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Artificial Intelligence and Automation in Hospital Administrative Systems: A Scoping Review

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ABSTRACT
Background: Hospital administrative processes including billing, scheduling, and medical records management—are critical to health system performance but are often characterized by inefficiencies, high operational costs, and workforce burden. Artificial intelligence (AI) and automation technologies, including robotic process automation (RPA) and natural language processing (NLP), have emerged as potential solutions to streamline these processes and enhance productivity.
Objective: This scoping review aimed to synthesize existing evidence on the use of AI and automation in hospital administrative functions, focusing on efficiency gains, cost savings, implementation barriers, and ethical and regulatory considerations.
Methods: A scoping search of peer-reviewed literature was conducted across major electronic databases including PubMed, Scopus, Web of Science, and Google Scholar. Studies published between 2015 and 2025 that examined AI-based or automation-driven interventions in hospital administrative settings were included. Eligible studies addressed applications in billing, scheduling, records management, hospital information systems, or workflow optimization. Data was extracted and synthesized narratively due to heterogeneity in study designs and outcome measures.
Results: The review identified substantial evidence that AI and automation improve administrative efficiency through reduction of processing time, minimization of manual errors, and optimization of resource allocation. RPA demonstrated significant benefits in billing and claims processing, while NLP enhanced documentation accuracy and records retrieval. Several studies reported measurable cost savings and productivity improvements following implementation. However, common barriers included integration challenges with legacy systems, limited interoperability, data quality concerns, staff resistance, insufficient training, high upfront costs, and uncertain short-term return on investment. Regulatory and governance challenges, particularly data protection compliance and algorithm transparency were also frequently highlighted.
Conclusion: AI and automation technologies show considerable promise in transforming hospital administrative processes by improving efficiency and reducing operational costs. Nevertheless, successful implementation requires strong governance frameworks, workforce capacity building, financial planning, and ethical oversight. Future research should focus on longitudinal cost-effectiveness evaluations and context-specific implementation strategies, particularly in resource-limited health systems.

KEYWORDS: Artificial intelligence, Billing systems, Cost savings, Digital health governance, Efficiency, Hospital administration, Health information systems, Natural language processing, Robotic process automation.

INTRODUCTION

Hospitals are complex organizations that depend not only on clinical excellence but also on efficient administrative systems to ensure quality care, financial sustainability, and regulatory compliance. Administrative processes—including billing, revenue cycle management, appointment scheduling, records management, and resource allocation—constitute a substantial portion of hospital operations and expenditures. In many healthcare systems, administrative costs account for a significant share of total hospital spending, highlighting the need for process optimization and efficiency improvement (1). Increasing patient volumes, workforce shortages, and growing regulatory demands have further intensified pressure on hospital administrative systems.

Artificial Intelligence (AI) has emerged as a transformative technology within healthcare. While early applications primarily focused on clinical decision support, diagnostic imaging, and predictive analytics, AI is increasingly being integrated into non-clinical and administrative domains (2). AI encompasses a range of technologies, including machine learning (ML), deep learning, and natural language processing (NLP), which enable systems to analyze large datasets, identify patterns, and support decision-making

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processes (2,3). In hospital administration, these technologies are being used to automate repetitive tasks, enhance workflow efficiency, and improve accuracy in data management.

Robotic Process Automation (RPA) represents another important innovation in hospital administration. RPA refers to software-based automation tools that mimic human actions in rule-based, repetitive tasks such as claims submission, billing verification, appointment confirmations, and data entry (4). Evidence suggests that RPA can significantly reduce processing times and administrative errors while improving revenue cycle performance (4,5). Similarly, NLP technologies are increasingly used to extract structured information from unstructured clinical documentation, facilitating automated reporting, coding assistance, and compliance monitoring (3,6).

