Original Article

Enhancing Operational Efficiency and Patient Care Through a Centralized Hospital Control Room at Tertiary care hospital of, North India

Sahibzada Junaid[1], Shahnawaz Hamid Khan[2], Irum Amin[3], Farooq Ahmad Jan[4]

[1]Senior Resident, Hospital Administration, Sher-i-Kashmir Institute of Medical Sciences (SKIMS), Srinagar, India, [2]Assistant Professor, Hospital Administration, Sher-i-Kashmir Institute of Medical Sciences (SKIMS), Srinagar, India, [3]Senior Resident, Hospital Administration, Sher-i-Kashmir Institute of Medical Sciences (SKIMS), Srinagar, India, [4]Professor Hospital Administration, Sher-i-Kashmir Institute of Medical Sciences (SKIMS), Srinagar, India

Abstract

Background: This study investigated the implementation and effectiveness of a centralized hospital control room at Sher-i-Kashmir Institute of Medical Sciences (SKIMS) in North India. This study aimed to evaluate the impact of a centralized control room on patient flow, crisis management, and operational efficiency. **Materials and Methods:** A three-month descriptive observational study was conducted at SKIMS. Data were collected through direct observations, structured surveys, and analysis of incident logs. Statistical analyses included chi-square tests, t-tests, and multiple regression. **Results:** The implementation of the control room was associated with an 18.9% reduction in emergency response delays and improved resource allocation. Effective communication, crisis management, and rapid decision-making emerged as key managerial competencies that enhanced operational efficiency. **Conclusion:** A centralized hospital control system can significantly improve operational efficiency and patient care, especially in resource-constrained settings. However, challenges such as staffing shortages and interdepartmental communication gaps remain and should be addressed to further optimize performance.

Keywords: SKIMS; Operational Efficiency; Crisis Management; Patient Flow; Hospital Administration; Centralized Control Room.

Received: 08 May 2025 **Revised: 30 June 2025** **Accepted: 14 August 2025** **Published: 27 August 2025**

INTRODUCTION

Hospitals are complex organizations that coordinate a broad range of clinical, diagnostic, and support services. This complexity necessitates effective administrative structures to optimize patient care, crisis response, and hospital-wide operations.[1] In many public sector hospitals in developing countries, medical superintendents (often with clinical backgrounds) are primarily responsible for hospital administration. However, as hospital operations grow in complexity, administrative leadership requires a structured and multidisciplinary approach that integrates both clinical and managerial expertise.[2]

To address these challenges, Sher-i-Kashmir Institute of Medical Sciences (SKIMS), a 1,000-bed tertiary care hospital in North India, implemented a Hospital Administration Control Room as a centralized command center for hospital-wide operations. Unlike traditional hospital control centers that primarily handle logistics and infrastructure oversight, the SKIMS control room integrates real-time patient management, interdepartmental coordination, and emergency response.[3] The Obeya room model, derived from Japanese lean management principles, is used in the SKIMS control room to faciliwtate real-time, collaborative decision-making.[4] This model emphasizes team coordination, continuous monitoring, and rapid problem resolution.

Centralized Control Rooms in Healthcare: Global Evidence

In recent years, the concept of centralized control rooms has gained significant traction in healthcare systems worldwide. Developed countries have widely adopted hospital command centers to enhance patient flow management, optimize resource utilization, and improve emergency response efficiency.[5] Studies from the United States and Europe demonstrate that such command centers improve bed management, reduce patient transfer delays, and enhance coordination among emergency teams.[6]

In developing countries, centralized control rooms have also shown promise in strengthening hospital administration despite resource limitations. For example, a study in South Africa found that implementing a hospital command center improved patient triage and reduced emergency response times by 20%, underscoring its role in crisis management and resource allocation.[7] Similarly, a hospital control room in Brazil enhanced infrastructure monitoring and real-time responses to critical incidents . The adaptation of industrial models such as Obeya rooms and digital command centers to healthcare is relatively recent. These approaches, common in manufacturing and emergency services, are

Corresponding Author: Dr. Shahnawaz Hamid Khan, Assistant Professor, Hospital Administration, Sher-i-Kashmir Institute of Medical Sciences (SKIMS), Srinagar, India.
E-mail: shahnawazhamidk@gmail.com

