review	Not applicable	Not applicable	Secondary data
Birla *et al.* (12)	Narrative review	Not applicable	Not applicable	Secondary data
Huang *et al.* (51)	Narrative review	Not applicable	Not applicable	Secondary data
Lu *et al.* (52)	Narrative review	Not applicable	Not applicable	Secondary data
Oikonomakos *et al.* (53)	Narrative review	Not applicable	Not applicable	Secondary data
Belkhouribchia (54)	Narrative review	Not applicable	Not applicable	Secondary data
Osa-Sanchez *et al.* (8)	Meta-analysis (28 studies)	Study selection, reporting completeness	Moderate	Small, heterogeneous studies
Abd-Alrazaq *et al.* (7)	Meta-analysis (69 studies)	Study selection, reporting completeness	Moderate	No treatment data
Kargarandehkordi *et al.* (30)	Meta-analysis (48 studies)	Study selection, reporting completeness	Moderate	Small, heterogeneous samples
Olawade *et al.* (55)	Narrative review	Not applicable	Not applicable	Secondary data
Aziz *et al.* (29)	Meta-analysis (46 studies)	Study selection, reporting completeness	Moderate	Limited device variability
Wang *et al.* (32)	Experimental	Sample selection, measurement validity	Moderate	Sample size not reported; limited psychophysiological features
Nahavandi *et al.* (56)	Narrative review	Not applicable	Not applicable	Secondary data
Rizzo (57)	Narrative review	Not applicable	Not applicable	Secondary data
Gutman *et al.* (58)	Narrative review	Not applicable	Not applicable	Secondary data
Boubga *et al.* (59)	Narrative review	Not applicable	Not applicable	Secondary data

The table presents risk of bias assessment of the 51 included studies. The table summarizes study designs, key methodological domains evaluated, overall risk of bias ratings, and main limitations. Narrative reviews are noted as not applicable due to lack of primary data and formal bias assessment.

Table S3 Summary of key studies on AI and wearable technologies in healthcare: methodologies, findings, limitations, and future directions

No.	Study	Methodology used	Key findings	Limitations and future research
A1	Boukenze *et al.* (1)	The study employed the C4.5 decision tree algorithm using the Weka platform to predict chronic kidney disease from a dataset obtained from the UCI Machine Learning Repository. The dataset contained 400 instances with 24 attributes. A 10-fold cross-validation technique was used to evaluate the model's accuracy and robustness	The C4.5 decision tree achieved exceptional CKD prediction performance, correctly classifying 396 of 400 cases with 99% CKD and 98% non-CKD accuracy. It exhibited a 0.02 mean absolute error, 0.97 Kappa, and 0.98–0.99 precision/recall, highlighting its reliability and potential for early disease detection and improved healthcare decision-making	The study, despite high accuracy, is limited by a small, non-representative dataset, binary CKD classification, lack of algorithm comparison, minimal parameter tuning, and absence of external validation. Future research should expand datasets, compare classifiers, integrate real-world EHR data, apply explainable AI, and conduct longitudinal studies for broader clinical applicability
A2	Nwaimo *et al.* (2)	This study employed a narrative review methodology, synthesizing literature on predictive modeling applications in healthcare. It examined various data sources including EHRs, wearables, and genomic data, and explored techniques like logistic regression, random forests, and DL. It also reviewed case studies demonstrating real-world implementations and discussed challenges and ethical considerations	Predictive modeling transforms healthcare by enabling early disease detection, personalized treatment, and efficient resource allocation. Leveraging EHRs, wearables, and genomic data, it forecasts outcomes like readmission and disease progression. Real-world applications improve patient engagement and operations, establishing predictive analytics as key to personalized, proactive, and cost-effective clinical decision-making	Predictive healthcare modeling faces challenges from fragmented, biased, or incomplete data and limited interpretability, hindering clinical adoption. Most models lack systematic validation across diverse populations. Future research should prioritize data standardization, explainable and privacy-preserving AI (e.g., federated learning), and longitudinal studies to evaluate real-world effectiveness, equity, and clinical integration
A3	Mondal (23)	This descriptive survey employed a non-experimental quantitative design using non-probability purposive sampling to collect data from 162 married women aged 18–45 years in rural West Bengal. Structured and semi-structured interview schedules were used to assess knowledge levels and identify factors influencing the use of temporary contraceptive methods	The study revealed that most women (70.98%) had average contraceptive knowledge, with oral pills being most used (38.89%), followed by CU-T, injectables, and condoms. Decisions were mainly joint (83.34%), with 74.70% guided by health workers. Knowledge correlated with religion and marital age, emphasizing accessibility and spousal communication in contraceptive choice	The study's small, purposively sampled, cross-sectional design limits generalizability and causal inference. Self-reporting and cultural norms may bias responses on sensitive reproductive topics. Future research should use larger, randomized, longitudinal samples, compare temporary and permanent methods, and include qualitative studies to explore socio-cultural barriers for improved family planning interventions
A4	Beg *et al.* (33)	This meta-analysis provides an overview of predictive analysis in healthcare, covering methodologies, applications, challenges, and future directions. A systematic search of PubMed, IEEE Xplore, and Scopus identified peer-reviewed studies meeting inclusion criteria. Data extraction captured key methods, applications, and challenges, with quality assessment conducted to ensure reliability and minimize bias	Predictive analytics can revolutionize healthcare by enabling proactive, personalized care, optimizing resources, and advancing research. Its adoption is hindered by data quality, ethical concerns, and implementation challenges. Addressing these barriers and leveraging emerging technologies can enhance patient outcomes, transform healthcare delivery, and drive medical innovation	Predictive healthcare analytics faces barriers including poor data quality, interoperability issues, privacy concerns, and limited model transparency. Organizational resistance, financial constraints, and skill gaps hinder implementation. Future work should enhance data standardization, develop interpretable and bias-aware models, and pursue scalable, collaborative, longitudinal approaches for responsible clinical integration of predictive tools
A5	LaBoone and Marques (27)	This study uses a qualitative review methodology to analyze recent developments and applications of AI in healthcare. It synthesizes information from various published sources to explore AI's role in diagnosis, treatment, drug discovery, patient monitoring, and data management, emphasizing both technological capabilities and practical healthcare implications	The review underscores AI's transformative role in healthcare, enhancing diagnostics, predictive modeling, and treatment optimization. Applications include robotic surgery, virtual assistants, and chatbots that streamline patient care. AI accelerates drug discovery, supports telehealth and remote monitoring, and optimizes data management. Overall, AI improves decision-making, reduces errors, and boosts global healthcare efficiency and accessibility	The study is limited by its narrative design, absence of quantitative AI tool comparisons, and lack of focus on data quality, transparency, or ethical concerns. Applications remain concentrated in advanced regions. Future research should prioritize real-world validation, explainable AI, equitable access, and interdisciplinary efforts to address bias, privacy, and regulatory challenges
