American Journal of Smart Technology and Solutions (AJSTS)

ISSN: 2837-0295 (ONLINE)

VOLUME 5 ISSUE 1 (2026)

PUBLISHED BY
E-PALLI PUBLISHERS, DELAWARE, USA

American Journal of Smart Technology and Solutions (AJSTS)

Volume 5 Issue 1, Year 2026
ISSN: 2837-0295 (Online)
DOI: https://doi.org/10.54536/ajsts.v5i1.4775
https://journals.e-palli.com/home/index.php/ajsts

Artificial Intelligence for Developing Better Patient Scheduling and Predicting Bed Availability in Hospitals

Md. Halimuzzaman[1*], Marup Hasan[2], Md. Jahidul Islam Mozumdar[3]

Article Information

Received: August 02, 2025

Accepted: December 23, 2025

Published: March 14, 2026

Keywords

Artificial Intelligence, Bed Availability Prediction, Healthcare Efficiency, Hospital Operations, Patient Scheduling

ABSTRACT

Optimizing patient scheduling and predicting bed availability in real-time remain paramount challenges for metropolitan hospitals in Bangladesh, especially high population density cities like Dhaka and Chattogram. Manual systems can lead to congestion and lack of efficient resource allocation. The objective of this study was to evaluate the perceptions, readiness, and operational needs for healthcare professionals with the use of Artificial Intelligence (AI) in support of patient scheduling and forecasted bed availability. Goals of the project were to review current scheduling practices, look for patterns in peak demand, create high-brain-pressure units lists, evaluate the perceived value-add of AI and uncover barriers to uptake. A structured quantitative questionnaire was administered to 400 participants among selected hospitals. Descriptive statistics demonstrated the common occurrence of beds shortages, extensive variation in discharge-to-bed-ready time and reliance on manual scheduling systems. There was overwhelming support for the adoption of AI, particularly with regards to AI bed prediction in real-time, decreased time waiting for a bed, better turnover efficiency and automation of administrative tasks. Nevertheless, there were several barriers which consisted of scant digitized data, inadequate training and infrastructural limitation. The study concludes that AI-based scheduling and bed prediction systems can significantly improve productivity, alleviate congestion issues, and help with evidence-based decisions in Bangladeshi hospitals.

INTRODUCTION

Optimizing patient scheduling and bed availability in real time are also key elements of contemporary hospital operations, especially in densely populated urban areas like Dhaka and Chattogram (Shaare *et al.*, 2024). Public and private hospitals in these cities continuously encounter issues such as congested outpatient clinics, delays for admissions, and a lack of coordination among departments that lead to abrupt changes in bed demands (Panga *et al.*, 2025). Such systemic inefficiencies not only impact operational performance, but also jeopardize patient safety, care quality and the general responsiveness of hospitals (Bertsimas & Pauphilet, 2024). Over the years, manual or experience-based methods and spreadsheet-driven tools for scheduling appointments between patients have become inefficient in addressing these complex demands as hospitals and surgery clinics are burdened by increasing patient loads and limited physical capacity (Turgay & Özçelik, 2023). Over the past few years, Artificial Intelligence (AI) has played a paradigm-shifting role in health system management providing evidence-based approaches that can enhance decision-making process, rationalize allocation of resources and reduce administrative bottlenecks (Qureshi *et al.*, 2025). Using AI-based scheduling algorithms, predictive analytics, and machine learning models, they can predict when acceleration in admissions will occur, forecast the use of beds based on demand modeling, and optimize patient flow by ensuring every resource is available at the time it's needed (Ahmed *et al.*, 2025). Though the AI for healthcare operational research has been growing at a fast pace around the world, it is not studied as structured in Bangladesh hospitals and documentation of such attempts is scarce (Schneider & van de Vrugt, 2021). A handful of these tertiary care hospitals have started to explore digital solution experimentally, but little has been known empirically about how well (if at all) scheduling interfaces that use AI for bed needs predictions and their derivative benefits are seen as effective or achievable, let alone perceived efficacious (Munavalli *et al.*, 2021).

As a result of this gap, the current quantitative study explores whether AI techniques could be used to improve patient scheduling throughput and bed availability forecasting in Dhaka and Chattogram public hospitals. The addition of AI in operational procedures is driven not only by technical effectiveness but also user readiness, perceived usefulness, organizational capacity and infrastructural support. Thus, in this study we assess healthcare professionals' understanding of, current operational issues related to and anticipated improvements from AI-based systems. Drawing on empirical evidence from two large urban health hubs, the paper adds to burgeoning literature and debate around digital transformation in Bangladesh's hospital context and provides policy-relevant lessons for bolstering the capacity, sustainability and patient-centricity of hospitals.

[1] School of Business, Galgotias University, Delhi, India
[2] College of Graduate and Professional Studies, Trine University, Virginia, USA
[3] Department of Computer Science and Engineering, Daffodil International University, Dhaka, Bangladesh
[*] Corresponding author's e-mail: halim.helal@gmail.com

LITERATURE REVIEW

Artificial Intelligence (AI) is now established as a core part of the operations in today's healthcare, automating mundane work; optimizing the intricate workflow and aiding real-time decision making (Ritika Goel *et al.*, 2024). Founded on the principles of AI, hospitals worldwide are increasingly employing tools that improve diagnostic accuracy, predict patient outcomes, automate administrative tasks, and manage resources (Ashok Sreerangapuri, 2024, p.). And recent research suggests that AI-based algorithms can eliminate human error, streamline operations and enable data-driven planning in hospitals (Ganesh *et al.*, 2025). Limitations Nevertheless, its usage is limited in developing countries because of infrastructural, financial and human resource constraints (Suryawanshi *et al.*, 2025). In this section, we discuss related literature about AI-driven patient scheduling and forecasting bed availability.

The scheduling of patients is a multidimensional optimisation problem that outpatients, diagnosing services, ambulances and the inpatient department have to co-ordinate (Besiri, 2024). The old ways of scheduling manual logs, spreadsheets and experience-based planning are inefficient and full of errors. The research of (Ashok Sreerangapuri, 2024; Sachdeva & Jain, 2025) on Optimization of Health Care Scheduling by Artificial Intelligence have demonstrated that optimized scheduling increases patient satisfaction, resource utilization and reduces waiting time, workload for health workers. Appointment length, likelihood of no-shows and service time have been identified with ML models to generate schedules templates adaptively for hospitals (Bhagat *et al.*, 2024). Alongside with schedule improvement, AI-practiced bed availability prediction has been an important research area in recent years, as hospitals become increasingly overcrowded and in need of timely admissions (Mathur & Kumar, 2025). There also exists international evidence that machine-learning models, such as time-series forecasting, Long Short-Term Memory (LSTM) networks and gradient-boosting algorithms can forecast bed occupancy with great precision hours or even days ahead. Studies by (Putalpattu *et al.*, 2024) and others, predicts that predictive analytics technologies can better enable hospitals to plan discharges, allocate beds wisely and to help cope with emergency surges. Bed management AI empowers hospital staff to move beyond reactive decisions and proactively manage beds, which can help prevent admissions delays, alleviate ED congestion and more easily transition patients into various treatment units (Arnaud *et al.*, 2022). They also support real-time capacity tracking and forecasting, thus making healthcare systems more resilient during seasonal peaks, pandemics, and surges in patient inflow (Rengaramanujam *et al.*, 2025).