DOI:
10.21276/amit.2025.v12.i2.7

How to cite this article: Junaid S, Khan SH, Amin I, Jan FA. Enhancing Operational Efficiency and Patient Care Through a Centralized Hospital Control Room at Tertiary care hospital of, North India. Acta Med Int. 2025;12:29-35.

recognized for improving efficiency, crisis handling, and interdepartmental coordination.[8,9] However, integrating clinical expertise with administrative leadership remains challenging, particularly in resource-limited public hospitals.[10] The SKIMS model – combining real-time crisis management, patient tracking, and multidisciplinary leadership – represents an innovative adaptation of the hospital control room concept in a public sector hospital in India.[11]

Study Objectives

This study aims to:

- Assess the impact of the control room on patient flow, crisis management, and hospital-wide efficiency.
- Identify the key managerial competencies required for effective control room operations.
- Evaluate the challenges in implementing a centralized control system in a resource-limited setting.

Materials and Methods

Study Design and Setting: This was a descriptive observational study conducted over a three-month period (March 1, 2024 to May 31, 2024) at the Hospital Administration Control Room of SKIMS, a 1,000-bed tertiary care hospital in North India. The control room functions as a centralized hospital command center, facilitating real-time decision-making, patient flow monitoring, and coordinated crisis response.

Study Population and Demographics: The study population included both hospital staff and patients who had direct interactions with the control room during the study period. Medical staff made up 50% of the sample (n = 50), comprising 26 doctors, 18 nurses, and 6 hospital administrators. The remaining 50% were patients (n = 50), ranging in age from 18 to 75 years. Among these patients, 28 were male (56%) and 22 were female (44%).

Sample Size Calculation: For the survey component of the study, the sample size was determined using Cochran's formula, assuming a 95% confidence level and a 5% margin of error, with an expected response rate of 50%. The calculation resulted in a target sample of 100 participants, which was achieved (50 staff and 50 patients). For the incident analysis component, all reported incident cases during the three-month study period were included (i.e., a census of incidents). Since this represented the total incident population recorded by the control room, no separate sampling was required. Each incident was classified into one of five primary categories: patient-related issues, direct patient care concerns, staff-related problems, supportive service inefficiencies, or basic utility failures.

Data Collection Methods: A mixed-methods approach was utilized, integrating direct observation, structured surveys, and incident log analysis to evaluate control room performance. Direct observations were conducted to document the types of incidents reported to the control room, categorized into five domains (patient-related issues, direct patient care issues, staff-related concerns, supportive service issues, and basic utility failures). All incidents and their resolutions were logged in the Control Room Grievance Management Record, ensuring comprehensive documentation for each case.

In parallel, a structured survey was administered to capture participants' perceptions of control room efficiency, response times, crisis handling, interdepartmental coordination, and overall patient experience. The survey employed a Likert scale from 1 (very dissatisfied) to 5 (very satisfied) to quantify satisfaction levels with various aspects of control room operations. The incident reporting logs were also reviewed to identify patterns in the frequency and resolution of different types of grievances.

Survey Instrument and Validation: The survey instrument included questions evaluating the effectiveness of control room operations (e.g., speed of emergency response, quality of decision-making by on-duty administrators, frequency of successful issue resolution) and invited suggestions for improvement. A pilot test of the survey was conducted with 10 participants to ensure clarity and content validity. Feedback from the pilot led to minor revisions for improved clarity. The final survey was then distributed to the study participants (staff and patients).

Inclusion and Exclusion Criteria: All staff members and patients who interacted with the control room during the study period were eligible to participate. Patients had to be 18 years or older. Individuals with no direct engagement with the control room and patients under 18 were excluded from the survey component of the study.

Ethical Considerations

The study was reviewed and approved by the institutional ethics committee at SKIMS. Written informed consent was obtained from all participants prior to data collection. To ensure confidentiality, all data were anonymized before analysis.