AI-driven scheduling systems have also demonstrated promise in optimizing appointment allocation and resource utilization. Predictive analytics models can identify patients at high risk of missing appointments, forecast bed occupancy, and improve operating room scheduling efficiency (2,7). These applications contribute to reduced waiting times, improved patient flow, and better utilization of hospital resources. Furthermore, AI-enabled revenue cycle management systems have been associated with improved claim acceptance rates and reduced denial rates, thereby enhancing financial performance (5).

Despite these potential benefits, implementation of AI and automation in hospital administrative processes presents several challenges. Technical barriers such as interoperability limitations, integration with legacy systems, and data quality concerns can impede effectiveness (2). Organizational resistance, workforce adaptation issues, and training requirements may further complicate adoption (3). Ethical and legal considerations including data privacy, algorithmic bias, transparency, and accountability, have also been highlighted in literature as critical governance issues (8). Ensuring compliance with data protection regulations and maintaining trust in AI-driven systems are essential for sustainable integration.

Although individual studies and narrative reviews have examined AI applications in healthcare, much of the existing literature emphasizes clinical uses rather than administrative processes. A structured synthesis focusing specifically on hospital administrative domains—such as billing, scheduling, records management, and workflow automation—is needed to consolidate evidence regarding efficiency gains, cost savings, and implementation challenges. Therefore, this scoping review aims to examine the use of AI and automation in hospital administrative processes, evaluate their impact on operational and financial outcomes, and identify barriers and ethical considerations associated with their adoption. By synthesizing current evidence, this review seeks to inform hospital leaders, policymakers, and researchers regarding the opportunities and governance requirements associated with AI-driven administrative transformation.

Justification for the Sri Lankan Context

Sri Lanka's healthcare system provides universal access to care through a predominantly tax-funded public sector, which delivers most inpatient services nationwide (9). Despite strong health indicators compared to many countries in the region, the system faces increasing operational pressures due to rising non-communicable diseases, population ageing, workforce constraints, and financial limitations (10). These pressures have amplified inefficiencies in hospital administrative processes, particularly in tertiary and high-volume secondary care institutions.

Administrative functions such as patient registration, medical record retrieval, referral coordination, internal transfers, inventory management, and reporting remain partially paper-based or supported by fragmented digital systems in many public hospitals (11). This fragmentation leads to duplication of data entry, delays in information retrieval, limited interoperability between institutions, and increased administrative workload for healthcare staff. Studies evaluating hospital information systems (HIS) implementation in Sri Lanka have highlighted gaps in integration, real-time data exchange, and standardized digital workflows (12).

The Ministry of Health has recognized digital transformation as a strategic priority through the National Digital Health Strategic Framework 2021–2025, which emphasizes strengthening health information systems, promoting interoperability, and modernizing hospital administrative workflows through digital innovation and integrating laboratory system and pharmacy with patient care which exist only in few hospitals and all most all national programs (13). The framework outlines the need for integrated electronic medical records (EMRs), standardized data governance structures, and improved use of digital tools to enhance efficiency and accountability within the health sector. However, while digitization efforts are ongoing, many administrative processes still rely on manual or semi-digital approaches that limit efficiency gains and scalability (12,13).

In high-volume tertiary hospitals in Sri Lanka, overcrowding and long waiting times remain persistent challenges (14). Administrative inefficiencies particularly in appointment scheduling, patient flow management, and records retrieval contribute to

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these delays. Studies evaluating patient flow and service utilization in Sri Lankan public hospitals have identified bottlenecks in registration, documentation, and internal coordination as key operational constraints (15). Automation technologies such as AI-based scheduling systems and predictive analytics could support improved patient flow forecasting, optimize clinic appointments and surgical appointments allocation, and enhance bed management efficiency.

Although public hospitals in Sri Lanka provide services free at the point of delivery, administrative inefficiencies still generate indirect economic burdens through staff overtime, duplication of work, resource wastage, and delays in service delivery and quality (10,14). Robotic Process Automation (RPA) and machine learning assisted coding systems could reduce claim denials, improve documentation accuracy, and enhance financial sustainability in these settings. (16).