A6	Shajari *et al.* (11)	This study adopts a systematic review approach to explore the technologies, applications, and benefits of predictive analytics in healthcare. It involved structured searches across major scientific databases, selecting peer-reviewed articles published between 2010 and 2020. The review focuses on the use of ML, big data, and AI tools in predictive healthcare	The study highlights predictive analytics' role in enhancing healthcare through early diagnosis, personalized care, resource optimization, and prevention. ML and big data predict readmissions, disease progression, and emergency needs. Applications in hospital management and decision support improve outcomes and reduce costs, though success relies on data quality, integration, and workflow alignment	This review is limited to English studies [2010–2020] and does not assess predictive tools' effectiveness or cross-setting performance. Challenges include data variability, poor interoperability, and limited clinician engagement. Future research should develop standardized evaluation frameworks, ensure equitable integration, enhance transparency, address bias and privacy, and assess long-term healthcare impacts
A7	Shei *et al.* (9)	This narrative review analyzes recent peer-reviewed studies examining the validity and reliability of consumer-grade wearable devices in tracking health and fitness outcomes. It synthesizes current evidence on physiological measurements such as heart rate, step count, oxygen saturation, and caloric expenditure, and offers expert interpretation for both lay and professional audiences	The review highlights widespread adoption of wearables for health tracking but notes inconsistent measurement reliability. Step counts and heart rate are generally accurate under controlled conditions, while metrics like calories, sleep, and oxygen saturation vary. Proprietary algorithms limit verification, and most devices lack medical-grade precision, requiring cautious interpretation for health monitoring	This review is limited by varying study quality, small samples, and inconsistent testing, hindering generalization across wearables. Proprietary algorithms restrict independent validation, and individual physiological differences are often overlooked. Future research should standardize validation, enhance algorithm transparency, conduct large-scale diverse studies, and prioritize personalized calibration for clinical and performance applications
A8	Channa *et al.* (4)	This systematic review followed PRISMA guidelines and analyzed literature from IEEE Xplore, Web of Science, and PubMed Central between December 2019 and June 2021. From 1,100 initially identified articles, 70 met inclusion criteria. The selected studies focused on wearable sensor technologies for remote COVID-19 monitoring, screening, and symptom assessment	The review highlights wearables' key role in remote COVID-19 management, monitoring parameters like respiratory rate, temperature, and heart rate. They aid early diagnosis, symptom tracking, and contact tracing, with AI improving accuracy and decision-making. Wearables reduce healthcare burdens and support social distancing, though global adoption is limited by technological and socio-economic disparities	This review is limited by its narrow timeframe, selective databases, and lack of large-scale, diverse validations. Many studies lack standardized metrics or comparative trials, and AI-integrated wearables remain early-stage with unresolved reliability, privacy, and ethical issues. Future research should emphasize real-world testing, interoperability, equitable access, regulatory frameworks, and personalized calibration for effective pandemic response
A9	Shang (34)	This study presents a comprehensive literature-based analysis of wearable devices, focusing on their technological evolution, applications, and societal impact. Drawing on existing academic and industry sources, it synthesizes information from previous studies to assess current capabilities and trends while identifying ongoing challenges and innovations shaping the future of wearable technologies	The study shows wearables evolving from basic fitness trackers to multifunctional, AI-integrated tools for healthcare, fitness, AR/VR, and smart environments. They enable continuous monitoring and chronic disease management but face barriers like privacy concerns, short battery life, and high costs. Market leaders include Apple and Garmin, with future progress hinging on biosensor innovation, non-invasive monitoring, improved interfaces, and stronger privacy protections	The study is limited by its reliance on secondary literature without empirical data or real-world case studies. Future research should conduct longitudinal studies on wearable adoption, establish standardized validation and algorithm transparency, and address ethical implications. Emphasis on inclusivity, affordability, and culturally sensitive designs will enhance global health technology deployment
A10	Huhn *et al.* (28)	This study conducted a scoping review using the PRISMA-ScR framework to examine the use of affordable, noninvasive wearable devices in health research. It screened 7,499 articles across four medical databases and included 179 studies that utilized consumer-grade wearables for quantitative health outcome assessment among over ten million participants	The review highlights extensive use of affordable, wrist-worn wearables for tracking steps, heart rate, and sleep, primarily in North American observational population studies. Applications included correlation analyses, prognostic forecasting, and experimental research, with emerging uses in COVID-19, fertility, and mental health monitoring. Wearable-derived big data increasingly supports population health insights and digital health innovation	This review is limited to low-cost, noninvasive wearables and studies mainly from high-income countries, restricting generalizability and causal inference. Future research should assess wearable effectiveness in diverse, low-resource populations using longitudinal and intervention designs. Emphasis on ethical issues, data privacy, and integration challenges is crucial for equitable, responsible deployment in health monitoring and personalized care
A11	Obianyo *et al.* (5)	The study employed a narrative review methodology, synthesizing peer-reviewed literature on wearable health technologies from major databases. Key focus areas included device evolution, applications in preventive healthcare, AI integration, and associated challenges. Data were analyzed thematically to highlight current trends, technological advancements, and future directions without conducting primary experiments or quantitative meta-analysis	This review examines wearable health technology evolution, from early fitness trackers to AI-integrated medical devices. It highlights applications in continuous monitoring, early diagnosis, and personalized preventive care, while addressing challenges like data accuracy, privacy, and compliance. Future directions emphasize ethical considerations, equitable access, and the transformative role of wearables in modern healthcare delivery	This review is limited by reliance on secondary literature, potential publication bias, and lack of large-scale empirical validation across diverse populations. Future research should prioritize real-world testing, standardized validation protocols, algorithm transparency, and cross-disciplinary studies, ensuring equitable access, privacy protection, and integration of AI-driven wearables into global healthcare systems
A12	Kaewkannate and Kim (24)	This study conducted both subjective and objective evaluations of four popular wrist-worn fitness trackers—Withings Pulse, Misfit Shine, Jawbone Up24, and Fitbit Flex. Seven users tested each device to assess accuracy in tracking steps and distance, user satisfaction, and ease of use. Online reviewer feedback was also compared with user experiences	The study revealed that Withings Pulse excelled in accuracy, step and distance tracking, and user satisfaction, followed by Fitbit Flex, Jawbone Up24, and Misfit Shine. Despite its appealing design, Misfit Shine lagged in accuracy. Users prioritized reliable tracking, aligning with online reviews, highlighting accuracy as the key driver of overall satisfaction	This study's findings are limited by a seven-user sample, focus on step and distance tracking, and testing of only four devices. Broader studies with more participants, diverse devices, and additional health metrics, including longitudinal and contextual physiological data, are needed to validate wearable performance and enhance generalizability
