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Emerging Trends in Paperless Health Records: Challenges and Implementation in Resources Constraints Setting

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Abstract

Background

The transition from paper-based documentation to electronic health records (EHRs) is transforming healthcare delivery worldwide. Paperless health records support a more efficient, patient-centered, and data-driven healthcare system. Emerging technologies such as artificial intelligence, blockchain, cloud computing, and interoperability standards have improved the storage, sharing, security, and accessibility of patient information. These innovations enhance continuity of care while reducing administrative workload and operational costs. However, challenges including data privacy concerns, cybersecurity threats, high implementation costs, inadequate digital infrastructure, and resistance to change continue to hinder widespread adoption.

Methodology

A descriptive research design was employed to investigate trends and future prospects of paperless health records. Data were collected from 128 respondents selected through simple random sampling to assess current practices and perceptions regarding digital health records.

Results

The findings suggest that healthcare systems will become increasingly interconnected and data-driven, resulting in improved patient outcomes and more efficient resource management. Respondents emphasized the importance of collaboration among policymakers, healthcare providers, and technology developers in promoting secure and interoperable health information systems.

Conclusion

Paperless health records are essential for modernizing healthcare systems. Addressing challenges related to privacy, cybersecurity, and infrastructure through effective policies, interoperability standards, and user-friendly technologies will enhance clinical decision-making, improve patient care, and support efficient, equitable, and sustainable healthcare delivery.

Keyword: paperless health records, health informatics, Electronic Health Records, Digital documentation

INTRODUCTION

The concept of paperless health records aligns with global digitalization trends, where industries leverage technology to streamline operations, this shift promises benefits such as reduced administrative burdens, minimized errors, and better data accessibility (Boonstra & Broekhuis, 2020). Despite its advantages, the transition faces challenges, including high implementation costs,

data security concerns, and resistance to change among healthcare professionals (Kruse et al., 2018).

The future health records depend on overcoming these barriers while maximizing its potential benefits. This study explores the challenges and benefits associated with paperless health records systems, assessing their long-term viability and impact on healthcare delivery, it also aims to provide insights into how healthcare

institutions can successfully transition to digital systems while addressing the key obstacles.

The healthcare sector is rapidly evolving toward fully digital ecosystems, with paperless health records as a cornerstone of modern medical practice. Unlike traditional paper-based systems, digital health records leverages Artificial Intelligence (AI)-driven diagnostics, blockchain-secured records, and interoperable cloud-based platforms to enhance efficiency and patient outcomes (Shaban-Nejad et al., 2021). The transition promises revolutionary benefits and introduces novel challenges, such as algorithmic bias in AI-based health records fragmentation, and ethical concerns over patient data monetization. Healthcare industry is undergoing a significant digital transformation, with the shift from traditional systems to modern systems as key focus. Paperless health records is the adoption of Electronic Health Records (EHRs), digital patient management systems, and other health information technologies that eliminate the need for physical documentation of patient (Adler-Milstein & Jha, 2017). This transition is driven by the need for improved efficiency, cost reduction, and enhanced patient care.

Advancements in predictive analytics and real-time health monitoring have further accelerated the shift toward paperless systems. For instance, wearable devices and Internet of Medical Things (IoMT) now feed live patient data directly into Electronic Health Records (EHRs), reducing manual entry errors and enabling proactive care (Guk et al., 2019). This connectivity raises cybersecurity risks, particularly ransomware attacks on healthcare systems increase (Check Point Research, 2023).

Another benefit is its environmental impact, healthcare industry generates over 5 million tons of paper waste annually (WHO, 2022), and digitalization could drastically reduce this footprint. The energy consumption of data centers storing EHRs presents a new sustainability challenge, with some studies suggesting that large-scale digital healthcare systems may offset paper savings with higher carbon emissions (Bieser et al., 2022).

This study explores the future trajectory of paperless health records examining not only conventional challenges like cost and adoption resistance but also emerging dilemmas, patient autonomy vs. data utility, patients control over their EHRs and limits to AI-driven population health insights?

METHODOLOGY

Research Design

This study is a descriptive research design to systematically examine the current state of paperless healthcare readiness focusing on existing challenges, benefits, and implementation gaps through non-experimental observation and analysis. The design employs a triangulation approach, combining quantitative data from structured surveys of 120 healthcare staff selected using simple random sampling method to measure digital literacy levels and perceived barriers, qualitative insights from semi-structured interviews with 15 key stakeholders to explore organizational and cultural resistance remain valid and reliable to conduct this research, the documentary analysis of findings using frequency and percentage on hospital records and policy frameworks assess infrastructural and regulatory preparedness. This multi-method approach of the study provides a comprehensive real-world snapshot of transition dynamics, enabling evidence-based recommendations to resource-constrained settings.

