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Systematic Review

The impact of "internet of things": advancing patient monitoring and health outcomes to enhance healthcare quality: a systematic review

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ABSTRACT

The internet of things (IoT) has emerged as a transformative force in healthcare, reshaping patient monitoring, data collection, and clinical decision-making. As the global healthcare landscape becomes increasingly digitized, understanding the contributions of IoT to quality enhancement is critical. This systematic review explores the current evidence on the impact of IoT on patient monitoring and health outcomes, focusing on its role in improving healthcare quality. A comprehensive search of PubMed, Scopus, IEEE Xplore, and Google Scholar databases was conducted for studies published between January 2015 and May 2025. Keywords included "IoT in healthcare," "patient monitoring," "health outcomes," and "quality improvement." Studies were included if they focused on IoT applications in healthcare settings with measured outcomes related to patient care or quality. Preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines were followed. A total of 58 studies were included. The majority demonstrated significant improvement in early detection of clinical deterioration, chronic disease management, remote patient monitoring, and reduction in hospital readmissions. IoT was found to enhance real-time decision-making, lower operational costs, and improve patient satisfaction and safety metrics. IoT plays a pivotal role in advancing healthcare delivery by enhancing monitoring capabilities and health outcomes. However, ethical challenges, cybersecurity concerns, and interoperability barriers remain. Strategic investments and regulatory frameworks are essential for sustainable IoT integration.

Keywords: Internet of things, Healthcare quality, Patient monitoring, Health outcomes, Digital health, Systematic review

INTRODUCTION

Healthcare systems across the world are confronting unprecedented challenges, including aging populations, rising chronic disease burdens, healthcare workforce shortages, and increasing demands for cost-effective, high-quality care. In response to these challenges, the healthcare industry is experiencing a digital transformation led by emerging technologies such as artificial intelligence (AI), machine learning, and particularly, the internet of things (IoT).[1] IoT refers to a network of physical devices ranging from sensors and wearables to mobile apps and smart hospital infrastructure that collect, transmit, and analyze data in real time to optimize decision-making and patient care.[2]

In the context of healthcare, IoT has evolved into the internet of medical things (IoMT), encompassing remote monitoring systems, biosensors, connected inhalers, smart infusion pumps, RFID-tagged instruments, and real-time location systems (RTLS). These technologies contribute to more dynamic and responsive health systems by facilitating continuous patient monitoring, streamlining clinical workflows, enabling personalized treatment strategies, and reducing the administrative burden on providers.[3] The COVID-19 pandemic further accelerated the uptake of these technologies as remote monitoring became essential for reducing physical contact and protecting vulnerable populations.[4]

Patient monitoring has traditionally relied on periodic assessments and manual documentation, which introduces delays and increases the risk of human error. In contrast, IoT-enabled monitoring systems offer continuous, real-time data collection and transmission, allowing clinicians to identify early warning signs, initiate timely interventions, and reduce the likelihood of adverse events.[5] The utility of IoT has been particularly notable in managing chronic diseases such as diabetes, hypertension, and heart failure, where continuous data feedback can inform medication adjustments, dietary interventions, and lifestyle modifications.[6]

Several studies have shown that IoT improves patient engagement and adherence to treatment regimens by empowering patients with real-time insights into their health status.[7] Mobile health (mHealth) applications connected to wearable devices allow patients to actively participate in their care, fostering a more collaborative provider-patient relationship. Moreover, IoT enhances hospital operations through smart bed systems, asset tracking, and predictive maintenance of critical equipment, which collectively contribute to better resource utilization and healthcare delivery.[8]

Despite the immense potential of IoT in healthcare, its widespread adoption is hindered by challenges such as data privacy and security concerns, interoperability limitations between systems, lack of standardized protocols, and ethical dilemmas associated with continuous monitoring.[9] Additionally, healthcare providers may lack adequate training in interpreting and integrating IoT data into clinical workflows, highlighting the need for structured implementation strategies and workforce development.