A13	Shin *et al.* (35)	This study conducted a systematic review of 463 academic articles published between 2013 and 2017 across six major databases, including PubMed, Scopus, and Web of Science. Topic modeling techniques were used to categorize research into six thematic areas, providing a comprehensive synthesis of the WAT research landscape	The review identified six key themes in WAT research: technology development, medical applications, behavior change, user engagement, self-monitoring, and privacy. WATs support preventive healthcare and rehabilitation by tracking activity, heart rate, and sleep. Yet, engagement varies, and privacy concerns persist, reflecting WATs' growing interdisciplinary significance in health and behavioral sciences	This review is limited by its 2017 cutoff, English-only studies, and reliance on topic modeling, which may miss qualitative nuances. Future research should address evolving user interactions, long-term psychological impacts, privacy, algorithm transparency, and access disparities, emphasizing user-centric designs and real-world, longitudinal health interventions across diverse populations
A14	Iqbal *et al.* (36)	This study employed a comprehensive review of current literature on wearable health technology, analyzing its evolution across five aspects: early wearables, sensor integration, medical applications, AI integration, and healthcare impact. The authors examined key devices, technological advancements, and their benefits through an interdisciplinary synthesis of research studies and device evaluations	Wearable health technology has evolved from basic fitness trackers to AI-powered medical tools. Early devices promoted activity, while sensor integration enabled real-time vital monitoring and chronic disease management. Modern wearables support predictive analytics, preventive care, and personalized health management, transforming healthcare delivery toward proactive, data-driven, and patient-centered approaches	The study is limited by reliance on secondary data, potential omission of recent innovations, and insufficient attention to device validation and user diversity. Future research should conduct long-term clinical trials, address ethical and privacy issues, assess accessibility, and explore integrating wearable data into healthcare systems to improve outcomes and workflows
A15	Verma *et al.* (37)	This study conducted a systematic literature review focusing on the integration of IoT and wearable devices in healthcare, with an emphasis on how 5G technology enhances their application. The review synthesized existing research on IoT-based detection, monitoring, treatment, and diagnostics, identifying key technological frameworks, implementations, and emerging challenges	IoT-based wearables are transforming healthcare through real-time monitoring, disease detection, and personalized treatment. Leveraging 5G's speed and low latency enhances data analytics, diagnostics, and remote imaging. This evolution toward intelligent, scalable networks enables continuous health tracking, improving accessibility and responsiveness, and advancing patient-centered, data-driven healthcare systems	The review is limited by its reliance on theoretical sources, absence of clinical validation, and limited discussion of privacy, energy efficiency, and user compliance. Future research should emphasize real-world IoT wearable deployments, longitudinal clinical studies, interoperability, and security, while addressing ethical and regulatory frameworks for responsible healthcare technology adoption
A16	Escobar-Linero *et al.* (38)	This study utilized a systematic review methodology to analyze recent developments in wearable healthcare devices and their integration with IoT technology. Relevant peer-reviewed articles were selected from established databases, focusing on the functions, benefits, and architecture of wearable IoT systems for real-time health monitoring and chronic disease management	Wearable IoT devices enhance real-time monitoring, early disease detection, and personalized care by tracking vital signs, transmitting data, and supporting remote diagnostics. They improve chronic disease management, patient engagement, and healthcare efficiency through continuous data collection, alerts, and cloud analytics, driving scalable, affordable, and transformative preventive and remote healthcare solutions	The study is limited by reliance on literature without empirical trials, with many technologies still in prototype stages. Key concerns include privacy, interoperability, and energy use. Future research should prioritize real-world applications, longitudinal trials, patient outcomes, and cost-effectiveness, while addressing regulatory, ethical, and infrastructural challenges for equitable, secure wearable healthcare adoption
A17	Jegan and Nimi (39)	This article provides designers with information to identify and develop smart wearable devices based on the data extracted from a literature survey on previously published research articles in the field of wearable devices for monitoring vital parameters	The key information available in this article indicates that quality signal acquisition, processing and longtime monitoring of vital parameters requires smart wearable devices. The development of smart wearable devices with the listed design criteria supports the developer to design a low power wearable device for continuous monitoring of patient health conditions	The study is limited by its theoretical nature, relying solely on secondary literature without experimental validation or real-world testing. Practical performance, user experience, and challenges like privacy, interoperability, and long-term adherence remain unaddressed. Future research should develop and evaluate prototypes, emphasizing usability, accuracy, healthcare integration, scalability, and user-centric design
A18	Vo and Trinh (10)	This study adopts a narrative review methodology, analyzing existing literature on the integration of AI with wearable technology in healthcare. The authors synthesize findings from recent publications to explore how AI-powered wearables enhance personalized health monitoring, disease prediction, diagnostics, and the real-time tracking of vital physiological parameters	AI-powered wearables transform healthcare by enabling real-time monitoring, early diagnosis, and chronic disease management. They track vital signs, support diabetes, cardiovascular, and mental health care, and provide personalized, predictive insights through ML. Cloud and IoT integration enhance efficiency, promoting proactive, preventive care, especially for remote and underserved populations	The study is limited by minimal clinical validation, data accuracy variability, and unresolved privacy concerns. Many AI wearables remain early-stage and lack standardization for clinical adoption. Future research should prioritize long-term trials, algorithm transparency, ethical safeguards, EHR integration, equitable access, and innovations in battery life, miniaturization, and seamless connectivity
A19	Guk *et al.* (40)	This study conducted a comprehensive literature review using established scientific databases to evaluate the advancements, applications, and design considerations of smart wearable devices in healthcare. The methodology involved analyzing existing research on signal acquisition, physiological parameter monitoring, and wearable technology development to inform the design of low-power, real-time monitoring devices	Smart wearables enable continuous health monitoring and early disease detection through high-quality signal acquisition and long-term vital tracking. With efficient sensors, power management, and wireless connectivity, they support reliable remote monitoring. These devices enhance personalized, preventive care by allowing real-time patient and caregiver oversight outside traditional clinical settings	This review is limited by its reliance on secondary data without primary testing or real-world validation. Future research should conduct clinical trials and user evaluations to assess wearable effectiveness, comfort, and accuracy. Addressing privacy, security, interoperability, and developing scalable, cost-effective solutions through interdisciplinary collaboration is essential for widespread adoption
