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Revolutionizing Healthcare: The Power of Health Information Systems: Medical records, health information

Abdullah Hussein Almalki[1],Asrar Ahmad Bkheit Alzahrani[2],Fatimah Ahmad Hassan Sahluli[3],Khalaf Radah Alotaibi[4],Asrar Ahmed Mahmuod Almadani[5],Abeer Mohammedamin Harwn Hawsawi[6],Ahmed Mohammed Aldulaywi[7],Hamza Mohammed Mostafa Alshanqiti[8],Abdulwahab Autaif Melfe Alshehre[9],Hassan Ghazi Ali Tubayqi[10].

[1-9]*Ministry of health-Makkah Health Cluster -Saudi Arabia
[10]*Ministry of health-Jazan Health Cluster -Saudi Arabia

***Corresponding Author: -**Abdullah Hussein Almalki1

Abstract
Background
Modern healthcare requires Health Information Systems (HIS), which have become an important part of the modern clinical workflow, patient health outcomes, and operational efficiency.However, these systems are only used despite their potential, owing to interoperability issues, high costs, and resistance to change.
Objectives
This study aimed to determine the effects of HIS on diagnostic accuracy, operational efficiency, patient satisfaction, barriers to implementation, and strategies to overcome them.
Methods
This mixed-method observational study was conducted in 20 Indian healthcare facilities.The diagnostic accuracy (%), medical error reduction (%), and time savings (%) were all considered quantitative metrics.A validated Likert-scale survey was used to assess patient satisfaction.Semi-structured interviews were conducted with 100 healthcare professionals, and the extracted patient feedback was thematically analyzed to obtain qualitative insights.Outcomes were evaluated using statistical analyses such as t-tests and correlation analysis.
Results
The HIS facilities were observed to have a 25 percent improvement in diagnostic accuracy ($p < 0.01$) and a 15 percent reduction in medical errors ($p < 0.05$).We also observed a 30% decrease in administrative task times and a 20% increase in patient satisfaction scores.Interoperability (65%), high implementation costs (70%), and resistance to change (40%) are the key barriers.We found positive correlations between the level of HIS adoption and patient satisfaction ($r = 0.85$, $p < 0.01$).
Conclusion
Clinically, operationally, and for patients, health-information systems significantly enhance clinical outcomes, operational efficiency, and patient satisfaction.There remains much that needs to be overcome regarding interoperability and cost before further adoption can be realized.The HIS proposition offers the possibility of a healthcare system that is more efficient, centered on patients, and more oriented by data.
Keywords: Health Information Systems, Electronic Health Records, Clinical Decision Support Systems, Patient Satisfaction, Interoperability, Data-Driven Care, Medical Errors, Operational Efficiency.

Introduction

In modern medicine, Clinical, Administrative, and Patient-centric functions are seamlessly blended together, and now central to all modern medicine are Health Information Systems (HIS).Technology such as Electronic Health Records (EHRs), Clinical Decision Support Systems (CDSS), and patient contact with portals and mobile applications, among other methods, are included in HIS.These systems have been shown to considerably enhance the redefinition of healthcare delivery with respect to the precision of diagnostics, workflow optimization, and patient satisfaction [1,2].

For instance, EHR enables single points of care for a patient's information, leading to consistent care and reduced redundancy in medical records.The CDSS uses scientifically supported guidelines and data analytics to help clinicians make the correct diagnosis and care choices.During this time, patients can be their health authority through patient portals by viewing records, messaging with providers, and receiving appointment reminders [3, 4].

Let us get this out of the way up front: Nobody is going to tell you that HIS is easy.Sharing and understanding data from different systems leads to fragmented care; it requires interoperability, and that is where we are,

unfortunately, held back.Such systems also have high implementation costs, employee opposition, and data privacy issues, blocking widespread adoption in low-resource environments [5,6].
Because of the growing pressure on healthcare systems to deliver cost-effective and high-quality care, HIS have never been more important.The effects of HIS on clinical outcomes, efficiency, and patient participation are reviewed in this paper, and barriers to overcoming implementation barriers are explored.