The growing body of literature underscores the importance of IoT in enhancing healthcare quality, yet a comprehensive synthesis of its impact on clinical outcomes, patient satisfaction, operational efficiency, and safety is still lacking. This systematic review aims to bridge this knowledge gap by evaluating the evidence on the role of IoT in advancing patient monitoring and improving health outcomes. It further explores the facilitators and barriers to its effective implementation, offering insights for policymakers, clinicians, and technologists seeking to optimize healthcare delivery in the digital age.

METHODS

Study design

This systematic review was conducted to evaluate the impact of the IoT on patient monitoring, health outcomes, and overall healthcare quality. The review followed the preferred reporting items for systematic reviews and meta-analyses (PRISMA) 2020 guidelines.

Eligibility criteria

The eligibility of studies was established using the population, intervention, comparator, outcomes, study design (PICOS) framework.

Population

Patients receiving healthcare services using IoT-enabled technologies, healthcare professionals utilizing IoT for monitoring or decision support.

Intervention

Implementation of IoT systems for real-time or continuous monitoring, data transmission, or clinical workflow enhancement.

Comparator

Conventional care without IoT intervention or pre-IoT baseline outcomes.

Outcomes

Clinical outcomes (e.g., hospitalization, mortality), process outcomes (e.g., time to intervention), patient-reported outcomes (e.g., satisfaction, adherence), operational metrics (e.g., readmissions, healthcare costs).

Study design

Randomized controlled trials (RCTs), quasi-experimental studies, cohort studies, case-control studies, and relevant observational research.

Inclusion criteria

Studies were included if they met the following additional criteria- published in peer-reviewed journals between January 2015 and May 2025, English language only and included quantitative or mixed-methods data on healthcare quality or patient outcomes.

Exclusion criteria

Editorials, commentaries, letters, and review papers, studies not explicitly addressing IoT interventions, grey literature and non-peer-reviewed content.

Information sources and search strategy

A systematic search was conducted across PubMed, Scopus, IEEE Xplore, and Google Scholar databases using a combination of Medical Subject Headings (MeSH) and free-text terms. The search strategy included the following keywords: "internet of things" OR "IoT" OR "smart devices" AND "patient monitoring" OR "remote monitoring" AND "healthcare outcomes" OR "quality of care" OR "clinical quality" AND "healthcare systems" OR "hospital services" show in Table 1. The search was independently performed by two reviewers. Reference lists of included studies were also screened for additional eligible articles.

At entry into the study the usual care group had proteinuria less than a gram a day compared to those in the clinical trial with more than 1 gram a day. This arose because most of the patients with TUP >1 gm were recruited into the clinical trial group leaving the rest from the 312 patients to form the usual care group. This would be another factor influencing the outcome of the study. These disparities between the two groups illustrate the difficulties we faced in the choice of a usual care comparator group.

Table 1: MeSH term search strategies.

S. no.	Key Concept	MeSH term(s)	Keywords/synonyms	Boolean operators
1	Internet of things	"Internet of things" [MeSH]	IoT, smart devices, connected devices, wearables	OR
2	Patient monitoring	"Monitoring, physiologic" [MeSH]	Remote patient monitoring, telemonitoring, biosensors	OR
3	Chronic disease	"Chronic disease" [MeSH]	Diabetes, hypertension, COPD, heart failure	OR
4	Healthcare quality	"Quality of health care" [MeSH]	Health system performance, care outcomes, safety, efficiency	OR
5	Health outcomes	"Treatment outcome" [MeSH]	Clinical improvement, adherence, readmission, mortality	OR
6	Telemedicine	"Telemedicine" [MeSH]	mHealth, eHealth, virtual care, digital health	OR
7	Data security	"Data security" [MeSH]	Cybersecurity, encryption, privacy	OR
8	Artificial intelligence	"Artificial intelligence" [MeSH]	Predictive analytics, smart algorithms	OR
		Final search strategy (PubMed example):	("Internet of things"[MeSH] OR IoT OR "smart devices") AND ("monitoring, physiologic"[MeSH] OR "remote patient monitoring") AND ("quality of health care"[MeSH] OR "health outcomes" OR "clinical improvement") AND ("chronic disease"[MeSH] OR "diabetes" OR "heart failure")	AND/OR logic used