A20	Taherdoost (41)	The study utilized a systematic numerical review method to extract and analyze relevant literature on IoT-enabled wearable healthcare technologies. Sources were reviewed based on their applications in sports monitoring, disease detection, patient monitoring, and medical diagnosis, focusing on continuous vital sign tracking and personalized healthcare through integrated IoT systems	IoT-integrated wearables enhance healthcare by enabling real-time monitoring of vital signs, early disease detection, and chronic condition management. They support remote diagnostics, improve data transmission, and personalize interventions, benefiting aging and active populations. These devices transform patient engagement, promote proactive care, and offer a scalable alternative to conventional in-clinic monitoring	This review is limited by the absence of empirical validation and reliance on secondary literature without real-world device testing. Future research should prioritize longitudinal clinical trials to assess compliance, accuracy, and outcomes, while addressing privacy, security, and interoperability. Enhancing ML integration and affordability is crucial for widespread, global adoption
A21	Chakraborty *et al.* (42)	This article employs a narrative review methodology, synthesizing recent literature on the evolution and application of data-driven ML and DL technologies in medicine. It categorizes advancements into two focal areas: ML to DL transitions in medical science and the emergence of ChatGPT-based chatbot technologies in healthcare	The review highlights how ML and DL transform medical data analysis, diagnosis, and patient care. DL enhances predictive analytics and personalized decision-making, leveraging imaging and EHR data. Chatbot technologies like ChatGPT support patient interaction and guidance. Together, DL and intelligent chatbots advance personalized medicine, clinical workflows, and overall healthcare delivery	The study is limited by its conceptual focus and reliance on secondary literature, lacking empirical validation or quantitative assessment of ML and DL models. Future research should prioritize clinical trials, model interpretability, and integration into healthcare infrastructure, while addressing patient trust, bias, ethical concerns, and the development of secure, explainable AI
A22	Badawy *et al.* (26)	This study conducted a comprehensive survey of 40 selected papers from IEEE, Springer, and Elsevier journals, focusing on the application of ML and DL algorithms in healthcare prediction. Keywords such as ML, DL, and various medical specialties were used to identify relevant studies for review and analysis	The survey shows that ML and DL improve disease prediction and diagnosis by detecting complex patterns in medical data. They enhance clinical decision-making across cardiology, radiology, hepatology, and nephrology, supporting early diagnosis and personalized care. AI-driven systems reduce errors, optimize resources, and improve outcomes, reshaping predictive and preventive healthcare	This study is limited by reliance on secondary data without empirical validation or comparative performance metrics for AI models. Future research should benchmark ML and DL algorithms across diverse datasets, address privacy and interpretability challenges, and explore hybrid, ethical, and scalable solutions through longitudinal studies for sustainable clinical adoption
A23	Aliferis and Simon (43)	This introductory chapter adopts a conceptual and narrative review approach to present foundational knowledge of biomedical AI/ML. It synthesizes historical milestones, technological developments, and thematic elements by drawing on existing literature and expert perspectives, emphasizing the evolution, distinguishing features, and strategic requirements for trustworthy adoption of AI/ML in healthcare	The chapter traces the evolution of biomedical AI/ML, highlighting rapid growth in healthcare applications alongside adoption challenges due to limited best practices and trust gaps. It introduces seven dimensions—such as transparency, fairness, usability, and domain relevance—to foster trust and adoption, providing a roadmap for navigating biomedical AI/ML's progress and challenges	This chapter is limited by its conceptual nature, lacking empirical data and model comparisons. Its broad scope may miss domain-specific or regional challenges. Future research should pursue interdisciplinary, data-driven studies, real-world implementation, and longitudinal evaluation, while developing standardized, transparent, and interoperable frameworks to build trust and support ethical biomedical AI/ML adoption
A24	Yenikaya *et al.* (21)	This study employed four DL networks—ResNet101, AlexNet, GoogLeNet, and Xception—to classify chest X-ray images for disease diagnosis. A dataset of 1,680 images, including COVID-19, viral pneumonia, and normal cases, was augmented using rotation. The data was split 70% for training and 30% for validation to assess classification performance	The study shows DL models effectively classify chest X-rays into COVID-19, viral pneumonia, and normal, with ResNet101 achieving 96.32% accuracy. Findings demonstrate AI's robustness in diagnostic imaging, supporting rapid, accurate disease detection and enhancing healthcare decision-making, particularly for distinguishing COVID-19 from similar pulmonary conditions	The study is limited by a small dataset of 1,680 X-ray images, testing only a few DL models, and relying on rotation-based augmentation. Future research should expand datasets across diverse demographics, evaluate more models, integrate clinical metadata, and explore hybrid AI-human systems to improve diagnostic accuracy and reliability
A25	Rashid *et al.* (44)	The study employed a comparative analysis of four DL networks—ResNet101, AlexNet, GoogLeNet, and Xception—for disease diagnosis using chest X-ray images. A dataset of 1,680 images was used, featuring COVID-19, viral pneumonia, and healthy cases. Data augmentation via rotation and a 70/30 training-validation split were applied for model evaluation	The study demonstrates that DL effectively diagnoses respiratory diseases from chest X-rays, with ResNet101 achieving 96.32% accuracy, outperforming AlexNet, GoogLeNet, and Xception. Models accurately distinguished COVID-19, viral pneumonia, and healthy cases, highlighting AI's potential to enhance diagnostic speed, accuracy, and efficiency in clinical settings, particularly during pandemics	The study is limited by its small dataset of 1,680 X-ray images and reliance on rotation-based augmentation, reducing generalizability. Future research should use larger, diverse datasets and integrate multimodal data like symptoms and patient history to enhance accuracy. Emphasizing model explainability is key for real-world clinical trust and adoption
A26	Rahman *et al.* (45)	The study employed an exhaustive literature survey methodology by systematically searching prominent journal and conference databases using targeted keywords. It reviewed and synthesized the most recent and advanced developments in ML and DL within healthcare, emphasizing integration benefits, practical applications, and emerging trends across smart healthcare systems	The review highlights ML and DL's transformative role in healthcare, enhancing disease prediction, drug discovery, medical imaging, and clinical decision-making. Integrating ML-DL frameworks enables personalized care, predictive analytics, and patient monitoring. These technologies improve healthcare efficiency, accessibility, and outcomes, confirming AI's growing impact on smart, data-driven healthcare systems	The study is limited by inconsistent data availability, low algorithm transparency, and integration challenges in healthcare systems. Many ML/DL models lack clinician interpretability, and regulatory frameworks lag behind technological advances. Future research should enhance explainability, standardize datasets, address bias and interoperability, and explore real-time AI applications in telemedicine, wearables, and global health