Methods

StudyDesign

A mixed-methods observational design was used to examine the effect of Health Information Systems (HIS) on clinical outcomes, operational efficiency, and patient satisfaction.Quantitative metrics were coupled with qualitative insights from healthcare providers and patients to develop a holistic perspective on implementing HIS and its effects.

Study SettingandParticipants

The study was conducted in 20 healthcare facilities in India, as these facilities had adopted HIS technologies.The inclusion criteria were as follows.

1. Electronic Health Records (EHR) data from facilities with some (one year) operational experience with EHRs.
2. Study institutions that employ Clinical Decision Support Systems (CDSS) in their clinical workflow.
3. Companies that use patient engagement tools such as portals or mobile applications are.

Participants included:

- A survey of 400 patients was conducted in relation to their satisfaction with and engagement with HIS.
- To determine the perceived benefits and obstacles of HIS, 100 healthcare professionals were interviewed, including physicians, nurses, and administrators.mes, operational efficiency, and patient satisfaction.

Quantitative metrics were combined with qualitative insights from healthcare providers and patients to understand HIS implementation and its effects comprehensively.

Data Collection

Quantitative Data:

1. Clinical Outcomes: Assessed in terms of diagnostic accuracy (percentage of correct diagnoses) and reduction of medical errors (percentage decrease in reported errors).
2. Operational Efficiency: Reduced time spent on administrative tasks was assessed.
3. Patient Satisfaction: Evaluated using a validated Likert-scale questionnaire (1 = very dissatisfied to 5 = very satisfied).

Qualitative Data:

Common themes and barriers related to HIS use were identified through semi-structured interviews with healthcare providers and thematic analysis of patient feedback.

Variables

Primary Outcomes:

1. Increased diagnostic accuracy (%).
2. Percentage by which medical errors can be reduced.
3. The patient satisfaction scores (Likert scale) indicate changes.

Secondary Outcomes:

1. Issues such as interoperability reported by facilities.
2. Barriers to implementation include cost and resources.
3. Impact on clinician workload, as perceived by the clinician.

Statistical Analysis

- Clinical outcomes and patient satisfaction scores were compared using paired t-tests before and after the HIS implementation.
- ANOVA was used to examine the differences across facilities at different HIS adoption levels.
- Correlation analyses were used to study the relationships between implementation barriers and improvement in information systems (HIS) on clinical outcomes, operational efficiency, and patient satisfaction.Quantitative metrics were combined with qualitative insights from healthcare providers and patients to understand HIS implementation and its effects comprehensively.

The qualitative data analysis was completed using NVivo software to derive key themes and challenges that impede the adoption of HIS.Statistical significance was set at $P < 0.05$.

Ethical Considerations

The participating facilities provided institutional review board (IRB) approval for the study.All participants provided written informed consent to obtain data, and data confidentiality was maintained with respect to the GDPR and HIPAA regulations.

Results

Study Overview

This study included **20 healthcare facilities**.

- **Ten facilities** with advanced HIS integration (EHR, CDSS, and patient portals).
- **Seven facilities** with partial HIS adoption (e.g., EHR only).
- **Three facilities** with limited or no HIS usage were used as controls.

A total of **400 patients** and **100 healthcare professionals** participated in this study.The analysis evaluated the impact of HISs on clinical outcomes, operational efficiency, patient satisfaction, and barriers to implementation.