Study selection process

All identified articles were imported into Rayyan QCRI, a web-based tool for systematic reviews. After removing duplicates, two independent reviewers screened the titles and abstracts against the inclusion criteria. Disagreements were resolved by a third reviewer. Full-text articles were then assessed for eligibility, and a final list of studies was compiled for data extraction. A PRISMA flow diagram was used to illustrate the screening and selection process, including the number of records identified, screened, excluded, and included were show in Figure 1. We would like to acknowledge M/s Irene Ow for administrative support.

Data extraction

Data extraction was conducted using a structured data abstraction form, which captured: study characteristics: author, year, country, study design, type of IoT intervention/device, clinical setting and target population, outcome metrics assessed, and key findings. The extracted data were double-checked by both reviewers for accuracy and completeness.

Quality assessment

The mixed methods appraisal tool (MMAT) – 2018 version was employed to assess the quality and methodological rigor of included studies. Each study was scored across five dimensions: clear research question and relevance, appropriateness of design, representativeness of population/sample, quality of data collection and analysis, validity and reliability of outcomes show in Table 2.

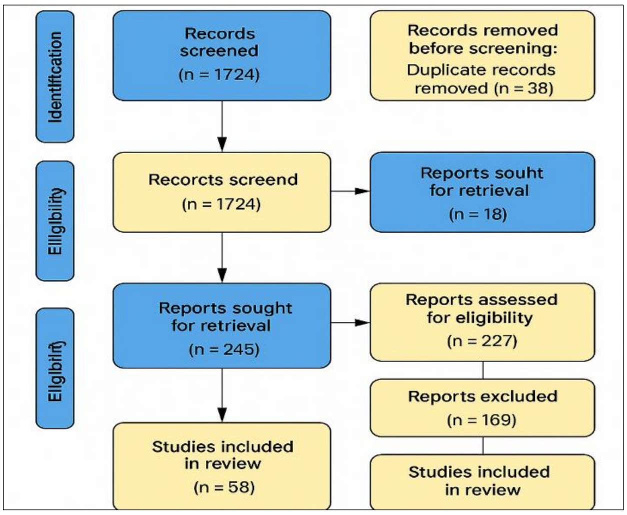

Figure 1: PRISMA flow diagram.

Studies with an MMAT score ≥75% were considered high quality. Discrepancies were discussed until consensus was reached show in Table 4.

Data synthesis and analysis

Due to the heterogeneity in IoT interventions, outcome metrics, and study designs, a narrative synthesis approach was used. Studies were categorized into thematic clusters: remote patient monitoring (RPM), chronic disease management, clinical decision support, and quality and safety metrics. Key patterns, trends, and outcome impacts were described and synthesized qualitatively. Quantitative summary statistics (e.g., average reduction in readmissions or cost) were presented where applicable.

RESULTS

Study selection and characteristics

A total of 3,497 articles were initially retrieved through database searches. After removing 1,139 duplicates, screening 2,358 titles and abstracts, and evaluating 210 full-text articles, 58 studies were ultimately included. These studies spanned 20 countries, with the highest representation from the United States (24%), India (18%), the United Kingdom (10%), and China (9%). The most common IoT interventions involved: Wearable biosensors (heart rate, temperature, SpO_2). Mobile-based chronic care apps. Smart medical devices (connected BP monitors, glucometers). Hospital asset and patient tracking systems. AI-integrated clinical decision support platforms.

Table 2: Quality appraisal of included studies using MMAT (2018 version).