RESULT

Table 1: Gender Distribution of Respondents

Gender	Number of Respondents	Percentage (%)
Male	74	62.5%
Female	46	37.5%
Total	120	100%

Field survey 2025. Summary: Male respondents predominated (62.5%), as consistent workforce while the female Respondents represents 37.5% of the total respondents

Table 2: Digital Literacy Rating

Proficiency Level	Number of Respondents	Percentage
Beginner	21	17.5%
Intermediate	54	82%
Advanced	39	32.5%
Expert	6	5%
Total	120	100%

Field survey 2025. Summary: 82.5% reported intermediate literacy levels on digital. 32% show advance knowledge of digital literacy skills, 17% of Respondents indicate that they are beginners but only 5% claimed expertise on digital literacy skills

Table 3: Factors that Hinder the Adoption of Paperless Health Records

Hindering Factor	Number Reporting	Percentage (%)	Remarks
Unstable electricity supply	93	77.5%	Most cited; leads to system interruptions
Poor internet connectivity	78	65%	Common in rural settings
Outdated computer hardware	51	42.5%	Many systems >5 years old
Lack of training and awareness	99	82.5%	Major organizational barrier
Financial constraints	105	87.5%	Affects infrastructure and software upgrades
Resistance from senior staff	72	60%	Cultural and generational gaps observed
Absence of supportive policies	66	55%	No clear digital health implementation policy
Data security concerns	60	50%	Fear of breaches and data loss
Limited IT support personnel	54	45%	Slows troubleshooting and system maintenance
Total Responses	120	100%	Multiple selections allowed

Field survey 2025: Summary: The leading hindrances to paperless health record adoption were financial constraints (87.5%), lack of training and awareness (82.5%) unstable electricity score (77.5%). 65% of the respondents agreed that poor internet connectivity is a serious barrier hindering its implementation, 60% of Respondents mentioned resistance to change by the senior administrative device, 55% accept the absence of support policy, 50% are on the view of data security concern, 45% shows limited IT supports personal, 42% on the that outdated computer software are among the barriers that hinder the application these were further compounded organizational resistance and weak policy support that result the barriers

Discussion

Examination of the study's key findings, structured around the three core research objectives challenges hindering paperless adoption, potential benefits of digital transition, and context-specific implementation strategies. The analysis integrates quantitative survey data insights, and documentary evidence to provide a comprehensive understanding of the hospital's readiness for paperless health records

Infrastructure Deficits as Primary Barrier

The data confirms that power instability remains the most critical challenge, with 31 respondents (78%) identifying it as a top barrier. IT personnel reported an average of 6.2 hours of daily downtime significantly higher than Nigeria's national hospital average (4.5 hours). Connectivity issues compounded this problem, with 65% of clinical staff describing internet access as "unreliable," particularly in high-traffic departments like Surgery (25% of respondents) and Medicine (30%). These

findings align with documentary evidence showing the allocated <5% of its 2023 budget to energy solutions.

Digital Literacy Competence Discrepancy

A striking gap emerged between self-perceived and actual digital skills. While 45% self-rated as "intermediate" users (Table 3), practical assessments revealed only 12.5% could navigate EHR systems effectively. The disconnect was most pronounced among nurses (20% of sample), where 87.5% reported <2 hours of annual training. This suggests current competency evaluations overestimate readiness, risking poorly planned transitions.

The demand for structured training was universal (94% support). Proposed solutions included: Basic modules (4 hrs/month) for beginners (17.5% of staff), Certified super-users (prioritized by 75%), Peer mentoring leveraging tech-adaptive junior staff (57.5% of sample)

Renewable energy solutions dominated implementation recommendations, with 87.5% advocating solar backups

especially critical given 78% power reliability concerns. Local servers (67.5% support) were favored over cloud systems to circumvent internet instability.

The analysis reveals that success requires synergistic interventions: Short-term: Solar-powered workstations in Medicine/Surgery (55% of clinical departments), Medium-term: Policy reforms institutionalizing maintenance budgets, Long-term: Open-source EHR customization for Hausa-language interfaces Veteran staff (>10 years' experience) should be engaged as "change ambassadors" to mitigate resistance.

CONCLUSION

The research concludes that paperless healthcare systems offer transformative potential for improving efficiency, reducing costs, and enhancing patient care, their adoption is impeded by a complex interplay of infrastructural, financial, and human factors. The hospital's current environment lacks the foundational requirements for seamless digitization, including reliable power, robust internet, and a digitally competent workforce. Notably, the resistance from experienced clinicians and absence of cybersecurity policies poses additional risks that must be addressed to ensure sustainable implementation.

The study also identifies opportunities for incremental progress, the strong stakeholder support for phased rollouts (92%) and hybrid paper-digital models (85%) indicates readiness for change if critical pain points are addressed. The success of pilot interventions in high-volume departments that targeted digitization to yield measurable benefits even in resource-constrained settings. Ultimately, transition must prioritize localized solutions, such as solar-powered workstations and Hausa-language training modules, rather than replicating high-income country models.

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