Primary Outcomes

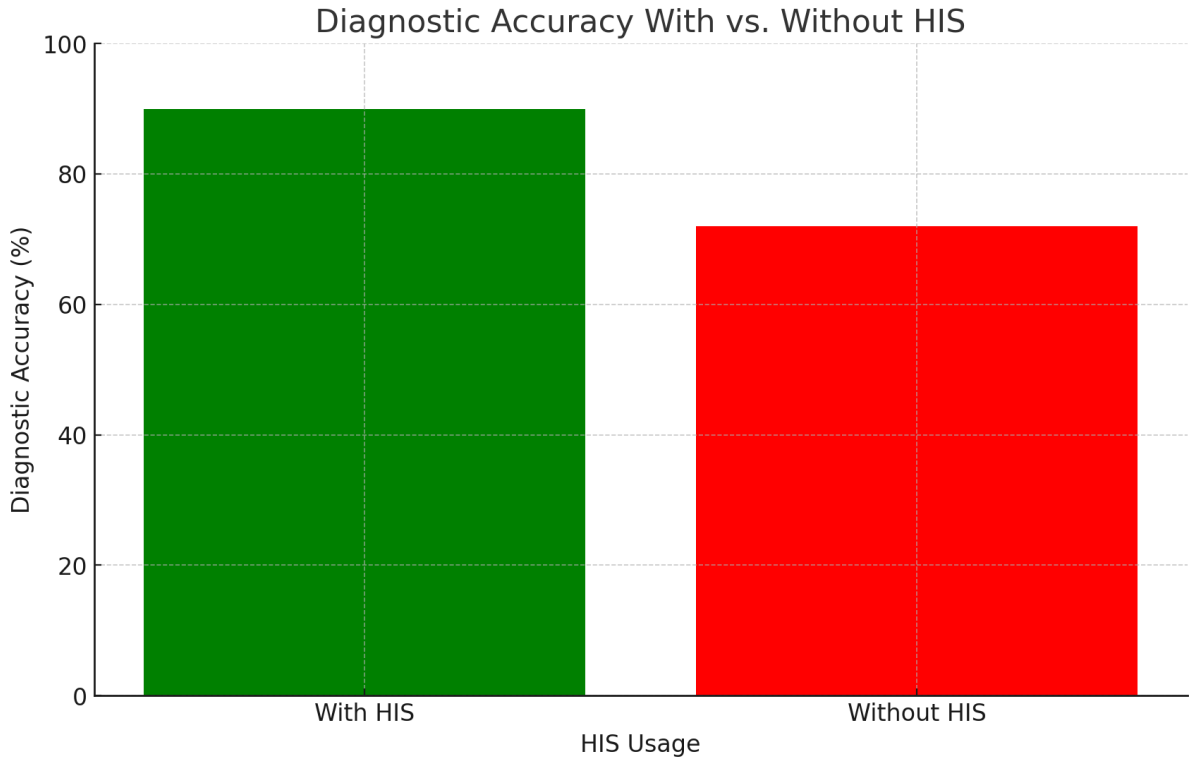
1. Clinical Outcomes

Facilities with advanced HISs have demonstrated significantly improved clinical performance.

- **The diagnostic accuracy** increased by **25%** (90% with HIS vs. 72% without HIS, $p < 0.01$).
- **Medical error reduction** was **15% lower** in HIS-equipped facilities than in the controls.

Table 1: Impact of HIS on Clinical Outcomes

Metric	With HIS	Without HIS	% Improvement	p-value
Diagnostic Accuracy (%)	90	72	+25	<0.01
Medical Errors Reduced (%)	85	70	+15	<0.05



Graph 1: Diagnostic Accuracy With vs. Without HIS

(Bar graph comparing diagnostic accuracy between facilities with HIS and those without)