The COVID-19 pandemic further exposed the importance of resilient administrative systems capable of rapid adaptation (17). During pandemic response activities, health facilities were required to manage appointment rescheduling, bed capacity monitoring, laboratory reporting, and data submission under significant pressure. Evaluations of Sri Lanka's health system response have emphasized the importance of digital tools and centralized data management in improving coordination and operational responsiveness (17). These experiences underscore the potential value of AI-enabled forecasting and automation tools in strengthening hospital administrative resilience.

However, adoption of AI and automation in Sri Lanka must be considered within the context of existing infrastructure limitations, workforce capacity, and governance frameworks. Challenges identified in digital health implementation include variability in IT infrastructure across districts, limited technical expertise, concerns about data privacy, and the absence of comprehensive regulatory guidance for AI applications (12,18). Ethical considerations—such as data security, transparency of algorithmic decision-making, and accountability for automated administrative errors—require careful policy attention to ensure responsible implementation (18).

Importantly, Sri Lanka's relatively strong public health governance structure and centralized health administration create favorable conditions for coordinated digital transformation (9,13). With appropriate investment, capacity building, and regulatory oversight, AI-driven automation in administrative domains could improve operational efficiency, reduce clerical burden and collection of huge amounts of hard card copies following paper based systems which already existing which hinders on health staff, enhance data quality, and contribute to overall health system sustainability.

Given the ongoing national commitment to digital health transformation and the documented administrative challenges within Sri Lankan hospitals, there is a clear need to synthesize global evidence on AI and automation in hospital administrative processes. Such evidence can inform contextually appropriate and effective policy decisions; guide phased implementation strategies and support responsible integration of AI technologies into Sri Lanka's healthcare system.

METHODOLOGY

This study employed a scoping review methodology to map and synthesize existing evidence on the use of artificial intelligence (AI) and automation in hospital administrative processes. The scoping review approach was selected because the research topic is relatively emerging, heterogeneous in nature, and characterized by diverse study designs, implementation settings, and outcome measures. Unlike systematic reviews that primarily focus on effectiveness evaluation, scoping reviews are more appropriate for identifying knowledge gaps, mapping key concepts, and summarizing broad evidence domains.

The review was conducted following established scoping methodological frameworks. The research question, inclusion criteria, and search strategy were developed a priori to ensure transparency and reproducibility. Peer-reviewed articles, implementation reports, systematic reviews, and observational studies published in English between 2015 and 2025 were considered for inclusion. The selected timeframe was chosen to capture the evolution of AI and automation technologies in healthcare administration.

Literature research was performed using major electronic databases including PubMed/MEDLINE, Scopus, Web of Science, Embase, IEEE Xplore, and CINAHL. A comprehensive search strategy was developed using combinations of keywords and Boolean operators. The search terms included variations of "artificial intelligence," "machine learning," "natural language processing," "robotic process automation," combined with administrative process domains such as "hospital administration," "billing," "scheduling," "records management," "workflow automation," and "healthcare operations."

Study selection followed a two-stage screening process. In the first stage, titles and abstracts were screened to remove irrelevant studies and duplicates. In the second stage, full-text articles were assessed for eligibility based on predefined inclusion criteria.

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Studies were included if they focused on AI or automation applications in hospital administrative processes and reported operational, financial, or implementation-related outcomes.

Data extraction was performed using a standardized extraction form. Information collected included author and year of publication, country of study, study design, administrative domain addressed, type of AI or automation technology used, sample or setting characteristics, and key findings related to efficiency, cost, accuracy, or implementation barriers.

Quality appraisal was not the primary objective of this scoping review; however, study methodological characteristics were considered during interpretation of findings. The results were synthesized thematically by grouping evidence into major administrative domains, including billing and revenue cycle management, appointment scheduling, records management using natural language processing, efficiency outcomes, cost effects, and ethical or implementation challenges.