A27	Alam *et al.* (25)	This systematic review followed PRISMA guidelines to analyze the landscape of predictive analytics in healthcare. From an initial pool of 687 articles, 37 studies were selected based on relevance to AI and ML applications in early disease detection, diagnostic accuracy, real-time monitoring, and resource optimization across various healthcare settings	The study shows that AI- and ML-driven predictive analytics improve early detection and intervention for chronic diseases, boosting diagnostic accuracy by up to 40%. Leveraging EHRs, wearables, and demographics, these models aid pandemic forecasting, real-time monitoring, and resource optimization, promoting scalable, preventive, and personalized data-driven healthcare management	The study is limited by privacy concerns, ethical issues, algorithmic bias, and integration challenges with current healthcare systems. Many models lack transparency and generalizability. Future research should develop interpretable, bias-resistant algorithms, standardized diverse datasets, and interoperable systems, while exploring applications in low-resource settings, behavioral health, and preventive interventions
A28	Gabriel *et al.* (22)	The study employed a computer vision–based AI platform for real-time video analysis in hospital rooms, identifying individuals, objects, motion, and boundary events. Data were collected across 1,000 days from over 300 high-risk fall patients at 11 hospitals. Inference results were stored securely and partially released for public research use	The AI platform achieved strong performance in hospital monitoring, with F1-scores of 0.92 for object detection and 0.98 for patient-role classification, and 0.82 (±0.15) accuracy for "patient alone" tracking. Its passive, continuous monitoring supports fall-risk detection, unsupervised movement identification, and timely clinical interventions, enhancing patient safety and hospital care	The AI platform's generalizability is limited by its focus on high-risk fall patients and deployment in specific hospital settings, with accuracy potentially affected by room layouts, lighting, and demographics. Privacy concerns from continuous video monitoring persist. Future research should expand to diverse populations, integrate EHRs and wearables, employ privacy-preserving methods, and assess real-world clinical impact through longitudinal studies for safe, scalable, and ethical implementation
A29	Khalifa and Albadawy (46)	This systematic review followed a four-step approach: a comprehensive literature search across PubMed, Embase, and Google Scholar; application of inclusion and exclusion criteria; structured data extraction focusing on AI methods and their clinical applications; and synthesis of findings to evaluate AI's role in enhancing predictive capabilities in healthcare	The review of 74 studies highlights eight key AI applications in clinical prediction: diagnosis, early detection, prognosis, risk assessment, treatment response, disease progression, readmission, and mortality prediction. AI shows strong performance in oncology and radiology, improving precision, enabling real-time insights, personalizing care, and enhancing workflows for better outcomes and healthcare efficiency	Current AI in clinical prediction is limited by fragmented data, lack of standardization, unvalidated models, and algorithmic bias from unrepresentative datasets. Ethical concerns over transparency, explainability, and privacy remain. Future work should develop explainable models, use diverse datasets, promote cross-institutional sharing, and conduct prospective trials with stakeholder involvement for clinically meaningful, ethical adoption
A30	Alowais *et al.* (47)	This review analyzed literature from PubMed/Medline, Scopus, and EMBASE to assess the integration of AI in healthcare. Articles published in English were included without time constraints. The review focused on evaluating AI's impact on clinical practice, particularly in diagnosis, treatment recommendations, and patient engagement across diverse healthcare settings	AI integration in healthcare enhances diagnostic precision, treatment optimization, and workflow efficiency. By analyzing large datasets, AI supports personalized medicine, clinical testing, virtual assistants, medication management, and mental health care. It improves outcomes, reduces errors and costs, and aids population health, patient education, and trust, driving responsive, data-driven healthcare	AI adoption in healthcare faces challenges with data privacy, model transparency, bias, and ethical concerns. Limited data quality, lack of standardization, and unclear regulations hinder scalability. Future research should prioritize explainable AI, interoperability, and ethical frameworks, alongside clinician-developer-policy collaboration, diverse patient inclusion, and longitudinal studies to ensure safe, equitable, and effective real-world deployment
A31	Hirani *et al.* (48)	This narrative review traces the evolution of AI in healthcare from the 1960s to the present, synthesizing findings from peer-reviewed literature and expert analyses. It explores applications in diagnostics, treatment, and patient engagement, with particular emphasis on recent developments catalyzed by the COVID-19 pandemic and associated ethical considerations	AI is transforming healthcare through precision medicine, robotic surgeries, drug discovery, and telemedicine, with rapid growth during COVID-19. It enhances diagnostics, personalized care, remote monitoring, and efficiency while reducing clinician workload. However, its benefits must be balanced with ethical oversight, addressing data privacy, bias, and equitable access in healthcare innovation	The study is limited by its narrative design, lack of standardized evaluation frameworks, and focus on early-stage AI tools with limited generalizability. Future research should use longitudinal, comparative studies to assess real-world outcomes, while addressing ethics, data governance, and transparency. Global collaboration and regulatory frameworks are essential to ensure inclusive, equitable, and responsible AI deployment
A32	Grout *et al.* (3)	This study utilized a DL approach combining Word2Vec embeddings of SNOMED CT codes, binned clinical observations, and social determinants of health derived from longitudinal EHR data of approximately 50 million U.S. patients. These embeddings were input into a Bidirectional GRU model to predict four major health outcomes over 3 years	The DL model showed high predictive accuracy for future disease diagnoses, with AUCs of 0.92 for type 2 diabetes, 0.94 for COPD, 0.92 for hypertension, and 0.94 for myocardial infarction. Incorporating social determinants and SHAP-based explainability enhanced clinical relevance, supporting early interventions and population health management through individualized risk assessment	This study is limited by potential generalizability issues due to reliance on a U.S.-based structured EHR dataset, excluding insights from unstructured notes or imaging. Future research should integrate multimodal data, validate models across diverse populations, and assess workflow integration. Real-time deployment, continual model retraining, fairness, and data privacy are critical for responsible adoption