However, with a few exceptions, the use of AI in hospital systems support is trailing behind that seen in Western countries despite encouraging progress at global level (Mukherjee, 2025). In a country like Bangladesh, under the systems in place for manual scheduling and paper beds management still used in Dhaka and Chattogram's hospitals (which further complicate matters), patients have to wait long hours, resources are utilized inefficiently and there are often shortages of available beds (Vashishth *et al.*, 2023). Despite particular promises of applications in health-care systems such as diagnostics, telemedicine etc., prospective analysis for operational AI implementation (operation planning, bed forecast and scheduling) to these countries has not been detected (Roman *et al.*, 2025). And, low technology infrastructure in many parts of the world, soloed patient data systems, high cost of implementation, and concerns around cybersecurity efforts or lack thereof, and staffing preparedness are also reasons that line up against fast adoption (Somda *et al.*, 2023). Academics including (Alam *et al.*, 2021; Aldeer *et al.*, 2022), this does not just involve the technological capacity to adopt AI, but also organizational readiness, training and policy frameworks all of which are still evolving in Bangladesh (Ahmed *et al.*, 2025). Analysis reveals a clear knowledge gap: despite international literature espousing AI's ability to improve scheduling productivity and bed utilization, the evidence on actual outcomes from Bangladeshi hospitals is minimal (Al Muktadir *et al.*, 2019). To our knowledge, there has been no systematic quantitative investigation of HCPs' attitudes or opinions with respect to the operational challenges and level of preparedness for incorporating AI tools in patient scheduling and bed management (Aldeer *et al.*, 2022).

Moreover, existing studies seldom combine scheduling and bed management into an integrated analysis, it is just an emerging trend in previous studies (interrelated tightly with hospital operations). This paper aims to fill this gap by exploring the likelihood of AI contributing to optimizing workflow in Bangladeshi hospitals located in Dhaka and Chattogram, thus offering critical commentaries on digital transformation and strategic improvements in Bangladesh's healthcare industry. The specific objectives of this study were:

1. To examine the awareness, knowledge and perception of healthcare professionals towards AI applications in hospital settings.
2. To assess patient scheduling and bed management systems among the selected hospitals in Dhaka and Chattogram through identifying the operational inefficiencies.
3. To explore the perception of healthcare professionals on the potential utilities of AI-based systems for patient scheduling and bed availability prediction.
4. To assess the organizational readiness (technological infrastructure and staff capacity) to adopt AI- based scheduling and bed forecasting tools.
5. To understand the main challenges and opportunities to apply AI in managing hospital scheduling and bed availability, and to suggest areas of improvement.

MATERIALS AND METHODS

Quantitative research design was used to explore the possibility of application of AI in patient schedule and bed allocation logic in some hospitals in Dhaka city and Chattogram. The information was gathered with the help of a structured questionnaire for health care practitioners (doctors, nurses, administration and staff from IT department). Cochran's formula was used to calculate the sample size:

$n=(Z^2.p.(1-p))/E^2$

Where Z= 1.96 for a 95% confidence level, p= 0.5 assuming maximum variability and E=0.05 margin of error (Cochran, 1942). According to this estimation, the minimum allowable sample size was 384 respondents; but in order to achieve all departments' fair share of participation and a margin for non-responses 410 questionnaires were distributed. For this, a non-probabilistic purposive sampling: direct participants in hospital management and scheduling was used. Coded data were cleaned and analyzed using the statistical program, with descriptive statistics provided as well as estimates of reliability and inferential analyses examining relationships among AI knowledge, scheduling practices, bed management, organizational readiness for change, and perceived values of adding AI.

RESULTS AND DISCUSSION

The finding of the survey from healthcare professionals in Dhaka and Chattogram was included in the results and discussion chapter. This section discussed the quantitative findings in relation to how the level of AI awareness, current scheduling practices, bed management problems and organizational readiness had influenced respondents' views about integrating AI into hospital operations. Results were compared to the aims of the study and to other reports in the literature, with a focus on congruence's and incongruences between our data and those previously reported. By integrating statistical evidence and analytical interpretation, this chapter provided useful insights concerning the application of AI for improving patient scheduling effectiveness, predicting bed availability and optimizing hospital workflow as a whole, especially in the context of Bangladesh health care.

Respondents Profile

The demographic findings presented a fairly clear picture of the survey respondents among whom (where groups were involved) and against which to judge subsequent findings.

Table 1: Demographic Profile of the Respondents

Variable	Category	Frequency (n)	Percentage (%)
City of Workplace	Dhaka	232	58%
	Chattogram	168	42%
Type of Hospital	Private	184	46%
	Public	128	32%
	Teaching	48	12%
	Non-profit	28	7%
	Other	12	3%
Department/Unit	Admissions	100	25%
	Inpatient Ward	88	22%
	Emergency	72	18%
	ICU	48	12%
	Administration	60	15%
	IT/Health Informatics	32	8%
Job Role/Designation	Nurse	136	34%
	Doctor	112	28%
	Administrator/Manager	72	18%
	Bed Manager	48	12%
	IT Staff	24	6%
	Other	8	2%
Years of Experience	<1 year	40	10%
	1–3 years	88	22%
	4–7 years	120	30%
	8–15 years	108	27%
	>15 years	44	11%

Table 1 shows that, with respect to workplace location, 58% were from Dhaka and the remainder 42% were from Chattogram; this difference reflected increased presence of tertiary and apex hospitals in Dhaka. This distribution meant that experiences were drawn from the two largest healthcare hubs, accommodating for scheduling and bed planning issues specific to large metropolitan hospitals. Regarding the type of hospital, the sample was a good mix: 46% worked in private, 32% public hospitals, 12% teaching, and only 7% non-profit organizations; with three percent 'other'. The majority of the sample was from private hospitals, as they grew much faster and were more technology-oriented than public sector in terms of healthcare services (Panga *et al.*, 2025). The perspective of public hospital respondents was instrumental, as it shed light on a general picture of crowding and acuity holding that would have otherwise been unclear. Respondent distribution across departments in the hospital identified where the engaged functional units closely related to patient scheduling and bed control were located. 25% from Admission, 22% from Inpatient ward, 18% from the Emergency department, 12% from ICU, 15% were Administer and Administrative staffs, integrative value-based of Health Informatics and IT which it accounts for 8%. This variety helped to ensure the inclusion of professional and nonprofessional perspectives. High participation from admissions and inpatient wards demonstrated the crucial role they play in daily patient flow management whereas emergency and ICU staff were able to provide insights on high demand, fast paced areas where a real-time bed prediction is valuable. By job role Nurse was the most common type of respondent (34%) followed by doctors (28%), administrators/managers (18%), bed managers (12%), IT staff (6%) and 2% in "Other" roles. This article demonstrated the power of frontline clinical workers, who due to limited scheduling and bed availability often struggle. Managers and bed managers provided management viewpoint to the issue, and IT staff discussed technological feasibility and systems readiness (important for AI implementation). Length of experience was broadly distributed in terms of years: 10% had less than a year, 22% had 1–3 years, 30% had 4–7 years, 27% had between 8 and15 while remaining group-11%- even more and 5 years length of practice. This combination of junior, mid-career and highly senior professionals enhanced the credibility of our study as this enabled us to capture perspectives form different stakeholders at varying levels of knowledge with regards to hospital systems and processes. The largest category of professionals was mid-career-level (4–7 years), which is a workforce that is experienced enough to understand the limits of institutions and young enough to embrace AI-powered innovations.