The review findings were presented using narrative synthesis supported by summary tables. No primary data collecting involving human participants was conducted. Therefore, ethical approval was not required for this study.

Overall, the scoping review methodology enabled comprehensive mapping of existing literature on AI and automation in hospital administrative processes and facilitated identification of research gaps relevant to health system implementation, particularly in resource-limited settings.

RESULTS

1. Study Selection and Characteristics

The database search (PubMed/MEDLINE, Scopus, Web of Science, IEEE Xplore, Embase, and CINAHL) identified a substantial body of literature addressing artificial intelligence (AI) and automation in hospital administrative processes. After removal of duplicates and screening of titles and abstracts, full-text review resulted in inclusion of studies focusing specifically on administrative applications rather than clinical decision support. The final sample comprised empirical studies (observational, quasi-experimental, case studies), systematic reviews, implementation reports, and mixed-method evaluations published between 2015 and 2025.

The majority of included studies originated from North America and Europe, with increasing contributions from Asia-Pacific settings in recent years. Most studies examined robotic process automation (RPA), machine learning–based scheduling systems, natural language processing (NLP) for documentation and records management, and AI-supported revenue cycle management. Outcomes assessed included efficiency metrics (processing time, turnaround time), accuracy/error rates, cost savings, staff workload, and implementation barriers.

2. AI and Automation in Billing and Revenue Cycle Management

Billing and revenue cycle management were among the most frequently reported administrative domains for AI application. Robotic Process Automation (RPA) systems were widely implemented to automate repetitive, rule-based tasks such as claims submission, eligibility verification, coding validation, denial management, and payment posting.

Studies reported substantial reductions in processing time following RPA deployment. Automated claims handling systems reduced claim processing times by 30–70%, depending on the complexity of billing rules and payer requirements. Error rates in coding and claim submissions decreased significantly when machine learning–assisted validation tools were integrated with electronic health record (EHR) systems. Several quasi-experimental studies demonstrated improvements in first pass claim acceptance rates and reductions in denial rates after implementation of RPA-supported workflows.

Cost savings were a consistent finding. Hospitals reported reductions in administrative overhead, particularly in large tertiary institutions with high patient volumes. Time savings translated into reallocation of staff toward higher-value tasks, such as patient engagement and financial counseling. In large hospital systems, automation of revenue cycle tasks yielded measurable return on investment (ROI) within 12–24 months of implementation.

However, variability in financial outcomes was observed. Smaller institutions reported higher upfront costs relative to short-term savings, indicating that economies of scale may influence cost-effectiveness. Additionally, integration challenges with legacy billing systems sometimes delayed anticipated efficiency gains.

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3. AI-Driven Scheduling and Appointment Optimization

AI-based scheduling systems were evaluated in outpatient and inpatient contexts. Predictive analytics models were used to forecast appointment no-shows, optimize clinician schedules, allocate operating theatre time, and manage bed occupancy.

Machine learning algorithms analyzing historical attendance patterns, demographic characteristics, and contextual variables improved prediction of no-shows compared to traditional statistical models. Hospitals using predictive scheduling tools reported reductions in missed appointments and more efficient utilization of clinical resources. Some studies demonstrated improved throughput in high-demand specialties through dynamic scheduling adjustments.

In operating room (OR) management, AI-assisted scheduling systems enhanced utilization rates and reduced idle time. Predictive models enabled more accurate estimation of procedure duration, minimizing delays and cancellations. Similarly, AI-driven bed management systems improved patient flow by forecasting discharge times and admission surges.

Efficiency gains were reflected in shorter waiting times, better resource allocation, and reduced administrative workload for scheduling staff. Nonetheless, staff acceptance varied, particularly when algorithmic recommendations conflicted with experiential judgment. Resistance to replacing manual scheduling expertise with automated systems emerged as a recurrent theme.

4. Records Management and Natural Language Processing (NLP)

Natural Language Processing (NLP) was commonly used to enhance records management, documentation accuracy, and reporting. NLP tools extracted structured data from unstructured clinical notes, automated coding suggestions, and facilitated regulatory reporting.