A33	Sozib (6)	This review evaluates recent literature on wearable AI technologies for CVD prediction and prevention. It analyzes the implementation of ML models—such as decision trees, random forests, support vector machines, and deep neural networks—using physiological data from wearables, alongside imaging, genetics, and EHRs, to assess predictive performance and clinical relevance	Wearable AI technologies enable proactive cardiovascular care by continuously analyzing HRV, sleep, and activity to detect early risk indicators. ML models like SVMs and deep neural networks often surpass traditional diagnostics in sensitivity. Integrating wearable, genetic, imaging, and EHR data enhances prediction accuracy, supports real-time interventions, and improves patient outcomes	Wearable AI technologies face challenges in data privacy, consent, security, algorithmic bias, and clinical integration. Interoperability and clinician acceptance remain barriers. Future research should develop ethical frameworks, inclusive datasets, and real-world trials, while examining patient adherence and scalability to ensure responsible, equitable, and effective adoption of AI-powered health monitoring systems
A34	Hiremath (49)	This review examines the evolution and current capabilities of AI-driven cardiac monitoring through wearable devices. It synthesizes findings from existing studies on the integration of sensors (ECG, PPG), ML algorithms (CNNs, RNNs), and telemedicine systems. Emphasis is placed on data processing, predictive analytics, and personalized cardiovascular care frameworks	AI-powered wearables are transforming cardiac care through continuous monitoring, early arrhythmia detection, and personalized treatment planning. DL models like CNNs and RNNs achieve near-cardiologist accuracy, while telemedicine integration enables timely interventions and remote management. These devices enhance patient engagement, reduce hospital visits, lower costs, and shift care from reactive to preventive	AI-driven cardiac wearables face challenges with data quality, signal accuracy, interoperability, and regulatory compliance. Privacy, security, and long-term adherence also limit impact. Future research should improve multi-sensor fusion, usability, and standardized data protocols while integrating wearable data into EHRs and cloud-based, adaptive AI systems for scalable, ethical, and precise cardiovascular care
A35	Jena *et al.* (50)	This review synthesizes findings from recent clinical and technological studies evaluating wearable devices in cardiology. It focuses on ECGs, defibrillators, and biometric trackers, analyzing their performance, clinical relevance, and applications in cardiac care and rehabilitation. Key studies such as the Apple Heart and Fitbit Heart Studies are critically examined	Wearable devices, including ECG-based tools like Apple Heart and Fitbit Heart, offer accuracy comparable to traditional monitors for heart rate and rhythm tracking. They enable early arrhythmia detection, support rehabilitation, and provide lifestyle insights. Enhanced sensors and real-time data transmission improve patient engagement, reduce costs, and transform cardiovascular care through scalable, remote monitoring solutions	Wearable devices face limitations in motion-related data accuracy, accessibility barriers, and privacy and regulatory challenges. Manufacturer variability complicates standardization and EHR integration. Future research should enhance algorithm reliability across diverse populations, establish robust data governance, and conduct long-term clinical trials to evaluate patient outcomes, adherence, and cost-effectiveness in real-world cardiology
A36	Nechita *et al.* (31)	This review synthesizes recent studies and clinical innovations related to the use of AI and smart cardiac devices in cardio-oncology. It examines applications of ML, DL, wearable ECG patches, biosensors, and implantable monitors to assess cardiovascular risk, detect cardiotoxicity early, and personalize cardiac care in cancer patients	AI-integrated cardiac devices are transforming cardio-oncology by enhancing risk assessment and early detection of treatment-induced cardiotoxicity. Machine and DL improve predictive accuracy, enabling tailored interventions. Wearable ECGs, biosensors, and AI-powered implants provide real-time monitoring, support proactive care, and leverage big data to optimize treatment decisions, improving long-term safety and patient outcomes	AI-driven cardiac monitoring in cardio-oncology faces challenges with data heterogeneity, lack of standardization, regulatory delays, privacy concerns, and access disparities. Future research should prioritize standardized data protocols, inclusive model training, and expanded clinical trials. Multidisciplinary collaboration is key to translating innovation into equitable, evidence-based, and clinically validated cardio-oncology care
A37	Birla *et al.* (12)	This review analyzed recent literature, clinical studies, and trial data on the integration of wearable devices and AI in oncology. It examined the roles of these technologies in patient monitoring, treatment optimization, and precision care delivery, while summarizing completed clinical trials and identifying regulatory and implementation challenges	AI and wearable technology in oncology enable continuous, noninvasive monitoring, enhancing early intervention and personalized care. They improve diagnostics, predict treatment responses, and guide tailored therapies. Wearables track activity, detect physiological changes, and support chemotherapy management. This synergy boosts patient engagement, adherence, and proactive clinical decision-making, advancing responsive, individualized cancer care	AI and wearable integration in oncology faces challenges with data privacy, security, and interoperability due to non-standardized devices and evolving regulatory frameworks. Future research should develop strong privacy safeguards, harmonize device standards, and conduct large-scale longitudinal studies. Clinician-technologist-regulator collaboration is essential to enable secure, scalable, and personalized oncology care
A38	Huang *et al.* (51)	This comprehensive review synthesizes recent advancements in AI-integrated wearable bioelectronics by analyzing peer-reviewed studies and technological reports. It examines foundational sensor and AI technologies, evaluates real-world applications in continuous health monitoring and precision medicine, and identifies technical, ethical, and regulatory challenges to guide future innovations in digital healthcare systems	AI-driven wearable bioelectronics enable continuous, real-time monitoring of vital physiological and biochemical signals. Powered by advanced AI and integrated with telemedicine, they facilitate early disease detection, chronic care, and personalized treatment. These devices improve healthcare access and promote preventive, patient-centered care, enhancing clinical efficiency and outcomes	The adoption of AI-enhanced wearable bioelectronics is limited by data interoperability, algorithmic bias, privacy concerns, and lack of regulatory frameworks. Technical challenges like power efficiency and sensor miniaturization persist. Future research must improve device robustness, explainable AI, and data integration, with interdisciplinary collaboration and clinical trials vital for safe, equitable, and effective deployment
A39	Lu *et al.* (52)	This review systematically analyzed literature from the 1990s to the present, focusing on the evolution of AI applications in thyroid disease management. It evaluated studies involving ML and DL techniques across diagnostic imaging, histopathology, and patient monitoring, emphasizing personalized treatment, clinical integration, and challenges in real-world deployment	AI has transformed thyroid disease management by enhancing diagnostic accuracy, reducing ultrasound interpretation subjectivity, and better differentiating benign from malignant nodules. Advanced algorithms lower unnecessary biopsies and optimize treatment. Integrating multimodal data enables real-time monitoring and early recurrence detection, supporting personalized, continuous care—especially post-thyroidectomy	AI in thyroid disease management faces challenges including data heterogeneity that limits model generalizability, lack of clinical validation, and transparency issues reducing practitioner trust. Ethical concerns around privacy, bias, and explainability persist. Future efforts should focus on large-scale validation, interpretable models, data standardization, and interdisciplinary collaboration for ethical, effective, and inclusive clinical integration