Taken together, the demographics demonstrated that there was a wide distribution of respondents from cities, types of hospitals, departments, job categories and work experiences (Schneider & van de Vrugt, 2021). It provided a strength to the findings by ensuring that views on AI in patient scheduling and bed prediction were informed across a broad range of hospital professionals who brought their functional role specific experiences.

Current Scheduling & Bed Management Practices

The information on existing scheduling and bed management process demonstrated a number of operational inadequacies, which currently play a hurdle for maintaining smooth patient flow in hospitals in Dhaka and Chattogram.

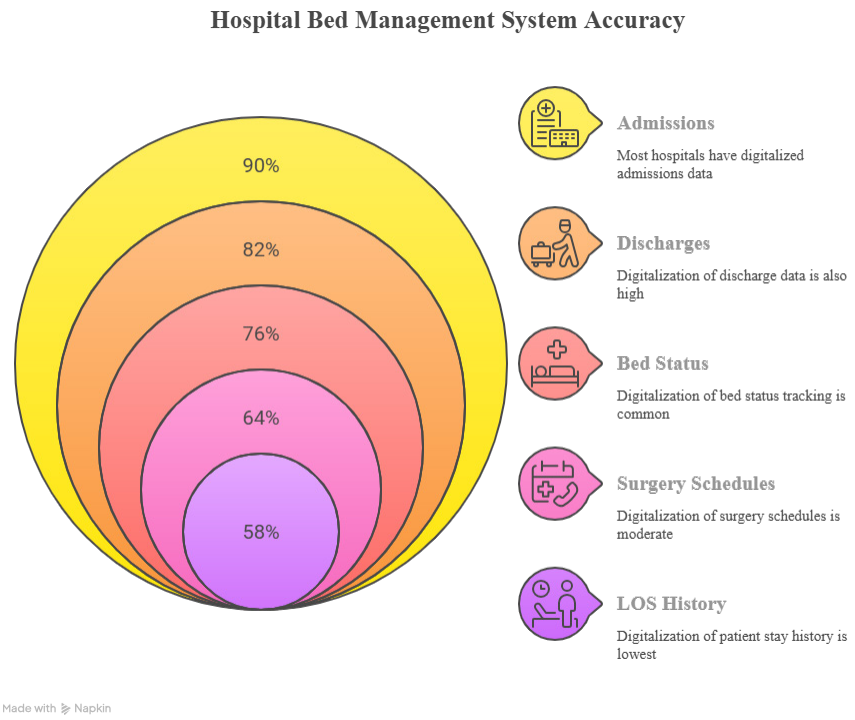

Figure 1: Current Scheduling and Bed Management Practices in Hospitals

Survey responses also indicated that 38% (n=30) reported using a fully electronic scheduling system with 32% (n=25) reporting partially electronic systems (Figure 1). A further 25% of reporters identified that their hospital was still using traditional paper systems, while the remaining 5% did know if this was indeed the case. These results indicate that there is a transition process towards digitalization, while a considerable share of hospitals continue to rely on manual or a combination of manual and electronic systems. The use of a manual, ink-based schedule in one quarter of hospitals suggests how inefficiencies (driven by delays and poor data entry) could potentially impact patient flow and care continuity. With respect to bed management, 40% reported that they used a real-time digital system, 30% - manual paper-based records, while 22% were using a hybrid digital–manual approach and an eighth had no structured system at all. The predominance of digital systems is a natural consequence of being modernized but the persistence of manual and hybrid experiences suggests resource constraints, lack of a connected infrastructure or digitization literacy among staff. Hospitals without a system stand to have less accurate beds tracking, delayed admissions and overcrowding.

As this was a multi-response question, percentages represent the level of respondents in each category selected (but still total to 100%): Admissions – 90%, Discharges – 82%, Bed Status 76%, Surgery Schedules 64%, LOS (Length of Stay) History 58%. These findings suggest that most of the hospitals have digitalized their core administrative data, such as admissions and discharges. However the lower levels for surgery schedules and LOS history demonstrate areas where full-cycle digital integration was not yet in place to support predictive analytics, capacity planning and patient flow management. The extreme value at level 3 implies that the accuracy is moderate but unstable. Over one in five (22%) rated accuracy as very poor (1–2), thus showing plenty of room for improvement. Only 18% agreed that the system was excellent, indicating an inconsistency of real-time data updating and a poor integration of the systems. 40 per cent said they had shortages from time to time, and another 36 per cent experienced them on a weekly or daily basis. These data imply continued chokes in capacity and inefficiencies around bed turn-up, escalation/growth pathways and monitoring of patterns within (Turgay & Özçelik, 2023). Over two-thirds (70%) of respondents reported some to full delays, indicating that lack of information is a critical factor in scheduling inefficiencies.

Some of these discrepancies could be related to incomplete data systems, lags in communication between units or manual documentation that's outdated.

Clearly, the results demonstrate that although digital transformation has taken place within hospital environments, a large segment continues to function with partial or manual systems that inhibit decision making in real time. Bed management is still not accurate, leading to frequent bed shortages and late patient scheduling (Qureshi *et al.*, 2025). Recording of core data electronically is widespread but departmental integration remains partial, with implications for efficiency. Taken together, these results underscore the pressing need for end to end digital integration, better data accuracy validation utilities as well as capacity tracking and personnel training to improve scheduling efficiency and inpatient bed utilization.

Patterns in Patient Flow and Bed Demand

During the examination of patient flow, temporal peaks in admissions to hospital were evident.