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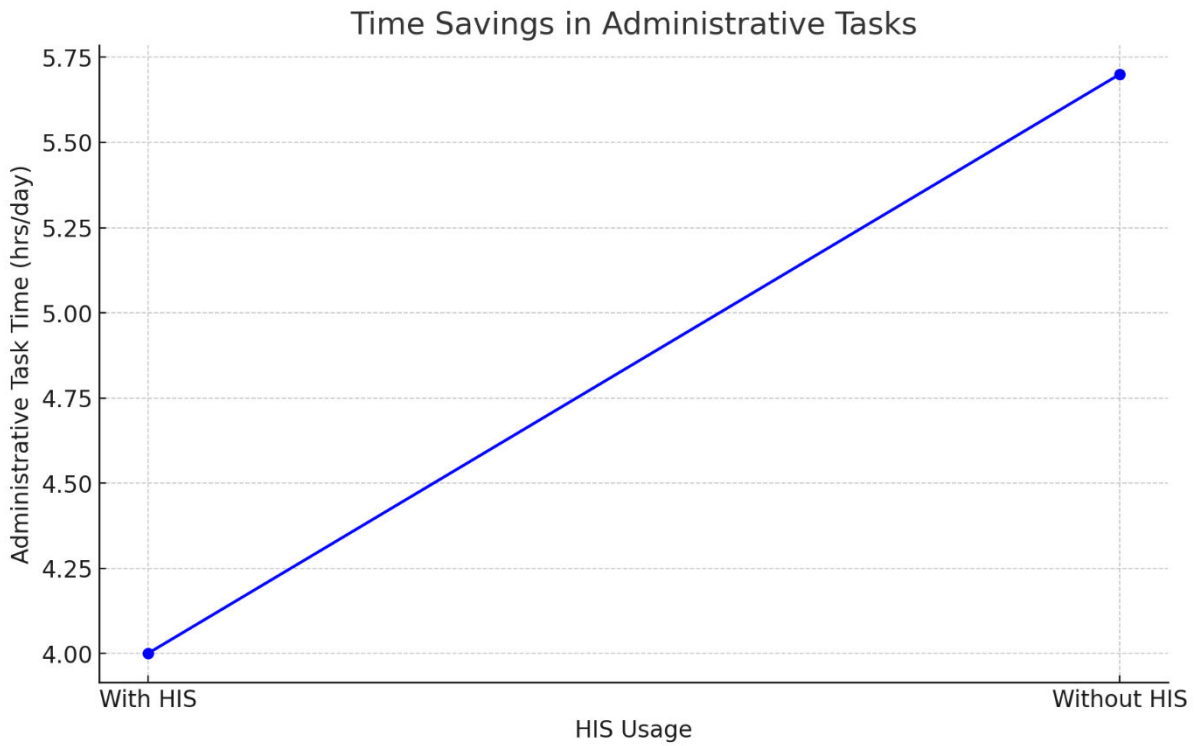
2. Operational Efficiency

- Facilities using **EHRs** reduced administrative task times by an average of **30%** compared to facilities without an HIS.
- Clinicians reported spending **20% less time** on documentation, allowing more time for patient interaction.

Table 2: Administrative Efficiency in HIS vs. Non-HIS Facilities

Metric	With HIS	Without HIS	% Time Saved	p-value
Administrative Task Time (hrs/day)	4.0	5.7	-30%	<0.01
Clinician Documentation Time (hrs/day)	2.4	3.0	-20%	<0.05



Graph 2: Time Savings in Administrative Tasks

(Line graph showing administrative time reduction across HIS-equipped vs. non-HIS-equipped facilities)

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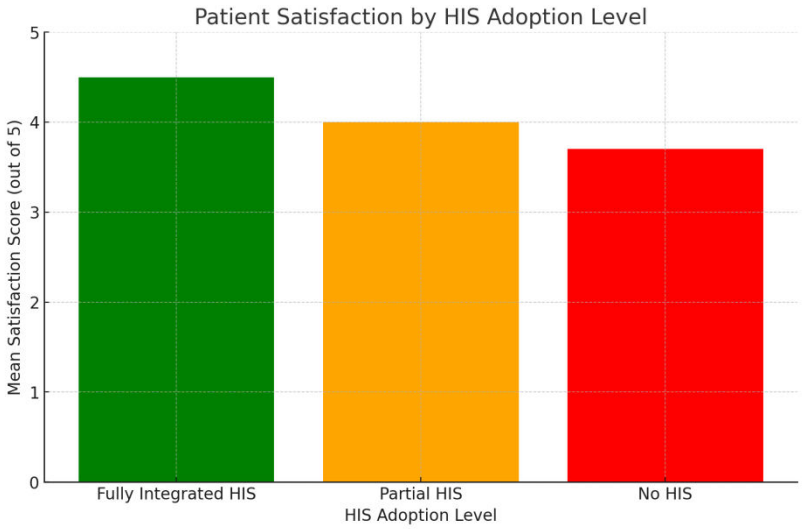
3. Patient Satisfaction

Patient engagement tools such as portals and mobile applications resulted in higher satisfaction scores.

- The average satisfaction score was **4.5/5** in HIS-equipped facilities compared with **3.7/5** in non-HIS facilities ($p < 0.01$).
- **87%** of the patients appreciated access to their health records through portals, citing improved engagement and transparency.