Studies showed that NLP reduced manual data abstraction time in administrative reporting tasks, such as quality indicators and compliance audits. Automated summarization of clinical documentation improved completeness and standardization of records. In some institutions, NLP integration reduced physician and administrative staff time spent on documentation reconciliation.

Furthermore, NLP-enabled systems improved interoperability between departments by converting free-text documentation into structured data formats compatible with hospital information systems. This facilitated real-time dashboards for operational monitoring.

Despite these benefits, challenges included variable accuracy across specialties and documentation styles. NLP systems performed better in standardized environments but required significant training datasets and customization. Concerns were raised regarding potential misclassification errors and data privacy risks when processing large volumes of patient information.

5. Efficiency Gains and Productivity Outcomes

Across administrative domains, efficiency improvements were consistently reported. Time savings were observed in billing cycles, appointment scheduling, record abstraction, and reporting workflows. Automation reduced repetitive manual tasks, thereby increasing throughput and operational capacity.

Quantitative studies demonstrated measurable productivity gains, including reductions in task completion time, faster turnaround for claims processing, and improved patient flow metrics. Staff-reported outcomes frequently included reduced cognitive burden and decreased clerical workload.

However, productivity improvements were context dependent. Institutions with robust digital infrastructure experienced more pronounced benefits. Conversely, hospitals with fragmented IT systems reported limited gains due to interoperability constraints.

6. Cost Savings and Financial Impact

Cost-related outcomes were widely examined. Reported financial benefits included reduced labor costs, decreased error-related losses, lower denial rates, and improved revenue capture accuracy. Automation of high-volume administrative tasks contributed to long-term operational savings.

Economic evaluations indicated positive ROI in medium- to large-scale implementations. Nonetheless, capital investment, licensing fees, infrastructure upgrades, and training costs were significant initial barriers. Studies emphasized the importance of phased implementation strategies to mitigate financial risks.

Some analyses cautioned against overestimating savings, noting that automation does not eliminate the need for human oversight. Hybrid human–AI models were more sustainable and often delivered better long-term value.

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7. Barriers to Implementation

Several barriers to the adoption of artificial intelligence in hospital administrative processes were identified across the included studies. Technical challenges were among the most frequently reported obstacles, particularly difficulties in integrating AI and automation systems with existing legacy hospital information systems. Limited interoperability between digital platforms and poor data quality further constrained the effective deployment of AI-based solutions. Organizational factors also played an important role in implementation outcomes. Staff resistance to technological change, concerns about potential job displacement, insufficient training opportunities, and limited leadership engagement were commonly reported barriers to successful adoption. Financial constraints were another major challenge, as the implementation of AI technologies often requires substantial initial capital investment, including costs related to software procurement, infrastructure upgrades, cybersecurity measures, and workforce training, while short-term return on investment remained uncertain in several settings. In addition, regulatory and governance issues were highlighted as important considerations. Compliance with data protection regulations, the absence of standardized national frameworks for AI validation, and the need for transparency in algorithmic decision-making were emphasized as critical requirements for safe and ethical implementation of AI-driven administrative systems.

Organizational readiness and digital maturity strongly influenced successful implementation. Studies highlighted that change management strategies, stakeholder engagement, and continuous monitoring were critical success factors.

8. Ethical and Legal Considerations

Ethical and legal concerns were recurrent themes across the literature. Data privacy and confidentiality were primary considerations, particularly when AI systems processed large volumes of sensitive patient and financial information. Compliance with data protection regulations (e.g., GDPR and national privacy laws) was essential.

Algorithmic bias and transparency were also emphasized. Machine learning models trained on biased or incomplete datasets could perpetuate inequities in resource allocation or scheduling decisions. Accountability for AI-driven errors, especially in billing and documentation, remained a complex legal issue.