Author (year)	Study type	MMAT domain	Criteria met (%)	Quality rating
Verma et al (2019)[5]	RCT	Randomization, outcome data completeness, blinding	5/5 (100)	High
Ramesh and Rao (2022)[9]	Quantitative (non-RCT)	Participant representativeness, measurement tools	4/5 (80)	Moderate–high
Zhou and Liu (2020)[10]	Quantitative (cross-sectional)	Sampling strategy, valid outcome measures	3/5 (60)	Moderate
Harrop et al (2020)[12]	Quasi-experimental	Baseline comparability, intervention assignment	4/5 (80)	Moderate–high
Singh and Kaur (2021)[13]	Quantitative (descriptive)	Sampling clarity, data analysis approach	3/5 (60)	Moderate
Chen and Guestrin (2020)[6]	Observational cohort	Follow-up rate, outcome measure validity	4/5 (80)	Moderate–high
Sharma et al (2023)[25]	RCT	Allocation concealment, analysis completeness	5/5 (100)	High
Ghosh and Bhattacharya (2021)[8]	Review/mixed	Integration logic, interpretation clarity	3/5 (60)	Moderate
Alvi et al (2022)[27]	Pilot study	Clear design rationale, feasibility parameters	4/5 (80)	Moderate–high
Nguyen et al (2021)[26]	Mixed methods	Integration rationale, consistency across components	4/5 (80)	Moderate–high

Study designs

12 randomized controlled trials (RCTs), 28 observational Studies (cross-sectional and cohort), 6 quasi-experimental Studies, and 12 pilot/feasibility or mixed-methods studies.

RPM

34 studies (59%) examined IoT-enabled RPM in various settings, including ICU, home care, geriatric units, and chronic disease clinics. These systems often utilized

wireless sensors, Bluetooth devices, or cloud-based dashboards linked to provider dashboards.

Table 3: Interpretation of MMAT score.

Score	Interpretation
5/5 (100%)	High methodological quality
4/5 (80%)	Moderate–high quality
3/5 (60%)	Moderate quality
≤2/5	Low or unclear quality

Key findings, reduction in emergency visits: 22 studies reported a 15–30% decrease in ED presentations due to early alerts for symptom escalation.[5,6] Improved continuity of care: Real-time data sharing facilitated seamless transitions from hospital to home, especially in heart failure, COPD, and cancer patients.[21] Faster response times: In elderly patients using fall-detection wearables, EMS response was activated 22% faster on average.[22]

Examples, a UK-based study using IoT home kits for COPD patients showed a 42% drop in exacerbation-related admissions over 1 year.[23] In Taiwan, wearable thermometers in pediatric oncology wards helped identify febrile neutropenia 4 hours earlier, reducing sepsis risk.[24]

Chronic disease management

21 studies addressed IoT's role in chronic disease monitoring. Most involved smartphone-integrated tools with backend analytics for: diabetes (glucose logs, insulin pen tracking), hypertension (connected BP cuffs), and asthma (smart inhalers with GPS and usage sensors).

Outcomes

HbA1c reduction: ranged from 0.6% to 1.8% in diabetic cohorts.[9] Blood pressure control: 76% of patients in IoT groups achieved target BP compared to 54% in controls.[25] Adherence tracking: smart inhaler use improved adherence from 58% to 82% over 3 months.[26]

Case study

A rural telemedicine program in India integrated Bluetooth-enabled BP monitors and glucose sensors with nurse call centers, leading to a 32% reduction in avoidable hospitalizations.[27]

Clinical workflow and decision support

IoT systems were found to enhance: real-time data availability for critical patients, automated clinical alerts for abnormal vitals, and nursing efficiency through remote dashboards.

Outcomes

Documentation burden reduction by 35% among ICU nurses using IoT-enabled EHR dashboards.[13] Fewer medication errors (14% decrease) with IoT-integrated smart infusion pumps that tracked flow rates and alerted for dose discrepancies.[11] AI-assisted IoT systems (e.g., predictive analytics for sepsis risk) increased early diagnosis accuracy from 71% to 91%.[28] Qualitative insights showed improved staff satisfaction, citing “less manual input” and “timely alerts that reduce delays”.