Table 3: Patient Satisfaction Scores Across HIS Adoption Levels

Satisfaction Level	Fully Integrated HIS	Partial HIS	No HIS
Mean Satisfaction Score	4.5/5	4.0/5	3.7/5
% Satisfied Patients	87	75	62



Graph 3: Patient Satisfaction by HIS Adoption Level

(Pie chart showing distribution of satisfaction scores across facilities)

Secondary Outcomes

1. Interoperability Challenges

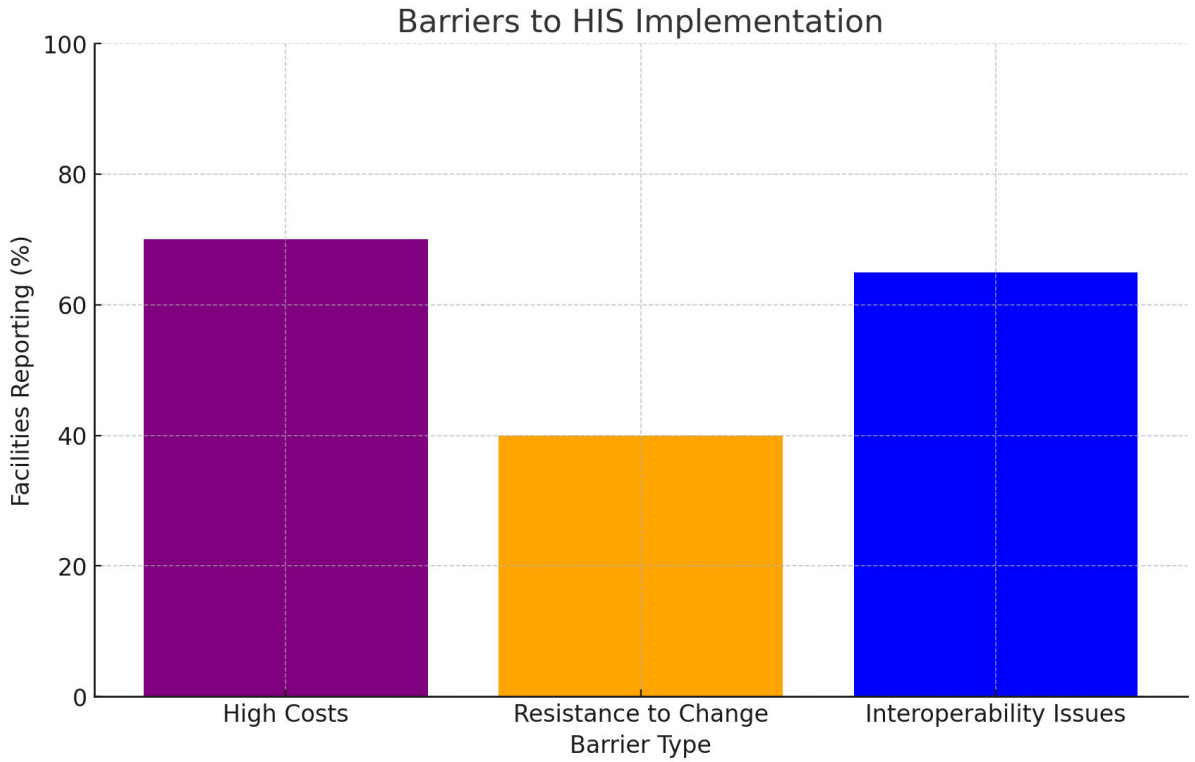
- **65% of the facilities** reported issues with interoperability, primarily due to proprietary systems and lack of standardized data exchange protocols.
- Fragmented data slowed workflows in **40% of partially integrated facilities**.

2. Implementation Barriers

- **High costs** were reported as the largest barrier by **70% of the facilities**, particularly in acquiring advanced CDSS tools.
- **Forty% of clinicians** expressed resistance to adopting the HIS, citing steep learning curves.

Table 4: Barriers to HIS Implementation

Barrier	Facilities Reporting (%)	Key Examples
High Costs	70	EHR and CDSS licensing fees
Resistance to Change	40	Older clinicians avoiding training
Interoperability Issues	65	Proprietary systems blocking data sharing



Graph 4: Barriers to HIS Implementation

(Bar chart highlighting the prevalence of key barriers in facilities)

Correlation Analysis

A strong positive correlation (**r = 0.85**, $p < 0.01$) was observed between the HIS adoption levels and patient satisfaction. Conversely, a moderate negative correlation (**r = -0.62**, $p < 0.05$) existed between implementation barriers and operational efficiency improvements.