The potential displacement or restructuring of administrative roles raised workforce ethics concerns. While many studies suggested that automation augments rather than replaces staff, workforce planning and retraining were identified as necessary components of responsible implementation.

9. Summary of Findings

Overall, the evidence indicates that AI and automation technologies particularly RPA and NLP improve efficiency, accuracy, and cost-effectiveness in hospital administrative processes. Billing and revenue cycle management demonstrated the most robust financial benefits, while scheduling and records management showed significant operational improvements.

However, successful implementation depends on infrastructure readiness, governance frameworks, workforce engagement, and ethical oversight. The current body of evidence is dominated by observational studies and implementation reports, with limited high-quality randomized or controlled evaluations. Future research should prioritize standardized outcome measures, long-term cost-effectiveness analyses, and robust evaluation frameworks to strengthen the evidence base.

Author (Year)	Country	Study Design	Administrative Domain	AI / Automation Type	Sample / Setting	Key Outcomes	Main Findings	Limitations
Almagadi et al. (2025)	Multinational	Systematic Review (28 studies)	Multi-domain (billing, scheduling, documentation)	AI, RPA, NLP	Hospital systems	Efficiency, productivity	AI improved task completion time, reduced manual entry burden	Heterogeneity of included studies

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Author (Year)	Country	Study Design	Administrative Domain	AI / Automation Type	Sample / Setting	Key Outcomes	Main Findings	Limitations
Secinaro et al. (2021)	International	Structured Literature Review	Health services management	AI (ML, predictive analytics)	Healthcare systems	Operational efficiency	AI enhanced decision-making and workflow optimization	Limited focus on hospital-level admin
Devapatla & Katti (2023)	USA	Case Study	Billing & Claims Processing	RPA	Large hospital network	Processing time, error rate	40–60% reduction in claim processing time; improved coding accuracy	Single-site study
Johansson (2022)	Sweden	Mixed Methods	Registration, billing, scheduling	RPA	Public hospital	Cost savings, workflow speed	Reduced administrative workload; improved turnaround time	Limited long-term evaluation
Sharma (2021)	India	Observational Study	Revenue cycle management	AI + RPA	Tertiary hospital	Cost, denial rate	Reduced claim denials and improved revenue capture	No control comparison
Joshua et al. (2025)	USA	Quasi-experimental	Revenue cycle	AI-driven automation	Multi-hospital system	ROI, cost savings	Positive ROI within 18 months; labor cost reduction	Short follow-up period
Nasef et al. (2025)	Multinational	Narrative Review	Hospital management systems	AI integration	Hospital management systems	Resource allocation	AI improved operational planning and forecasting	Narrative review design
Karrar et al. (2025)	Saudi Arabia	Descriptive Study	Documentation & HMIS	NLP, ML	Hospital information systems	Documentation accuracy	NLP reduced manual reporting time	Accuracy varied by specialty
Industry Case Report (Omega	USA	Implementation Report	Claims processing	AI document processing + RPA	Large healthcare BPO	Hours saved, ROI	15,000+ hours saved monthly; 99.5%	Industry-funded report

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Author (Year)	Country	Study Design	Administrative Domain	AI / Automation Type	Sample / Setting	Key Outcomes	Main Findings	Limitations
Healthcare, 2025)							processing accuracy	
Ali et al. (2023)	International	Systematic Review	Multi-domain	AI (ML, DL, NLP)	Healthcare sector	Efficiency metrics	AI reduced execution time and improved workflow performance	Broad healthcare focus

DISCUSSION

This scoping review synthesized evidence on the use of Artificial Intelligence (AI) and automation in hospital administrative processes, focusing on billing and revenue cycle management, scheduling systems, records management using Natural Language Processing (NLP), efficiency gains, cost implications, and implementation challenges. The findings demonstrate that AI and automation technologies—particularly Robotic Process Automation (RPA) and machine learning–based predictive systems—consistently improve administrative efficiency, reduce processing errors, and generate measurable cost savings in hospital settings.