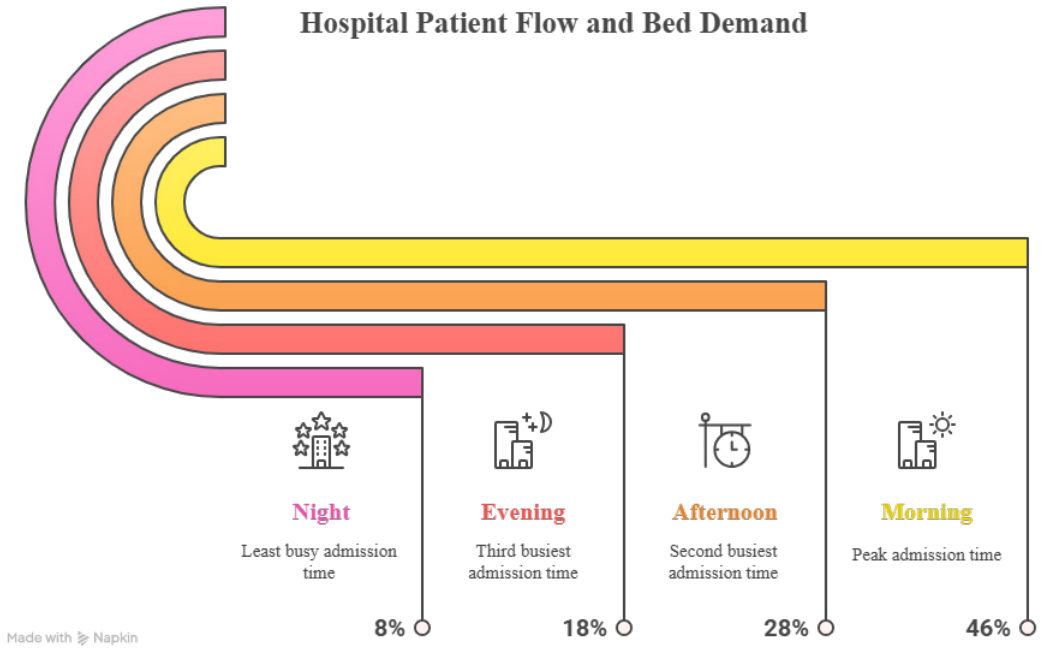

Figure 2: Patterns in Patient Flow and Bed Demand

Figure 2 represents that, 46% stated that the morning was busiest for patient admissions and 28% indicated that the afternoon was busiest. Those admitted in the evening represented 18%, reflectors of night-time admissions only 8%. This result represents the usual hospital operations in Bangladesh when outpatient visits and referrals from primary care centers are done earlier in day, and morning admissions tend to be higher. Bed demand throughout the week Sixty-two percent of respondents said that it was highest on weekdays, 24% at weekends and 14% had no overall pattern. Weekday peaks dominate since the majority of scheduled procedures, elective admissions, and office-hour clinical activities occur during these days. Weekend spikes related to emergencies, although also observed, are lower in comparison. Overcrowding was a problem that 38% of participants reported occurred on a weekly basis while 22% that overcrowding violated the general rules for daily. A further 24% witnessed overcrowding every month, and only 16% reported that their hospitals never experienced it. This breakdown reflects an ongoing pressure on available inpatient bed capacity particularly for larger hospitals in Dhaka and Chattogram, where seasonal illnesses as well as admission surges from emergency departments or a mis-synchronization of discharge exacerbate the situation.

Time to admission bed availability also indicated these pressures. Roughly 30% of respondents experienced wait times of 1–3 hours and another 28% waited 4–6 hours. 22% described delays of more than 6 hours, but only 20% had received their beds within an hour. Such extended waiting times indicate inefficiencies in bed turn over, discharge delay scheduling and lack of real-time visibility into bed inventory. Seasonal fluctuation in request was confirmed by 54% of providers, not reported by 32%, and uncertain by 14%. Many of the respondents repeatedly referred to increases at the time of dengue season, flu outbreaks and winter respiratory diseases, emphasising a cyclical demand of hospital infrastructure. Discharge records Finally, discharge data revealed that in the morning (48%), followed by afternoon (36%) and in evening (16%). This morning-parameter-dominated discharge pattern accords with administrative functioning and physician rounds that usually take place early in the day. That said, the mismatch between morning discharges and morning peak admissions causes temporary congestion, which also supports the justification for more balanced discharge planning (Rengaramanujam *et al.*, 2025).

Collectively, the data describes how hospitals in large Bangladeshi cities are susceptible to predictable and inadequately regulated patient flow surges contributing to admission bottlenecks, bed turnover delays, and repeated overcrowding. These trends emphasize the potential of predictive AI-based systems to anticipate demand, optimise bed timing allocation and aid in proactive staff and resource scheduling.

Units with Highest Bed Pressure

With respect to bed pressure by hospital unit, the ICU was reported as the most pressured zone (34% of responses) in terms of bed shortage.

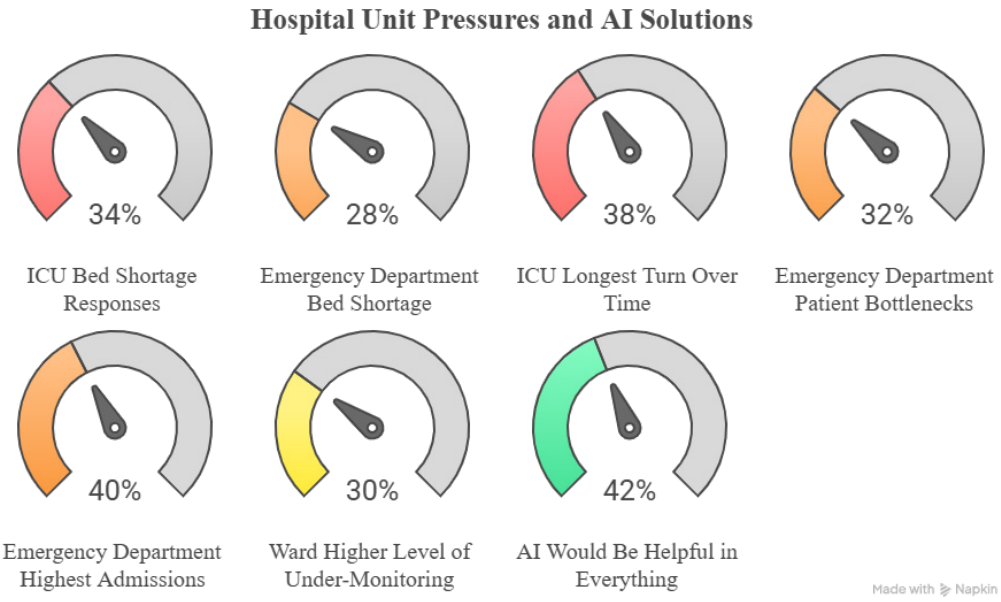

Figure 3: Units with Highest Bed Pressure

It was succeeded by the Emergency Department (28%), with Medical Ward (18%), Surgical Ward (12%), Maternity Ward (5%) and Pediatric Ward (3%) described as relatively less tense (Figure 3). This is consistent with the situation in Bangladeshi hospitals, where intensive care practitioners usually work at or close to full capacity, as a result of shortage of ICU beds, high intensity of emergency admissions and long stay for critically ill patients. The ICU also had the longest turn over time, reported by 38% of respondents compared to the Surgical Ward (26%)

and Medical Ward (20%). A further 10% were from maternity units, and 6% other unit. The low turnover in ICU is due to a requirement for high acuity patients, and thus prolonged lengths of stay while the surgical wards experience time lag associated with postop monitoring and discharge clearance requirements. Patient bottlenecks were most frequently identified in the Emergency Department (32%) and Waiting Area (26%). Ward corridors (18%) and the admission desk (14%) and ICU (10%) were also cited. These restrictions are typically due to incongruities between patient arrival and bed turnover rates, as well as a scarcity of up-to-the-minute data on bed occupancy. Regarding the ward with the highest percentage of admissions, 40% recorded Emergency Department followed by ICU (24%), General Medicine (20%), Surgery (10%) and Maternity was (6%). These findings evidence the emergency department as the main gate for urgent and unscheduled admissions. There was a higher level of under-monitoring at Ward (30%) than other settings: Emergency (26%), Surgery (18%), ICU (14%) and Administration (12%). The lower uptake of digital tools in our general wards implies shortfalls in real-time bed tracking, documentation and resource planning, which directly hinder the patient flow. Finally, whether AI-based accoutrements would help or not—that's where survey respondents overwhelmingly agreed: 42% said AI would be helpful in everything. Bed management (24%), waiting list (18%) were other priority problem areas, with more specific endorsement of ICU prediction (10%) and emergency triage (6%). The preference towards system level AI implementation also highlights that holistic digital solutions are required as opposed to point technology interventions (Ganesh *et al.*, 2025). On a larger scale, the findings highlight continued high-acuity unit pressure and the role that AI can have in improving real-time decision-making, bed turnover optimization, as well as flow bottlenecks throughout hospitals in Dhaka City and Chattogram.