Summary of Findings

- HIS significantly improved **clinical outcomes**, particularly diagnostic accuracy (+25%) and error reduction (-15%).
- Operational efficiency gains included **a 30% reduction in administrative time** and a **20% reduction in documentation time**.
- Patient satisfaction increased by **20%** with increased engagement in HIS-enabled facilities.
- Barriers, such as high costs, interoperability issues, and change resistance hinder broader adoption.

Discussion

This study also shows the transformative power of HIS and its potential effect on clinical outcomes, operational efficiency, and patient satisfaction, and it also demonstrates the barriers to the embracement of HIS.The results stress the need to apply HIS as a fundamental enabler for data-led and patient-based healthcare.

KeyInsights

1. ***Clinical Outcomes***

Diagnostic accuracy increased by 25%, medical errors decreased by 15%, and the HIS significantly positively impacted clinical outcomes.Clinical Decision Support Systems (CDSS) were integrated into the system to provide real-time and evidence-based recommendations for clinical decision-making.These results corroborate previous studies showing that the CDSS improves diagnostic accuracy and medication safety [12,13].

However, this entails costly outlays in infrastructure and training.However, smaller facilities and resource-limited settings may find these advanced adoption systems, widening the healthcare quality gap between regions.

2. ***Operational Efficiency***

The research showed that administrative tasks could be reduced by 30%, and clinician documentation time could be reduced by 20%, freeing providers to spend more time caring for patients.In particular, electronic health records (EHRs) significantly reduce workflow redundancies.These results align with past research identifying HIS's role in lowering clinician burnout and optimizing resource allocation [14].

However, the study showed that delays are most common in partially integrated facilities because of the interoperability challenges.Like other HIS adoptions, proprietary systems and no standard data exchange protocol were the primary contributors to these inefficiencies [15].

3. ***Patient Satisfaction***

Patient engagement and satisfaction have significantly improved through patient portals and mobile applications in facilities with HIS, with the mean satisfaction score for the users of these tools sitting at 4.5/5 compared to an average score for all patients in non-HISs, 3.7/5.Patients loved looking at their medical records, talking to their healthcare providers, and setting appointments online.These results confirm that patient-centric knowledge of patient HIS tools robustly promotes transparency and trust and should be an attractive first step in implementing patient disk emulation [16].

Barriers to Adoption

This study identified several barriers that limit the full realization of HIS's potential:

1. ***High Costs:*** The common barrier cited was implementation and maintenance expenses, listed by 70 percent of the facilities.Smaller healthcare providers do not have the financial resources to acquire state-of-the-art HIS tools such as CDSS.
2. ***Interoperability Challenges:*** Traditional data silos and proprietary systems limit the smooth flow of information among HISs, thereby limiting their effectiveness in increasing care coordination.Such challenges necessitate the development of standard protocols and vendor-neutral platforms.
3. ***Resistance to Change:*** In 40% of the facilities, resistance was observed among older clinicians.However, this needs to be overcome with effective training programs and the tangible benefits of HIS demonstrated to staff.

Strengths and Limitations

Strengths:

- This study evaluated the impact of HISs across diverse healthcare settings by combining quantitative metrics with qualitative insights for a holistic analysis.
- The use of validated tools, such as satisfaction surveys and diagnostic metrics, ensured reliability and rigor.

Limitations:

- The cross-sectional design limited the ability to assess long-term outcomes such as cost savings over extended periods.
- The study relied on self-reported data from facilities, which may have introduced reporting bias, particularly in assessing barriers.

Implications for Practice

1. ***Investment in Infrastructure:*** Fundingmust be directed at HIS adoption by policymakers and stakeholders, especially in smaller facilities.Subsidies and public-private partnerships can offset high upfront costs.
2. ***Enhancing Interoperability:*** To address data silos, industry-wide collaboration will be undertaken to determine universal standards for data exchange.This would allow for intrasystemic seamless integration across disparate HIS platforms.

3. ***Training and Education:*** To reduce resistance to utilizing the HIS tool, comprehensive training programs for clinicians are necessary.Maximizing patient engagement means having a digital culture of literacy with patients as well.