Principal Findings

Across the included studies, billing and revenue cycle management emerged as the domain with the strongest and most consistent evidence of benefit. RPA systems significantly reduced claim processing times, improved coding accuracy, and lowered denial rates. These findings suggest that automation is particularly effective in high-volume, rule-based administrative tasks. Financial performance improvements were frequently reported, especially in large hospital systems where economies of scale enhanced return on investment. This aligns with broader healthcare management literature indicating that administrative simplification can yield substantial cost containment benefits.

AI-driven scheduling systems also demonstrated notable operational improvements. Predictive analytics models reduced appointment no-shows, optimized clinician schedules, and improved operating theatre utilization. Enhanced bed management forecasting contributed to improved patient flow and shorter waiting times. These findings highlight AI's potential to support dynamic resource allocation in complex hospital environments.

Natural Language Processing (NLP) applications were primarily used for documentation optimization and records management. NLP-enabled systems reduced manual data abstraction, improved structured reporting, and enhanced compliance monitoring. However, performance varied depending on documentation quality and clinical specialty, indicating that contextual adaptation and high-quality training datasets are critical for reliable deployment.

Overall, efficiency gains were consistently observed across domains. Time savings, reduction in repetitive clerical tasks, and improved data accuracy were common outcomes. Cost savings were more variable, influenced by institutional size, infrastructure maturity, and implementation strategy. While medium- and large-scale systems reported positive ROI within 1–2 years, smaller institutions faced greater challenges due to high upfront costs.

Comparison with Existing Literature

The findings of this review align with broader evidence suggesting that AI adoption in healthcare has progressed beyond clinical decision support into operational and management domains. However, compared to clinical AI research, administrative AI applications remain under-evaluated using rigorous experimental designs. Most studies were observational, descriptive, or case-based, limiting causal inference. This methodological pattern has been observed in digital health implementation research more broadly.

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Administrative automation appears to follow an incremental innovation model rather than disruptive transformation. Rather than replacing administrative staff, AI and RPA systems frequently function as augmentation tools, reducing clerical burden while maintaining human oversight. Hybrid human–AI workflows were often reported as more sustainable than fully automated models.

Implications for Low- and Middle-Income Countries and Sri Lanka

For low- and middle-income countries (LMICs), including Sri Lanka, the implications of these findings are particularly relevant. Sri Lanka's health system faces increasing patient loads, constrained financial resources, and uneven digital infrastructure. Administrative inefficiencies—especially in tertiary public hospitals—contribute to overcrowding, delayed service delivery, and staff workload stress.

The evidence suggests that targeted AI applications in billing (private sector), appointment scheduling, bed management, and documentation standardization could significantly improve operational efficiency. In Sri Lanka's public sector, where services are provided free at the point of delivery, financial gains may not directly derive from billing improvements; however, efficiency gains could translate into better resource utilization and reduced indirect system costs. In the private sector, revenue cycle automation may enhance financial sustainability and insurance claim management.

Importantly, Sri Lanka's National Digital Health Strategic Framework provides a policy foundation for digital transformation. AI-enabled automation aligns with national goals of improving interoperability, strengthening hospital information systems, and enhancing service efficiency. However, successful implementation will require infrastructure standardization, capacity building, and governance frameworks to ensure responsible adoption.

Barriers and Implementation Challenges

Despite promising outcomes, several barriers were consistently identified. Technical challenges including interoperability limitations and integration with legacy systems—were among the most common obstacles. In many hospitals, fragmented digital systems limit seamless automation.

Organizational resistance also emerged as a significant barrier. Concerns about job displacement, lack of trust in algorithmic decision-making, and insufficient training can hinder adoption. Evidence suggests that early stakeholder engagement, transparent communication, and workforce retraining programs improve acceptance.

Financial constraints are particularly relevant in resource-limited settings. Although long-term cost savings are possible, initial capital investment in AI infrastructure, software licensing, cybersecurity, and training may be substantial. Phased implementation strategies and pilot programs may mitigate financial risks.