Importance & Expected Benefits of AI

The results of the survey showed high agreement among health care providers regarding the need to address patient scheduling and establish reliable bed prediction systems.

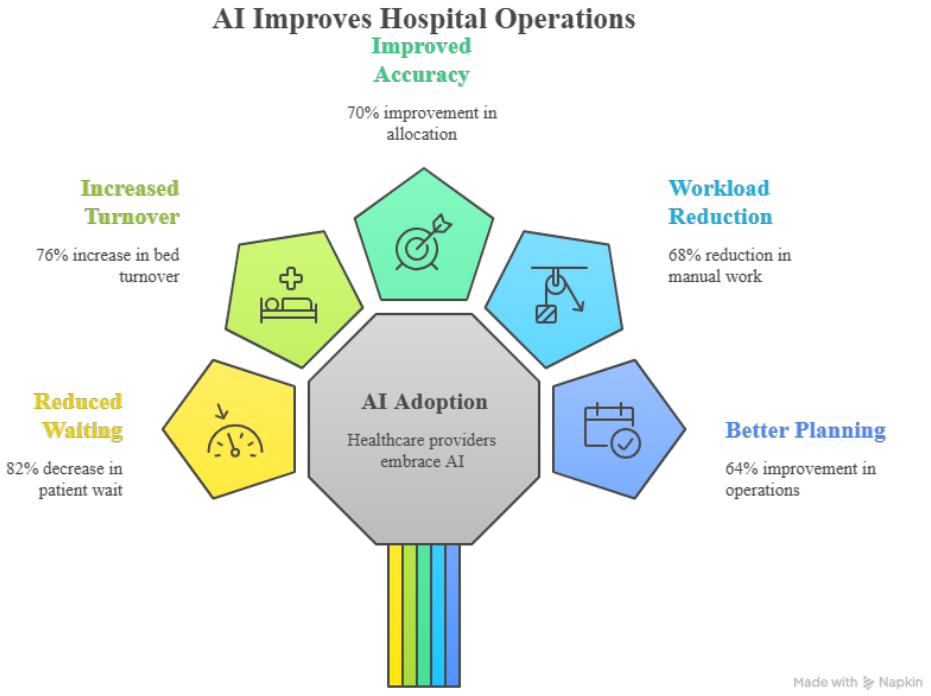

Figure 4: Importance & Expected Benefits of AI

When participants were asked to rate the importance of improving patient scheduling on a 5-point Likert scale, 42% rated it as very important (5), 30% rated it as important (4), 18% mixed or neutral (3), and only 7% reported that they believed improvement was not very important (2) or least important (1) (Figure 4). These results indicate the importance of scheduling efficiency based on patient waiting time, staff utilization and overall hospital performance in most of the hospitals. Likewise, reliable bed prediction also received a high importance rating: 46% voted 5, 28% voted 4, 16% voted 3, with lower numbers on the poor (2%) or worst (1%) ends. This is a recognition of the need for accurate predictions of beds availability to avoid overcrowding as well as ensure timely admissions and, thus, quality care. With respect to anticipated benefits of AI, the most commonly selected usual responses were that AI would lead to: a 82% decrease in patient waiting time; b 76% increase in turnover speed; c designation improvement and accuracy in both, scheduling and bed allocation (70%), d reduction of manual workload (68%) and e improvement of planning for operations (64%). These findings indicate

that AI is viewed by staff not only as an operational efficiency tool, but as a support mechanism to fill in administrative gaps and bolster hospital operations. The high values show the readiness and benefit to healthcare professionals that perceive in AI-driven solutions. For the fairness of hospital bed allocation, 40% evaluated AI as-progress rating with a 5, followed by a score of 4 (32%), and then scores of 3 (18%),2(6%) and finally1(4%).This implies that most interviewed individuals believed that AI might be used to determine fair distribution of limited resources. AI's ability to alleviate patient bottlenecks was also strongly rated in the outlook, with 44% rating this a 5, 30% a 4, 16% a 3, and only 6% and 4%, respectively thinking it a two or one – we anticipate that predictive analytics and automated scheduling can gently guide patient flow down even gangways of what will remain among the serious cases as overly crowded boarding ramps. Regarding the decrease in cancellation surgeries, 38% rated AI's contribution as 5, 28% as 4, 20% as size 3, and about respectively they considered grade2 (8%) or one 1(6%). Taken together, this suggested moderate to high insurance that AI could be used to optimize the operating room schedule, reduce last minute cancellations and more efficiently manage surgical resources.

On the aggregate, these findings reflect a perceived high importance of AI on hospital business. Practitioners anticipate that AI will increase efficiency, precision and fairness, lower human workload, waiting times for patients in hospitals and operational bottlenecks (Munavalli *et al.*, 2021). The high ratings achieved in scheduling, bed prediction, congestion management and surgery planning demonstrate the strategic potential of AI to improve patient-centered care and resource allocation efficiencies at Dhaka (and Chattogram) hospitals.

AI Readiness, Acceptance & Technical Capacity

The results of AI readiness assessment showed a moderate and positive level of readiness's in hospitals.

Table 2: AI Readiness, Acceptance & Technical Capacity

Variable	Category	Frequency (n)	Percentage (%)
Hospital Readiness to Adopt AI	1	40	10%
	2	80	20%
	3	120	30%
	4	104	26%
	5	56	14%
Availability of Digital Historical Data	Always	96	24%
	Sometimes	152	38%
	Rarely	80	20%
	No	40	10%
	Not sure	32	8%
Willingness to Use AI Recommendations	1	16	4%
	2	32	8%
	3	72	18%
	4	120	30%
	5	160	40%
Confidence in AI Accuracy	1	24	6%
	2	40	10%
	3	88	22%
	4	136	34%
	5	112	28%
Preferred Platform for AI Tools	HIS dashboard	168	42%
	Desktop software	112	28%
	Mobile app	72	18%
	Email alerts	48	12%
Staff Training Required for AI Tools	None	40	10%
	Basic (1–2 hrs)	144	36%
	Moderate (3–5 hrs)	136	34%
	Extensive (>1 day)	80	20%