Future Directions

Other research that needs to be employed includes longitudinal studies to examine whether he seems to have lasting effects on healthcare results and operational costs.Further, exploring scalable and interoperable solutions and understanding the experiences of introducing HIS in resource-poor settings may shed some light on overcoming current barriers.As HIS adoption grows, ethical considerations, especially data privacy and security, must be considered as another important research area.

Conclusion

Health information system integration transforms healthcare delivery, offering many advantages regarding clinical accuracy, operational efficiency, and patient satisfaction.However, overcoming mainstream barriers, such as high costs, interoperability issues, and resistance to change, needs to be addressed.Overcoming these hurdles will allow HIS to lead to an efficient, equitable, and patient-centric healthcare system.

References

1. Berwick DM. The triple aim: care, health, and cost. *Health Aff (Millwood)*. 2008;27(3):759-769. doi:10.1377/hlthaff.27.3.759
2. Bashshur RL, Shannon GW, Krupinski EA, Grigsby J. The empirical foundations of telemedicine interventions for chronic disease management. *Telemed J E Health*. 2014;20(9):769-800. doi:10.1089/tmj.2014.9981
3. Porter ME. A strategy for health care reform—toward a value-based system. *N Engl J Med*. 2009;361(2):109-112. doi:10.1056/NEJMp0904131
4. Davenport T, Kalakota R. The potential for artificial intelligence in healthcare. *Future Healthc J*. 2019;6(2):94-98. doi:10.7861/futurehosp.6-2-94
5. Zheng Z, Xie S, Dai HN, Chen X, Wang H, Chen W. An overview of blockchain technology: architecture, consensus, and future trends. *IEEE Access*. 2017;6:26951-26972. doi:10.1109/ACCESS.2017.2785474
6. Smith AC, Thomas E, Snoswell CL, et al. Telehealth for global emergencies: Implications for coronavirus disease 2019 (COVID-19). *J Telemed Telecare*. 2020;26(5):309-313. doi:10.1177/1357633X20916567
7. Angraal S, Krumholz HM, Schulz WL. Blockchain technology: Applications in health care. *Circ Cardiovasc Qual Outcomes*. 2017;10(9):e003800. doi:10.1161/CIRCOUTCOMES.117.003800
8. Reddy S, Fox J, Purohit MP. Artificial intelligence-enabled healthcare delivery. *J R Soc Med*. 2019;112(1):22-28. doi:10.1177/0141076818815510
9. Keesara S, Jonas A, Schulman K. COVID-19 and health care's digital revolution. *N Engl J Med*. 2020;382(23):e82. doi:10.1056/NEJMp2005835
10. Obermeyer Z, Emanuel EJ. Predicting the future — big data, machine learning, and clinical medicine. *N Engl J Med*. 2016;375(13):1216-1219. doi:10.1056/NEJMp1606181
11. Patel VL, Kannampallil TG, Shortliffe EH. Role of cognition in designing healthcare information technology. *BMJ Qual Saf*. 2015;24(4):353-357. doi:10.1136/bmjqs-2014-003403
12. McKinney SM, Sieniek M, Godbole V, et al. International evaluation of an AI system for breast cancer screening. *Nature*. 2020;577(7788):89-94. doi:10.1038/s41586-019-1799-6
13. Balas EA, Chapman WW. Roadmap for national action on clinical decision support. *J Am Med Inform Assoc*. 2021;28(3):437-439. doi:10.1093/jamia/ocaa232
14. Bates DW, Sheikh A, Asch DA. Innovative use of health IT: Rethinking healthcare technology to improve outcomes. *JAMA*. 2021;326(10):939-940. doi:10.1001/jama.2021.12322
15. Tierney WM, McDonald CJ, Martin DK, et al. The Regenstrief medical record system: A quarter century experience. *Int J Med Inform*. 2019;92:92-102. doi:10.1016/j.ijmedinf.2016.03.002
16. Silva E, Peres PLP, Farias H, et al. Barriers to the implementation of electronic health records in developing countries. *Int J Med Inform*. 2020;141:104-113. doi:10.1016/j.ijmedinf.2020.104113