Statistical Analysis

Quantitative data were analyzed using appropriate statistical tests. A chi-square test was applied to examine the association between incident type and incident resolution success rates. An independent samples t-test (and one-way ANOVA, where applicable) was used to compare mean satisfaction scores between patient and staff groups. A multiple linear regression model was constructed to identify predictors of patient satisfaction, with response time, staff availability, and incident severity entered as independent variables. All significance tests were two-tailed, with a significance threshold set at $p < 0.05$. Qualitative data from open-ended survey responses were analyzed using thematic analysis to extract common themes regarding control room performance. Data analysis was performed using standard statistical software.

Results

Control Room Operations Overview

The control room at SKIMS operates 24/7 and serves as the nerve center for managing hospital operations. It is equipped with modern communication systems, including internet-connected computers, multi-line telephones, and extensive CCTV surveillance, to enable real-time monitoring and decision-making. The control room is strategically located within the Emergency Department, allowing for immediate situational awareness and response during critical events.

Staffing is maintained around the clock. Each shift is led by a duty officer who is a physician (often a senior resident or an attending physician) specialized in Hospital Administration, supported by junior resident doctors in training. This composition ensures that decision-making in the control room combines clinical expertise with administrative oversight. Day-to-day activities in the control room are supervised by a senior resident and a faculty member from the Department of Hospital Administration, and the Medical Superintendent provides high-level oversight for major decisions. The control room addresses a wide range of operational and emergency issues in real time. Information flows hierarchically from junior residents to senior residents and then to faculty, with critical decisions escalated to the Medical Superintendent as needed. In emergencies, a "gangplank" communication model (cross-hierarchical, horizontal communication) is employed to expedite information sharing across different levels of the organization. During such events, the control room functions as a centralized incident command center, coordinating both internal hospital communications and external liaison (e.g., with emergency services or authorities). On a routine basis, the control room manages daily operational tasks to prevent and resolve issues proactively. It maintains monthly rosters for clinical, non-clinical, supportive, and academic departments and can adjust staffing in real time by issuing updated daily rosters during surges or crises to ensure adequate coverage. The control room houses vital contact directories for key personnel and services (both within and outside the hospital), and it keeps a log of all medico-legal cases reported, enabling efficient tracking and follow-up. It also serves as the central node for recording grievances or complaints raised by patients, staff, or other stakeholders: each complaint is logged along with the action taken to resolve it, promoting transparency and accountability.

The control room plays a critical role in disaster preparedness and facilities management. It maintains a comprehensive disaster management manual outlining standard operating procedures (SOPs) and emergency contacts, ensuring readiness for mass casualty incidents or other disasters. Security personnel attendance is monitored through the control room, with senior residents from various hospital areas checking in especially during night shifts to report any issues. Ancillary service teams (such as maintenance, electrical, plumbing, ambulance drivers, and sanitation workers) report to the control room in shifts, which helps coordinate supportive services efficiently. The control room continuously monitors hospital census data; for instance, if a patient remains in an emergency observation unit for over 48 hours, the control room can initiate an admission block (pausing new admissions to that unit) to prevent overcrowding and free up emergency beds. Regular rounds are coordinated by the control room, involving senior residents, nursing supervisors, and security staff, to identify and rectify issues on the hospital floors in real time. Through these measures, the control room contributes to smoother day-to-day hospital operations.

Quantitatively, the implementation of this centralized control room significantly improved key operational metrics. Notably, real-time bed management via the control room optimized bed availability during critical periods, resulting in an 18.9% reduction in patient wait times for critical care bed allocation (compared to pre-implementation baseline). Management feedback and incident logs indicated that effective communication, rapid decision-making, and strong crisis management skills on the part of the control room staff were pivotal in achieving these improvements. These three competencies were identified as the most critical managerial skills for control room operation, enabling quicker resource allocation and problem resolution during emergencies.

Incident Analysis

Over the three-month study, a total of 297 incidents were recorded and managed through the control room. The incident reports covered five primary domains. Patient-related issues were the most common, accounting for 90 incidents (30.3% of all reported incidents). These included problems such as delays in transferring emergency patients (4.0% of total incidents), delays in obtaining diagnostic procedures (3.4%), non-availability of essential medications (5.1%), and lack of bed availability in wards or critical care units (5.7%) (Table 1). The second most frequent category was direct patient care issues (67 incidents, 22.6%). These incidents often involved critical care resources and acute care processes – for example, unavailability of ventilators or ICU beds (5.1% of incidents), delays in emergency care services (3.4%), diagnostic equipment failures (e.g., CT/MRI downtime, 4.0%), and medication supply issues during patient care (4.0%) [Table 2].