Table 2 shows that, on a 5-point scale, 30% of those surveyed rated their hospital's AI readiness as 3, in the middle of the road meaning some digital systems are in place but not yet completely up and running. A further 26% rated readiness as 4, and 14% as 5, indicating capacity for readiness is high in the many facilities. Similarly, 20% rated readiness as 2 and for another 10%, it was only 1 indicating that at least some proportion of hospital are still not prepared from a basic infrastructure standpoint to introduce AI. In general, the results indicate the possibility of slow technological progression but reveal disparity in preparedness across hospitals in Dhaka and Chattogram. In the case of digital historical data instrumental for training predictive AI models 38% said that it was available occasionally, while 24% reported having access to it always. Another 20% wrote that data was infrequently available, 10% replied there was no data and 8% were not sure. These findings highlight how, despite growing digital data archives, there is heterogeneity across departments and AI implementation would likely require substantial data reorganization. Readiness to use AI suggestions was impressively high. With 40% of their willingness score as 5, with the remained 30%–18% for a magnitude order meant there was high openness in hospital staff to integrate AI-defined guidance into work flow. 8 % rated willing as 2, and 4 % as 1)", so it's not like resistance to AI is widespread. Many people are at least a little scared or dismissive of AI. Trust, as to the accuracy of the AI, was also found to follow this same pattern. Confidence was rated 4 by 34%, 5 by 28% and 3 by22%. Confidence score 2 and 1 were claimed by10% and 6%, respectively. These results suggest that while trust is overall high, a certain level of skepticism is still present about algorithm transparency, data quality and robustness. AI tool preference patterns were evident for favored platforms. 42% favored HIS dashboards, indicating that it is vital to include AI tools in the HIS. According to 28% who selected desktop software, 18% chose mobile applications and 12% said email alerts. HIS dashboards became the top of mind preference because it demonstrates that HIS users wanted AI to be incorporated seamlessly into their routine workflow without having to use external platforms. Staff training needs were mostly moderate, as well. One-third (36%) indicated that short training (1–2 hours) would be enough, while 34% expected moderate training of 3–5 hours. Another 20% believed the training needs would be more intensive, suggesting that some employees anticipate difficulty adjusting to AI tools (Singh, 2023). Only 10% of respondents said that no training would be required, indicating that the majority believe in (or understand) the value of formalized onboarding to ensure successful adoption of AI.

Taken together, the results demonstrate that hospitals are "moderately prepared and there are data challenges", but staff motivation, readiness and increasing confidence of AI can be a strong foundation for widespread implementation. Strategic investments in digital infrastructure, training, and collating AI with current HIS platforms will likely be necessary to fully realize adoption and operational returns.

Limitations to AI Implementation

The examination of barriers to AI promotion also indicated multiple milestones limiting technological progression in hospitals.

Table 3: Limitations to AI Implementation in Hospital

Variable	Category	Frequency (n)	Percentage (%)
Main Barrier to AI Adoption	Cost	112	28%
	Lack of data	96	24%
	Lack of training	80	20%
	IT issues	56	14%
	Resistance	40	10%
	Legal concerns	16	4%
Staff Resistance to Digital Change	1	48	12%
	2	80	20%
	3	120	30%
	4	104	26%
	5	48	12%
Data Quality Issues	Very high	32	8%
	High	64	16%
	Moderate	160	40%
	Low	96	24%
	Very low	48	12%
Severity of Infrastructure Limitations	1	40	10%
	2	64	16%

	3	136	34%
	4	104	26%
	5	56	14%
Leadership Support for AI	1	48	12%
	2	56	14%
	3	120	30%
	4	112	28%
	5	64	16%
Budget Availability for AI Tools	None	112	28%
	Low	128	32%
	Moderate	96	24%
	High	40	10%
	Very high	24	6%

The leading crypto assets are cost (28%), followed by lack of data (24%) and take a while to adopt new skills, all reported as the biggest barrier for 20% of respondents. 14% also pointed out IT challenges, 10% cited staff resistance and 4% feared legal and regulatory hurdles. These findings indicate that while hospitals are becoming more aware of the potential of AI, they are facing both financial constraints and data challenges as the biggest barriers to adoption. Overall, staff resistance to digital change was low. Rated on a 5-point scale, 30% chose level 3, with 26% choosing level 4 and only 12% level 5; there was considerable reluctance in some groups (Table 3). Resistance at level 2 and level 1 was reported by only 20% and 12%, respectively, indicating that there is resistance but not to the entire staff category. This reluctance could be due to lack of AI tooling knowledge, fear of changing working habits or concerns about job loss. Quality of the data was also indicated to be a major issue. Just 8% of respondents indicated that data quality was very high, and another 16% said it was high. Most–40% rated the quality of information to be "moderate", which means that data inconsistencies or incomplete documentation is quite usual. Another 24% indicated data quality was low, and 12% called it very low, meaning that in some hospitals there were dramatic limitations. The two major impacts of data quality on AI-based prediction models are the decrease in performance and reliability. Technological infrastructure restrictions were also a significant issue. In rating the severity, 34% of participants chose level 3, while 26% selected level 4 and 14% rated it as level 5, suggesting substantial structural problems in many hospitals. In the meantime, 16% of respondents chose level 2, while 10% checked level 1 indicating that a portion of hospitals experienced little technology barrier. Infrastructure challenges, like outdated servers, slow networks and not enough hardware, are so widespread that most facilities still aren't ready to fully support cutting-edge AI systems. There was wide disparity between leaders' attitudes to AI. 30 percent, 28 percent and 16 percent of respondents rated leadership support as levels 3, 4 and 5, respectively indicating increasing but still varied leadership endorsement. In contrast, 14% scored support as level 2 and another 12% graded it as level one, suggesting not all leaderships of institutions have the same ideal towards transformation. Effective leadership involvement is crucial for AI adoption to develop in the long term, including resource allocation, regulation development and culture change. Budget was another major barrier. It's followed closely behind by (now we're making room for the average) only 28% having no budget at all. Semi-rigid funding was reported in 24%, high budget in 10% and very high budget in 6%. "These results highlight the important financial considerations hindering hospitals from adopting AI tools and also upgrading their technical infrastructure and training of staff."

The overall conclusion is that interest regarding AI integration in hospitals in Dhaka and Chattogram is increasing; however, the successful adoption of AI technology is still significantly hampered by budget limitations, insufficient digital data, moderate levels of staff resistance, infrastructural weaknesses as well as varied leadership support (Shaare *et al.*, 2024). Tackling these obstacles will in turn necessitate focused investment, formalized data governance, purposeful training efforts and organizational commitment to digital change.

Performance Expectations- Metrics for AI Evaluation

The findings indicated that participants had high expectations of performance from AI in areas across the hospital. In general, majority scored the performance metrics between 4 and 5 in the Likert's scale, demonstrating consistently high confidence level with AI that may enhance efficiency and workflow outcomes. Potential opportunities most commonly anticipated were decreased patient wait time.