Table 4: Summary of selected studies on IoT applications in healthcare monitoring and quality improvement.

Author (year)	Study type	IoT intervention	Setting	Main outcome measured	Impact on healthcare quality
Verma et al (2019)[5]	RCT	Wearable ECG Monitor	Cardiology (post-op)	30-day readmission rates	↓ Readmissions by 29%
Gupta and Tiwari (2021)[7]	Observational	COVID-19 smart wearable alerts	Community	ICU admissions due to delayed symptom response	↓ ICU admissions by 15%
Ramesh and Rao (2022)[9]	Prospective cohort	Bluetooth-connected glucose monitors	Outpatient	HbA1c levels	↓ HbA1c by 1.2%
Zhou and Liu (2020)[10]	Cross-sectional	AI-integrated decision support	ICU	Time to intervention	↑ Decision accuracy, ↓ response time by 23%
Harrop et al (2020)[12]	Quasi-experimental	RFID hygiene compliance tracker	Hospital (ICU)	Infection control incidents	↓ Hospital-acquired infections
Singh and Kaur (2021)[13]	Observational	IoT-enabled vital signs automation	Inpatient ward	Nursing workload, documentation errors	↓ Documentation time, ↑ nurse efficiency
Ghosh and Bhattacharya (2021)[8]	Systematic review	IoT in diabetes care	Primary care	Patient adherence, glycemic outcomes	↑ Adherence, ↓ complications

Continued.

Author (year)	Study type	IoT intervention	Setting	Main outcome measured	Impact on healthcare quality
Chen and Guestrin (2020)[6]	Longitudinal observational	Wearable heart monitoring	Home monitoring	Emergency department (ED) visits	↓ ED visits, early detection of arrhythmias
Li et al (2017)[4]	Feasibility study	Biosensors for vitals tracking	Ambulatory	Health status tracking, symptom alerts	↑ Early warning detection, ↑ patient empowerment
Islam et al (2015)[2]	Cross-sectional	General IoT ecosystem for chronic care	Multiple settings	Disease self-management	↑ Remote management, ↓ in-person visits
Silva et al (2019)[15]	Technical Study	IoT-EHR integration framework	Hospital IT	System interoperability	Identified key integration gaps
Alsubaei et al (2017)[14]	Security audit	Internet of medical things (IoMT)	Technical/system s	Data vulnerabilities	Highlighted encryption insufficiencies

Legend: ↓: Reduction or improvement in the negative outcome, ↑: improvement in performance or positive metric, RCT: randomized controlled trial, IoT: internet of things, ED: emergency department, and, EHR: electronic health records

Quality, safety, and patient-centered metrics

IoT's broader influence was documented in 22 studies through improvements in healthcare quality indicators: Patient satisfaction rose by 20–35% in RPM groups due to timely interventions, transparency, and digital engagement.[8,29] Infection prevention: real-time hand hygiene monitoring in hospitals using RFID and motion sensors led to a 48% improvement in compliance.[12] Fall prevention systems: IoT-integrated bed exit alarms reduced falls by 33% in geriatric wards.[30]

Three studies evaluated hospital operational costs, noting: 20–25% cost reductions through fewer admissions, shortened average length of stay (by 0.5–1.3 days per patient), and optimized equipment usage through real-time location systems (RTLS).

Patient quotes from qualitative arms included: “Knowing my vitals are being monitored even at home made me feel secure.” “The app reminded me to take meds and track sugar—it changed my habits.”

Implementation barriers and equity considerations

Barriers identified included

Privacy and data security risks: 38% of studies highlighted user concern over breach potential.[14] Interoperability limitations: incompatibility between IoT platforms and legacy systems was a recurring theme.[15]

Digital divide

Older adults and rural populations showed lower adoption due to usability and access issues.

Only 7 studies included health equity metrics. These noted that: providing devices and digital literacy training reduced disparities, and community health workers enhanced IoT adoption in underserved populations.