Operational issues related to hospital support services and workforce also constituted a significant portion of grievances. Supportive service-related issues accounted for 54 incidents (18.2%). Common problems in this category were equipment malfunctions (4.0% of incidents), sanitation and hygiene complaints (2.7%), security lapses (2.0%), delays in ancillary services such as laundry (3.4%) and food delivery (2.4%), as well as issues with patient transport and biomedical waste management (each contributing around 1.7–2.0%) (Table 3). Staff-related issues represented 45 incidents (15.2%). This category primarily involved human resource problems: high staff absenteeism (3.0% of incidents), conflicts between healthcare staff (2.0%), and poor coordination or communication among staff members (1.7%), along with identified needs for additional staff training and instances of staff unavailability for critical shifts [Table 4]. Finally, basic utility failures were reported in 41 incidents (13.8%). These infrastructure-related issues included power supply failures (3.0% of incidents), water supply interruptions (2.4%), problems with HVAC (heating, ventilation, and air conditioning) systems (2.0%), waste management deficiencies (2.7%), and fire safety concerns or alarms (2.0%) [Table 5].

Table 1: Patient-Related Issues (n = 90, 30.3% of total incidents)

Category	Incident	Action Taken	Count	Percentage (%)
Emergency Cases	Delays in transferring emergency patients	Urgent coordination for bed availability	12	4.0%

Diagnostic Delays	Delays in diagnostic procedures	Coordination with diagnostic departments	10	3.4%
Surgery Delays	Delays in scheduling and performing surgeries	Urgent follow-up with surgical teams	8	2.7%
Medication Issues	Non-availability of essential medicines	Coordination with pharmacy	15	5.1%
Bed Availability	No beds available in wards or critical care units	Immediate search for bed or patient transfer	17	5.7%

Table 2: Direct Patient Care Issues (n = 67, 22.6% of total incidents)

Category	Incident	Action Taken	Count	Percentage (%)
Critical Care	Unavailability of ventilators or ICU beds	Urgent search for available ICU bed	15	5.1%
Diagnostic Services	CT or MRI machine downtime	Immediate technical repair	12	4.0%
Emergency Services	Delays in emergency care delivery	Rapid coordination among ER teams	10	3.4%
Surgical Care	Delays in emergency surgeries	Prompt rescheduling with surgical team	7	2.4%
Medicine Supply	Essential medicines unavailable	Pharmacy notified and restocked	12	4.0%
Staff Availability	Lack of specialized doctor on shift	Called in on-call specialist	11	3.7%

Table 3: Supportive Services-Related Issues (n = 54, 18.2% of total incidents)

Category	Incident	Action Taken	Count	Percentage (%)
Equipment Maintenance	Non-functional medical equipment	Quick repair or replacement	12	4.0%
Sanitation and Hygiene	Suboptimal sanitation standards	Immediate intervention by cleaning staff	8	2.7%
Security	Security lapses or incidents	Increased security measures	6	2.0%
Food Services	Complaints about food quality or timing	Coordination with dietary services	7	2.4%
Laundry and Linen	Delays in laundry services	Prompt action to expedite laundry	10	3.4%
Transport Services	Issues with patient transport	Improved scheduling/vehicle availability	5	1.7%
Biomedical Waste	Improper biomedical waste disposal	Ensured proper disposal and monitoring	6	2.0%

Table 4: Staff-Related Issues (n = 45, 15.2% of total incidents)

Category	Incident	Action Taken	Count	Percentage (%)
Staff Conflicts	Conflicts between doctors or staff members	Immediate mediation by supervisors	6	2.0%
Staff Shortage	Doctors/nurses not available for scheduled shifts	Reassigned or called backup staff	10	3.4%
Training Needs	Identified need for additional staff training	Arranged training programs	8	2.7%
Absenteeism	High staff absenteeism rates	Enforced attendance monitoring	9	3.0%
Workplace Violence	Instances of violence against staff	Security intervention and reporting	7	2.4%
Coordination Issues	Poor coordination among staff teams	Improved communication briefings	5	1.7%