A40	Oikonomakos *et al.* (53)	This review synthesizes recent advancements in AI applied to endocrinology and diabetes by analyzing peer-reviewed studies, FDA-approved devices, and clinical applications. It categorizes AI-based tools into current, developmental, and future-stage technologies, examining their use in diagnostics, patient monitoring, predictive analytics, and personalized treatment in endocrine and metabolic disorders	AI is revolutionizing endocrinology by improving early detection, personalized treatment, and continuous monitoring. ML enhances diagnostics in diabetes, thyroid cancer, adrenal tumors, and retinopathy. FDA-approved tools support glucose control and retinal screening. Integrating multimodal data enables real-time decisions, remote care, and risk prediction, advancing precision endocrine medicine	AI in endocrinology faces challenges including data heterogeneity, lack of standardization, limited clinical validation, and the "black box" problem reducing explainability and clinician trust. Ethical issues around privacy, bias, and equitable access persist. Future research must focus on transparent models, diverse datasets, unified standards, multicenter trials, and EHR integration for responsible, effective, and equitable adoption
A41	Belkhouribchia (54)	This narrative review analyzes peer-reviewed articles, clinical studies, and technological reports to explore the integration of AI in endocrine imaging. The study categorizes AI applications based on imaging modalities such as ultrasound, CT, and MRI, and evaluates their roles in diagnosis, lesion characterization, treatment planning, and prognosis assessment	AI enhances endocrine imaging by boosting diagnostic accuracy, lesion classification, and workflow efficiency. DL models improve thyroid nodule differentiation, reducing biopsies. In adrenal and pituitary imaging, AI aids lesion detection and segmentation, supporting early diagnosis and surgical planning. It also advances image reconstruction, radiomics, and risk stratification for personalized care, transforming endocrine diagnostics	AI in endocrine imaging faces challenges such as small, non-diverse training datasets, limited external validation, and variability in imaging protocols affecting model robustness. The black-box nature hampers interpretability, while regulatory and clinical acceptance barriers slow adoption. Future work should prioritize diverse multicenter data, explainable AI, real-time integration, and prospective validation through collaborative efforts
A42	Osa-Sanchez *et al.* (8)	This systematic review analyzed 249 studies published between 2020 and 2024 across four databases, with 28 studies meeting inclusion criteria. It examined recent advances in AI techniques, wearable devices, data types, and preprocessing methods used for diagnosing sleep apnea, emphasizing algorithm performance, device integration, and real-time monitoring capabilities	The review highlights the integration of wearables (patches, watches, rings) with CNNs and transfer learning for sleep apnea diagnosis. AI-powered devices enable real-time, accurate sleep monitoring and personalized intervention. Multi-modal data and DL improve diagnostic precision, emphasizing data quality and marking a shift toward accessible, non-invasive diagnostics	Current studies on AI-driven sleep apnea diagnosis face challenges in generalizability due to small sample sizes, inconsistent data quality, and device-specific limitations. Many models lack external validation, and varied preprocessing hinders cross-study comparisons. Future research should standardize data collection, conduct large-scale trials, develop hybrid AI models, and focus on population transferability and clinical integration through interdisciplinary collaboration
A43	Abd-Alrazaq *et al.* (7)	This systematic review examined 69 studies selected from 1,203 identified across eight databases, including MEDLINE, PsycINFO, Embase, and IEEE Xplore. Studies were screened and reviewed independently by two reviewers. Eligible research focused on wearable AI for anxiety and depression, with data extracted and synthesized narratively to identify key applications and research gaps	The review found wearable AI mainly used for diagnosing anxiety and depression, with no treatment applications reported. Most studies focused on depression in adults aged 18–65 years, using wrist-worn devices like the Actiwatch AW4. Physical activity, sleep, and heart rate data informed models, often built with random forests and SVMs. Wearable AI shows promise for prescreening but treatment potential remains unexplored, highlighting opportunities to broaden mental health applications	The review identifies key limitations, including no studies on wearable AI for treatment, predominance of observational designs, and lack of meta-analyses. Focus on adults aged 18–65 years limits applicability to children and elderly. Limited device diversity and real-world validation reduce generalizability. Future research should pursue rigorous trials, broader demographics, multimodal data, and foster collaboration to ensure clinical relevance, transparency, and ethical use
A44	Kargarandehkordi *et al.* (30)	This systematic review followed PRISMA guidelines to identify 48 studies utilizing AI models applied to wearable and smartphone-based biosensor data for mental health prediction. The included studies analyzed physiological signals such as heart rate, HRV, EDA/GSR, and behavioral proxies like accelerometry, location, audio, and usage metadata for model development	AI-driven biosensing via wearables and smartphones shows strong potential for predicting mental health conditions using heart rate, HRV, EDA/GSR, physical activity, and phone usage data. Despite varied methods, many studies report moderate to high accuracy. Integrating physiological and behavioral data enables context-aware models, offering promising remote, continuous mental health monitoring, though further refinement is needed	Limitations include small, heterogeneous samples, variable data quality, and limited ecological validity, reducing generalizability. Technical issues like battery life and sensor inconsistency affect feasibility. Most studies lack longitudinal validation and clinical integration. Future research should standardize data protocols, use diverse populations, validate models in real-world settings, and advance energy-efficient, privacy-preserving AI, supported by interdisciplinary collaboration
A45	Olawade *et al.* (55)	This review conducted a comprehensive literature search across PubMed, IEEE Xplore, PsycINFO, and Google Scholar. It included peer-reviewed articles, conference proceedings, and reputable online sources focused on the integration of AI in mental healthcare. Only English-language review studies analyzing current trends, applications, and ethical implications were considered	The review highlights AI's expanding role in mental healthcare through early disorder detection, personalized treatments, and virtual therapists. AI offers scalable, cost-effective access, particularly for underserved groups. Models excel in diagnosis and patient engagement while supporting—not replacing—clinicians. Implementation demands balancing innovation with ethics, privacy, bias mitigation, and preserving human connection	The field faces major challenges including data privacy, algorithmic bias, and lack of standardized regulations. Limited model transparency reduces clinical trust and adoption. Research is fragmented with inconsistent reporting and scarce longitudinal validation. Future efforts should focus on explainable AI, rigorous clinical validation, inclusivity, and interdisciplinary collaboration to develop culturally sensitive, secure, and equitable mental health AI tools