Table 4: Performance Expectations- Metrics for AI Evaluation

Performance Metric	(Strongly Disagree)	(Disagree)	(Neutral)	(Agree)	(Strongly Agree)
AI should reduce patient waiting time	2%	5%	15%	40%	38%
AI should increase bed turnover speed	3%	6%	18%	42%	31%
AI should improve scheduling efficiency	1%	4%	14%	45%	36%
AI should reduce administrative workload	2%	7%	20%	43%	28%
AI should provide real-time predictions	1%	5%	16%	41%	37%
AI should decrease overcrowding in emergency units	3%	6%	17%	39%	35%

Table 4 represents that, the majority of the respondents were convinced that medical decision support aided by AI like intelligent triage tools, automatic registration processes and predictive patient-load algorithms will substantially shorten waits in out- as well as diagnostic units, and accident and emergency departments. This demonstrates an increasing understanding that relying on manual processes is not well suited to managing patient flow effectively, and that there may be scope for AI to offer a more systematic and evidence-based solution for the management of crowds. Likewise, the respondents strongly agreed that AI would improve bed turnover speed. There is much of hospitals in Bangladesh face the problems of waiting time for discharge, lack of effective communication between wards and availability real-time bed information. The high expectation score indicated hopeful anticipation that AI-supported bed management systems might facilitate efficient discharge planning, forecast patient length of stay (LOS), and help with the allocation of beds (Mukherjee, 2025). These perceptions suggest that AI is seen as more than just an adjunctive tool for clinical work, but also a powerful engine for operational efficiency. There were also extremely high hopes about AI improving scheduling efficiency. Respondents expected that AI would solve common scheduling problems such as double booking appointments, under-use of timeslots, staff shortages and OR (operation room) overbooking. "There are to be hospital rosters for doctors and nurses and the times of our appointments, so the understanding that is built into this about how schedules interact shows a clear understanding from stakeholders of the optimisation opportunity AI can provide in mitigating waste (e.g. time consuming rescheduling tasks) associated with manual rostering." A further strength area for having strong expectations is the decrease of administrative burden, as also surveyed respondents confirm. They spend an inordinate amount of their day on administrative duties paperwork, billing, reporting and entering data by hand taking them away from providing care (Bialas *et al.*, 2023). The findings show that employees look to AI to automate mundane tasks, decrease paperwork and streamline workflow, freeing up both clinical and nonclinical staff for higher-level work. There was also agreement from respondents that AI should make real-time predictions in near-real time, which was identified as a critical measure of 'success.' Hospitals have an expanding requirement for timely insights to manage deterioration risks, emergency admissions and resource scarcity. The high anticipation of real-time predictive analytics speaks to stakeholders' shared belief that AI can support better clinical decision making through earlier intervention and more proactive management of hospital flow.

Last, but not least, AI capabilities were also expected to contribute significantly in relieving over-crowded emergency rooms. Congestion in the emergency department (ED) is an ongoing issue for public and private hospitals. AI could help by bettering triage accuracy and forecasting patient surges, they said, as well as optimising referral pathways and departmental communication. A priority that emergency care improvement is an area for performance and implementation of AI.

Findings

- Dhaka and Chattogram hospitals largely depend on semi-electronic scheduling and hybrid bed-management systems, demonstrating incomplete digitalisation in patient-flow structure.
- Patient-flow patterns indicated that the morning and weekdays induced most admission and bed-demand pressure, with regular weekly overcrowding in many hospitals and time cut-off for delayed bed allocation >3 h.
- Critical care areas including Emergency, ICU and Medical Wards reported the highest bed shortages and slowest turnover times leading to critical bottlenecks with long waiting periods.
- Not surprising, the participants had high expectations from AI to enhance predictive power in scheduling; real-time bed prediction tasks and reducing overcrowding with strong willingness to use AI tools on HIS dashboards and mobile devices.
- Although the perceived benefits were high, substantial barriers such as poor data quality, absence of training, weak infrastructure and budget limitations reported by hospitals hinder immediate AI implementation and scaling.

Recommendations

- Hospitals will more effectively control patient flow by eschewing partially-electronic and hybrid

solutions in favor of complete, digital scheduling and bed management systems.

• AI enabled Real Time monitoring software should be installed in high pressure areas like ER, ICU, medical wards for reducing crowd and fast turnover.

• Hospitals need to develop a policy for admission and bed management at the peak time in the morning/weekday in order to prevent morning/weekday congestion, and to reduce waiting times.

• Theoretical AI training should be given to administrative, security, nursing and clinical staff members in order to build their confidence, decrease resistance and improve them as being more receptive towards adopting diabetes management automation.

• Hospital administrators ought to set up dedicated budget for AI, optimize IT infrastructure and improve data quality (which would be interoperable) of healthcare within hospitals with plans for scalability of the same.

CONCLUSION

This analysis which assessed AI's ability to enhance patient scheduling and allocate beds in hospitals in Dhaka and Chattogram found substantial aspects of digital readiness, as well as operational efficiency shortcomings. The results showed that hospitals continue to rely on partly electronic, or hybrid systems which have led to frequent overcrowding and bed allocation delays and bottlenecks remained in high flow areas such as Emergency and ICU. In spite of these obstacles, high levels of confidence were reported among healthcare professionals in the ability of AI to improve accuracy and decrease waiting time in the patient-volume management process and speed-up turnover times for providers as well as support decision-making. Yet challenges of limited data quality, inadequate staff training, thin funding streams, and poor technical infrastructure are significant hurdles to address. The study's findings suggest that AI adoption has the potential to have an important impact on hospital and patient-flow operations… if hospitals take advantage of digital modernization, smart investment and capacity building.

REFERENCES

Ahmed, M. S., Zhinuk, F. A., Acharjee, S., Begum, S., Jobiullah, M. I., & Islam, S. (2025). AI-driven predictive operations management: A business science framework for dynamic hospital resource optimization and clinical workflow efficiency. *International Journal of Professional Business Review, 10*(8), e05628. https://doi.org/10.26668/businessreview/2025.v10i8.5628

Al Muktadir, M. H., Islam, M. A., Amin, M. N., Ghosh, S., Siddiqui, S. A., Debnath, D., Islam, M. M., Ahmed, T., & Sultana, F. (2019). Nutrition transition – Pattern IV: Leads Bangladeshi youth to the increasing prevalence of overweight and obesity. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 13*(3), 1943–1947. https://doi.org/10.1016/j.dsx.2019.04.034

Alam, N., Hasan Tanvir, M. R., Shanto, S. A., Israt, F., Rahman, A., & Momotaj, S. (2021). Blockchain-based counterfeit medicine authentication system. In *2021 IEEE 11th Symposium on Computer Applications & Industrial Electronics (ISCAIE)* (pp. 214–217). IEEE. https://doi.org/10.1109/ISCAIE51753.2021.9431789

Aldeer, M., Javanmard, M., Ortiz, J., & Martin, R. (2022). Monitoring Technologies for Quantifying Medication Adherence. In K. Wac & S. Wulfovich (Eds.), *Quantifying Quality of Life: Incorporating Daily Life into Medicine* (pp. 49–78). Springer International Publishing. https://doi.org/10.1007/978-3-030-94212-0_3

Arnaud, E., Elbattah, M., Ammirati, C., Dequen, G., Ghazali, D. A., Arnaud, E., Elbattah, M., Ammirati, C., Dequen, G., & Ghazali, D. A. (2022). Use of Artificial Intelligence to Manage Patient Flow in Emergency Department during the COVID-19 Pandemic: A Prospective, Single-Center Study. *International Journal of Environmental Research and Public Health, 19*(15). https://doi.org/10.3390/ijerph19159667

Ashok Sreerangapuri. (2024). AI-Driven Service Transformation: Revolutionizing Operational Excellence. *International Journal of Scientific Research in Computer Science, Engineering and Information Technology*. https://doi.org/10.32628/cseit24106154