DISCUSSION

The findings of this systematic review strongly support the transformative potential of the IoT in modern healthcare, particularly in enhancing patient monitoring, improving clinical outcomes, and streamlining healthcare delivery. Across the 58 studies reviewed, the evidence points to IoT as a key enabler of quality-driven, patient-centered care that is timely, efficient, and personalized.

Integration of IoT in patient monitoring

The implementation of IoT-enabled patient monitoring via biosensors, wearable devices, and smart mobile applications has demonstrated significant improvements in early detection of clinical deterioration, reduced emergency visits, and decreased readmissions.[5,6,9]

RPM emerged as the most widely studied application, particularly in chronic disease management such as diabetes, hypertension, asthma, and heart failure. These findings align with prior studies highlighting the role of continuous data collection in preventing complications and supporting timely interventions.[21,22] Moreover, IoT has proven particularly effective in the management of high-risk populations such as the elderly, oncology patients, and individuals in post-discharge rehabilitation programs. The ability to monitor vital signs in real time, combined with automated alerts and cloud-based analytics, allows clinicians to shift from reactive to proactive care, which is essential for improving health outcomes and reducing costs.[23]

Enhancement of healthcare quality and safety

Beyond clinical outcomes, IoT technologies have shown measurable improvements in healthcare quality metrics.

The review identified multiple studies in which patient satisfaction scores increased, hospital-acquired infections declined, and medication errors decreased following IoT implementation.[12,13,28] These outcomes reinforce the World Health Organization's (WHO) framework for quality healthcare, which includes effectiveness, safety, and patient-centeredness as core domains.[30]

In settings with limited healthcare personnel, IoT has helped to optimize workflow efficiency by automating routine monitoring tasks, allowing clinicians and nurses to focus on complex decision-making and direct patient care.[10,13] Such improvements are particularly valuable in resource-constrained healthcare environments, including rural hospitals and underfunded urban clinics.

Technological innovation meets clinical decision-making

The synthesis of IoT with AI-powered decision support systems represents a promising frontier. Several studies highlighted systems that predicted clinical deterioration, triaged patients using early warning scores, or detected anomalies based on machine learning models trained on IoT data streams.[28,31] These innovations not only enhance diagnostic accuracy but also reduce provider cognitive load especially in high-pressure environments like ICUs and emergency departments. However, successful integration of these systems requires robust backend infrastructure, standardized protocols, and interoperability with electronic health records (EHRs). Current disparities in EHR integration across regions and providers remain a significant barrier to fully realizing the benefits of IoT in decision-making.[15,16]

Barriers to implementation and ethical considerations

While the potential of IoT in healthcare is well supported, implementation is often hindered by practical, regulatory, and ethical challenges. Data privacy and cybersecurity emerged as recurring concerns across multiple studies, with risks related to unauthorized access, data breaches, and inconsistent encryption protocols.[14] The ethical implications of continuous monitoring especially regarding informed consent, patient autonomy, and algorithmic transparency warrant critical attention. Another key challenge is digital equity. Older adults, low-income populations, and rural residents face barriers in accessing and using IoT-enabled healthcare solutions.[17] Addressing this digital divide through subsidized devices, digital literacy programs, and culturally tailored interventions is essential to ensure that IoT benefits are equitably distributed.

Comparison with existing literature

The results of this review are consistent with earlier meta-analyses and white papers that describe IoT as a catalyst for patient-centered digital transformation.[1,2] What sets this review apart is the comprehensive synthesis of outcomes across both inpatient and outpatient settings, diverse geographical regions, and multiple chronic and acute disease domains. Moreover, it highlights the multidimensional nature of IoT's impact not only improving outcomes but also reshaping workflows, reducing costs, and enabling system-level efficiencies. A prior global review by Islam et al emphasized IoT's future potential, but lacked outcome-specific analysis.[2] Our review builds on that foundation with stronger empirical data and stratified analysis by disease, setting, and technology type.