A46	Aziz *et al.* (29)	This scoping review systematically searched seven databases for peer-reviewed studies published before March 2024 using keywords related to sleep disorders, AI, and wearable devices. Study selection involved two independent reviewers screening titles, abstracts, and full texts. Eligible studies applied AI algorithms to wearable device data for sleep disorder detection	The review of 46 studies shows wearable AI, mainly using commercial wrist devices and data like respiration, heart rate, and movement, excels in diagnosing sleep apnea. Leading algorithms include CNNs, random forests, and SVMs. While treatment use is lacking, DL advances enable accessible, continuous, scalable monitoring, promising to transform sleep disorder diagnosis, especially for underserved populations	Current studies predominantly focus on sleep apnea, with limited research on other sleep disorders like insomnia or narcolepsy. Clinical validation and treatment applications remain scarce, and variability in devices and algorithms complicates comparisons. Future work should emphasize clinical trials, broaden disorder coverage, improve algorithm accuracy, develop therapeutic functions, and address ethical concerns for equitable deployment
A47	Wang *et al.* (32)	This study compares traditional and intelligent methods for depression detection, emphasizing the role of AI and WIoT devices. It analyzes psychophysiological data collected from wearable devices and presents an illustrative example using sleep data. An ensemble model is proposed and evaluated against baseline methods	The study shows AI-enhanced wearables improve depression detection efficiency and objectivity over traditional methods. Psychophysiological signals from WIoT devices, like sleep and heart rate, provide strong indicators. An ensemble learning model improved predictive accuracy by nearly 10%, supporting early diagnosis and continuous monitoring, potentially reducing misdiagnosis and enabling timely intervention, especially in resource-limited settings	The study's focus on sleep and limited psychophysiological features may not fully capture depression's complexity. Model performance could vary due to demographic biases, and lack of real-world validation limits clinical use. Future research should incorporate multimodal data, diverse populations, comorbid conditions, and improve algorithm transparency for ethical, broader healthcare adoption
A48	Nahavandi *et al.* (56)	This review systematically analyzes recent applications of wearable devices integrated with AI across domains such as healthcare, industry, and sports. It examines studies utilizing supervised, unsupervised, semi-supervised, and reinforcement learning approaches, highlighting how these AI techniques are applied using wearable-generated data for diagnostics, performance monitoring, and user experience enhancement	Wearable devices provide valuable data for AI across healthcare, industry, and sports. In healthcare, AI wearables assist in diagnosing fitness, movement, and mental health; in industry, they optimize employee monitoring; in sports, they enhance training with personalized feedback. Supervised and unsupervised learning prevail, with reinforcement learning emerging. Challenges include computational demands, real-time processing, and device design. Continued AI-wearable integration promises transformative real-time decision-making	Current wearable-AI systems face challenges such as high computational demands, limited battery life, data privacy issues, and platform interoperability. Studies often lack scalability and long-term usability focus. Real-time AI deployment is hindered by hardware limits and latency. Future research should optimize low-power algorithms, enhance device communication, leverage edge computing, expand reinforcement learning, and develop ethical data governance frameworks for broader adoption
A49	Rizzo (57)	This review synthesizes findings from contemporary literature, case studies, and institutional reports to assess how AI is transforming data management, clinical trials, and care delivery in neurological sciences. It builds on prior thematic analyses, focusing on AI's integration with real-world and synthetic data, digital twins, and learning health systems	AI drives major advances in neurological data analysis, real-time diagnostics, and patient management using large real-world and synthetic datasets. Innovations like digital twins and in silico trials enhance precision and scalability. AI supports education and learning health systems, enabling continuous care improvement. Realizing this potential requires careful implementation with human oversight and ethical alignment	Despite advancements, AI deployment in neurology faces ethical challenges like data privacy, global access disparities, opaque decision-making, and healthcare system fragmentation. Environmental impacts and data biases hinder equity. Future research must focus on sustainable AI, cross-institution validation, human-centered integration, and governance frameworks for digital twins and adaptive trials. Interdisciplinary collaboration is essential for responsible innovation
A50	Gutman *et al.* (58)	This narrative review synthesizes findings from the past 25 years of advancements in neurology by analyzing literature on AI, neuroinformatics, and biomedical data science. It integrates developments in genomics, imaging, electrophysiology, and digital health platforms, with an emphasis on AI's role in diagnosis, treatment personalization, and real-world neurology practice	AI and neuroinformatics have transformed neurology by enhancing analysis of genomics, imaging, and electrophysiology data, improving diagnosis and treatment of neurodegenerative diseases. Advances in digital health and telemedicine, accelerated by COVID-19, expand care access and monitoring. Integration of biomarkers and personalized medicine refines subtyping and patient care, driving precision neurology	The review highlights ethical challenges in AI-driven neurology, including data privacy, consent, and algorithmic bias. Technical barriers involve integrating diverse data sources and scaling personalized treatments. Underrepresentation of populations and limited system interoperability persist. Future research should develop ethical frameworks, improve AI interpretability, explore quantum computing, and foster global collaboration to advance equitable, precision neurological care
A51	Boubga *et al.* (59)	This review adopts a narrative approach to examine recent literature on the application of AI in neurology. It synthesizes studies involving AI in neuroimaging, clinical decision support, and personalized treatment to assess its impact on diagnostic precision, patient management, and healthcare delivery within neurological practice	AI technologies enhance neurological disorder diagnosis and treatment by analyzing large clinical and imaging datasets. Tools like AI-driven neuroimaging and decision support improve detection of Alzheimer's, Parkinson's, and epilepsy. Predictive analytics enable personalized treatments, streamline workflows, reduce errors, and support early intervention. Integration with health records optimizes care, affirming AI's transformative role in neurology	AI in neurology faces key challenges such as data privacy, lack of transparency, and weak regulatory oversight. Limited and non-representative training data raise bias and generalizability concerns. Clinical adoption is slowed by insufficient standardization and clinician training. Future efforts should enhance data diversity, model interpretability, validation frameworks, and foster interdisciplinary collaboration, alongside longitudinal studies to evaluate real-world impact

The table summarizes key studies on AI and wearable technologies in healthcare, highlighting methodological approaches, principal findings, and major limitations. It also outlines proposed future research directions, illustrating how current evidence supports early detection, continuous monitoring, and personalized care while exposing gaps in validation, equity, ethics, and implementation. AI, artificial intelligence; AUC, area under the curve; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; COVID-19, coronavirus disease 2019; CVD, cardiovascular disease; DL, deep learning; ECG, electrocardiogram; EHRs, electronic health records; HRV, heart rate variability; IoT, Internet of Things; ML, machine learning; WAT, wearable activity tracker; WIoT, Wearable Internet of Things.