Ethical and Legal Considerations

Ethical and legal issues are central to administrative AI adoption. Data privacy and confidentiality are critical concerns, especially when large volumes of patient data are processed. Compliance with national data protection regulations and implementation of secure governance mechanisms are essential.

Algorithmic bias represents another potential risk. If predictive models are trained on incomplete or skewed datasets, inequitable resource allocation or scheduling decisions may result. Transparency, auditability, and continuous performance monitoring are therefore necessary components of responsible AI deployment.

Accountability for automated errors, particularly in billing and documentation, remains a complex legal issue. Most literature recommends maintaining human oversight in high-stakes administrative decisions to mitigate liability risks.

Strengths and Limitations of the Review

This review provides a focused synthesis of AI applications in hospital administrative domains, an area less explored compared to clinical AI research. It integrates evidence across billing, scheduling, and records management, offering a comprehensive perspective.

However, several limitations must be acknowledged. The heterogeneity of study designs, outcome measures, and implementation contexts limited comparability. Few randomized or controlled studies were available. Additionally, publication bias toward positive implementation outcomes cannot be excluded, as unsuccessful implementations may be underreported.

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CONCLUSION

AI and automation technologies demonstrate significant potential to improve hospital administrative efficiency, accuracy, and cost-effectiveness. Billing and revenue cycle management show the strongest financial benefits, while scheduling and documentation systems contribute to operational improvements. However, successful integration requires robust digital infrastructure, workforce engagement, and ethical governance.

For countries such as Sri Lanka, AI-driven administrative automation offers a strategic opportunity to enhance hospital performance within existing resource constraints. Careful planning, phased implementation, and regulatory oversight will be essential to translate technological potential into sustainable health system gains.

RECOMMENDATION

To facilitate the responsible adoption of artificial intelligence (AI) and automation in hospital administrative processes in Sri Lanka, a coordinated national policy framework is essential. The Ministry of Health should develop a dedicated national strategy for AI in health administration aligned with existing digital health initiatives such as the Hospital Health Information Management System (HHIMS) and the eIMMR platform. This framework should define standards for interoperability, data governance, cybersecurity, and algorithm validation to ensure safe integration with legacy systems. Establishing national technical guidelines for robotic process automation (RPA), natural language processing (NLP) tools for records management, and AI-assisted billing and scheduling systems would promote uniform implementation across tertiary, secondary, and district-level hospitals. In addition, collaboration with the Information and Communication Technology Agency (ICTA) and academic institutions can support local innovation and context-specific algorithm development.

Capacity building and workforce preparedness should be prioritized to address organizational resistance and skills gaps. Structured training programs for hospital administrators, medical record officers, accountants, and IT personnel should be incorporated into continuous professional development frameworks. Rather than framing AI as a job replacement mechanism, policy should emphasize augmentation of human roles—reducing administrative burden while improving efficiency and accuracy. Leadership engagement at hospital and provincial levels is critical; therefore, digital transformation indicators could be integrated into hospital performance evaluation systems. Pilot implementation projects in selected teaching and provincial hospitals would allow careful monitoring of cost savings, efficiency gains, and service quality improvements before national scale-up.

Finally, strong regulatory oversight and ethical governance mechanisms must underpin AI deployment in Sri Lanka's health sector. Policies should ensure compliance with national data protection legislation and establish clear accountability structures for algorithmic decision-making in billing, patient scheduling, and records management. Transparent procurement procedures, cost–benefit evaluation frameworks, and independent technical audits should be mandated to safeguard public funds and maintain public trust. Given Sri Lanka's resource constraints, phased investment models—supported by public–private partnerships and donor agencies—may help manage upfront costs while demonstrating measurable returns on investment. By embedding AI adoption within a structured governance and evaluation framework, Sri Lanka can enhance hospital administrative efficiency while maintaining equity, data security, and ethical integrity

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