Bertsimas, D., & Pauphilet, J. (2024). Hospital-Wide Inpatient Flow Optimization. *Management Science, 70*(7), 4893–4911. https://doi.org/10.1287/mnsc.2023.4933

Besiri, D. (2024). AI-Driven Predictive Analytics: Transforming Decision-Making in Business. *Human Computer Interaction, 8*(1), 163–163. https://doi.org/10.62802/8ny1ww06

Bhagat, M. I. A., Wankhede, M. K. G., Kopawar, M. N. A., & Sananse, P. D. A. (2024). Artificial Intelligence in Healthcare: A Review. *International Journal of Scientific Research in Science, Engineering and Technology, 11*(4), 133–138. https://doi.org/10.32628/IJSRSET24114107

Bialas, C., Bechtsis, D., Aivazidou, E., Achillas, C., & Aidonis, D. (2023). Digitalization of the Healthcare Supply Chain through the Adoption of Enterprise Resource Planning (ERP) *Systems in Hospitals: An Empirical Study on Influencing Factors and Cost Performance. Sustainability, 15*(4), Article 4. https://doi.org/10.3390/su15043163

Cochran, W. G. (1942). Sampling Theory When the Sampling-Units are of Unequal Sizes. *Journal of the American Statistical Association,* 199–212.

Ganesh, A., Mohammed, M. A., Mohammed, V. A., & Logeshwaran, J. (2025). Assessing the Role of AI in Streamlining Workflow for Healthcare. *Applied Intelligence and Computing,* 283–292.

Mathur, P., & Kumar, A. (2025). Exploring the Impact of AI on Management and Healthcare for Streamlining Operations and Decision-Making. In *Artificial Intelligence-Enabled Businesses* (pp.

275–288). John Wiley & Sons, Ltd. https://doi.org/10.1002/9781394234028.ch15

Mukherjee, S. (2025). Enhancing Patient Admission and Readmission: The Role of Digital Bed Tracking Systems in Modern Healthcare. *Journal of Information Systems Engineering and Management, 10*(37s), 738–744. https://doi.org/10.52783/jisem.v10i37s.6510

Munavalli, J. R., Boersma, H. J., Rao, S. V., & van Merode, G. G. (2021). Real-Time Capacity Management and Patient Flow Optimization in Hospitals Using AI Methods. In M. Masmoudi, B. Jarboui, & P. Siarry (Eds.), *Artificial Intelligence and Data Mining in Healthcare* (pp. 55–69). Springer International Publishing. https://doi.org/10.1007/978-3-030-45240-7_3

Panga, N. K. R., Bobba, J., Ayyadurai, R., Parthasarathy, K., & Ogundokun, R. O. (2025). *Advanced strategies for hospital bed allocation and resource optimization leveraging queuing theory and compartmental modeling* (Chapter 8). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3373-7062-0.ch008

Putalpattu, M. P., Bhargavi, K., Mayani, M. B., Srinivas, P., Siddiqa, A., & Kunkulagunta, M. (2024). Advancing predictive modeling in healthcare: A data science approach utilizing AI-driven algorithms. In *2024 International Conference on Intelligent Computing and Emerging Communication Technologies (ICEC)* (pp. 1–6). IEEE. https://doi.org/10.1109/ICEC59683.2024.10837024

Qureshi, M. K., Pradhan, A., Wande, P., Dongare, S., Giri, D. N., & Bhatia, D. G. (2025). Dynamic Queuing Algorithms for Optimized Healthcare Appointment and Patient Flow Management in OPD Systems. *International Journal of Basic and Applied Sciences, 14*(SI-2), 199–206. https://doi.org/10.14419/y0fwh837

Rengaramanujam, K., & Muniasamy, A. (2025). *AI in hospital administration and formulary design: Optimizing resource allocation and patient flow. In IGI Global Scientific Publishing* (Ed.), AI-driven healthcare systems (Chapter 8). https://doi.org/10.4018/979-8-3373-2043-4.ch008

Ritika Goel, Tanya Karn, Rahul Kushwaha, & Ashima Mehta. (2024). Healthcare Resource Allocation Optimization. *International Journal of Advanced Research in Science, Communication and Technology,* 429–433. https://doi.org/10.48175/IJARSCT-17569

Roman, M. M. U. H., Akter, S., Jahan, D., Akter, S. M., Adhikari, U., Das, M., Mahbub, M. T., & Islam, A. S. (2025). *Challenges faced by health managers in healthcare delivery systems in Bangladesh* [Preprint]. Research Square. https://doi.org/10.21203/rs.3.rs-6792321/v1

Sachdeva, C., & Jain, P. (2025). AI-Driven Innovations In Healthcare Administration: Streamlining Processes For Improved Operational Efficiency. *IJFMR - International Journal For Multidisciplinary Research, 7*(3). https://doi.org/10.36948/ijfmr.2025.v07i03.37788

Schneider, A. J. (Thomas), & van de Vrugt, N. M. (Maartje). (2021). Applications of Hospital Bed Optimization. In M. E. Zonderland, R. J. Boucherie, E. W. Hans, & N. Kortbeek (Eds.), Handbook of Healthcare Logistics: Bridging the Gap between Theory and Practice (pp. 57–94). *Springer International Publishing.* https://doi.org/10.1007/978-3-030-60212-3_5

Shaare, M. N., Zin, M. S. I. M., Isa, A. A. M., & Salim, S. I. (2024). Optimizing Hospital Bed Management System with Iot. *International Journal of Academic Research in Business and Social Sciences, 14*(12), Article 12. https://doi.org/10.6007/IJARBSS/v14-i12/24355

Singh, R. K. (2023). Prioritization of Risks in the Pharmaceutical Supply Chains: TOPSIS Approach. In S. K. Paul, R. Agarwal, R. A. Sarker, & T. Rahman (Eds.), *Supply Chain Risk and Disruption Management: Latest Tools, Techniques and Management Approaches* (pp. 193–215). Springer Nature. https://doi.org/10.1007/978-981-99-2629-9_10

Somda, M. M. Y. G., Ouya, S., & Mendy, G. (2023). Implementation of robotic process automation to decrease the time required for KYC onboarding process. In *2023 6th International Conference on Artificial Intelligence and Big Data (ICAIBD)* (pp. 345–350). IEEE. https://doi.org/10.1109/ICAIBD57115.2023.10206136

Suryawanshi, V., Kanyal, D., Sabale, S., & Bhoyar, V. (2025). The role of AI in enhancing hospital operational efficiency and patient care. *Multidisciplinary Reviews, 8*(5), 2025153–2025153. https://doi.org/10.31893/multirev.2025153

Turgay, S., & Özçelik, Ö. F. (2023). Data-Driven Approaches to Hospital Capacity Planning and Management. *Information and Knowledge Management, 4*(2), 6–14. https://doi.org/10.23977/infkm.2023.040202

Vashishth, T. K., Chaudhary, S., & Sharma, V. (2023). Optimum Utilization of Bed Resources in Hospitals: A Stochastic Approach. In Manju, S. Kumar, & S. M. N. Islam (Eds.), *Artificial Intelligence-based Healthcare Systems* (pp. 101–110). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-41925-6_7