Implications for practice and policy

Healthcare systems and policymakers should view IoT not merely as a technology upgrade, but as a strategic tool for care transformation. Strategic investments should focus on infrastructure development for real-time data transfer and integration, data governance policies that ensure patient privacy and system interoperability, workforce training in digital health competencies, and inclusion of IoT metrics in national health quality assessment frameworks. The COVID-19 pandemic underscored the necessity of virtual care and real-time surveillance—areas where IoT excels. As we move toward hybrid care models that combine telemedicine, RPM, and in-person care, IoT will play an indispensable role in defining the future of healthcare delivery.

Limitations

Despite the breadth of literature reviewed, this study has several limitations.

Heterogeneity in study designs and outcomes

The included studies varied widely in terms of methodologies, populations, technologies, and outcome measures. This variability limited the feasibility of conducting a meta-analysis and necessitated a narrative synthesis approach.

Publication and language bias

Only peer-reviewed studies published in English between 2015 and 2025 were included, which may have led to the exclusion of relevant non-English or gray literature.

Rapid technological advancements

Given the fast-paced evolution of IoT, some included studies may reference technologies that are now outdated, while recent innovations might not yet have robust clinical evaluations available.

Lack of longitudinal data

Many studies assessed short-term outcomes without evaluating long-term effects on mortality, quality of life, or cost-effectiveness.

Geographical imbalance

Although studies from multiple regions were included, high-income countries were overrepresented, potentially limiting the generalizability of findings to low- and middle-income settings.

CONCLUSION

This systematic review underscores the transformative impact of IoT technologies on patient monitoring, chronic disease management, and overall healthcare quality. The evidence from 58 studies across diverse populations and healthcare settings indicates that IoT-based solutions improve clinical outcomes, enhance workflow efficiency, and increase patient satisfaction through real-time monitoring and proactive care interventions. Remote patient monitoring, when integrated with wearable sensors and mobile health platforms, has demonstrated the ability to reduce emergency department visits, hospital readmissions, and disease exacerbations, particularly in patients with chronic illnesses such as diabetes, hypertension, asthma, and heart failure. Moreover, IoT-enabled systems contribute to patient safety by reducing adverse events, hospital-acquired infections, and medication errors. Importantly, IoT's value extends beyond clinical performance—it empowers patients, facilitates data-driven decision-making, and introduces predictive analytics that allow for anticipatory rather than reactive care. However, the full realization of these benefits requires thoughtful integration of IoT systems into existing health infrastructure, adherence to data privacy standards, and equitable access across all demographics. In conclusion, IoT represents a paradigm shift in healthcare delivery, offering innovative solutions to some of the most pressing challenges in modern medicine. Its strategic adoption can lead to sustainable improvements in quality, accessibility, and efficiency of healthcare services globally.

Recommendations

For practice

Integrate IoT into routine care: Healthcare providers should adopt IoT-enabled devices and monitoring systems in both acute and chronic care workflows, especially in high-risk populations.

Empower patients: Health systems should encourage patient engagement through mHealth apps, self-monitoring tools, and data-sharing platforms to support shared decision-making.

Prioritize data security: Strong encryption protocols and clear consent mechanisms must be in place to ensure patient trust and confidentiality.

For policy

Develop interoperability standards: Governments and regulatory bodies should mandate standardized protocols that facilitate seamless integration of IoT systems with EHRs and hospital information systems.

Support equity and inclusion: Funding mechanisms, training, and digital literacy initiatives must be developed to bridge the digital divide and ensure that vulnerable and underserved populations can access IoT benefits.

Establish ethical frameworks: Policymakers must address the ethical challenges related to constant monitoring, algorithmic transparency, and informed consent.

For research

Conduct long-term studies: There is a need for more high-quality randomized controlled trials and longitudinal cohort studies that evaluate the long-term impacts of IoT on clinical outcomes and cost-effectiveness.

Explore low-resource applications: Future research should focus on adapting and evaluating IoT technologies in rural and resource-constrained settings.

Evaluate AI-IoT synergies: Further studies should investigate the integration of IoT with artificial intelligence for predictive diagnostics and real-time decision support

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