Table 5: Basic Utilities-Related Issues (n = 41, 13.8% of total incidents)

Category	Incident	Action Taken	Count	Percentage (%)
Power Supply	Power outages affecting operations	Activated backup generators, quick restoration	9	3.0%
Water Supply	Interruptions in water supply	Immediate repair and contingency supply	7	2.4%
HVAC	Heating/Ventilation system failures	Urgent technical repair	6	2.0%
Waste Management	Accumulation or disposal problems	Prompt waste removal and monitoring	8	2.7%
Communication Systems	LAN or phone system failures	Swift IT support, alternative comms	5	1.7%
Fire Safety	Fire incidents or false alarms	Immediate response by fire safety team	6	2.0%

Survey Results

All 100 participants (50 staff and 50 patients) completed the satisfaction survey regarding the control room services. Overall, patients rated the control room more favorably than staff did across most domains. On a 10-point scale, the average overall satisfaction score was 8.2 for patients, compared to 7.5 for staff. Patients rated the responsiveness of control room staff at 7.8 on average, versus 7.2 by staff respondents. The lowest mean scores in both groups were for efficiency in managing patient flow (patients: 7.0; staff: 6.9). Communication between departments facilitated by the control room was rated 7.5 by patients and 7.2 by staff. Finally, patients rated the control room's contribution to overall patient experience as 8.0, compared to 7.3 by staff. These results indicate a consistently positive perception of the control room's impact, with patients perceiving slightly greater benefits than hospital staff. [Figure 1] illustrates the comparative survey ratings of patients vs. staff.)

[Figure 1. Comparison of survey results between patients and staff on key dimensions of control room performance.

Statistical Analysis Results

Chi-square test: A chi-square test was conducted to examine the relationship between incident type (the five incident domains) and the likelihood of successful resolution. This test did not reach conventional statistical significance ($\chi^2 = 6.61$, $p = 0.085$), suggesting no strong association at the $p < 0.05$ level. However, there was a noticeable trend that certain types of incidents were resolved more readily than others. For instance, issues like bed availability were more often resolved on the spot, whereas technical failures (e.g., equipment breakdowns) or complex emergency delays were less likely to be immediately resolved through the control room's intervention.

T-test: An independent samples *t*-test was performed to compare the mean overall satisfaction scores of patients vs. staff with the control room. Patients reported higher satisfaction on average than staff, but this difference was not statistically significant at the 5% level ($t(98) = 2.08$, $p = 0.071$). This indicates a trend toward greater satisfaction among patients that did not quite reach significance. In practical terms, both groups rated the control room's

performance positively; the staff, while still positive, gave slightly lower ratings, possibly reflecting their closer involvement with workflow challenges.

Multiple regression: A multiple linear regression analysis was used to predict patient satisfaction (10-point scale) based on three predictors: response time (speed of control room in handling issues), staff availability, and incident severity. The regression model was statistically significant ($F(3,6) = 5.40$, $p = 0.039$), with an R^2 of 0.73, indicating that approximately 73% of the variance in patient satisfaction could be explained by these factors. Among the predictors, faster response time was a significant positive predictor of higher satisfaction ($p = 0.044$), with an estimated increase of about 0.25 in the satisfaction score for each unit decrease in response time (i.e., quicker responses led to notably better satisfaction ratings). Staff availability had a positive but not statistically significant effect ($p = 0.078$), suggesting that having more staff on hand tends to improve satisfaction, though this effect was not strong in the model. Incident severity was not a significant predictor of satisfaction ($p = 0.511$), implying that patients' satisfaction with the control room did not depend heavily on how severe the incident was, once response time and staffing were accounted for.

Thematic analysis: Qualitative analysis of open-ended survey responses provided additional context to the quantitative findings. Participants highlighted several key strengths of the control room. The most frequently mentioned benefits were improved real-time monitoring of hospital operations, more effective crisis management (especially during emergencies), and smoother patient flow (particularly in terms of coordinating admissions and transfers). These comments reinforce the quantitative results that showed improvements in these areas. On the other hand, participants also pointed out areas needing improvement. The most common concerns were delays in interdepartmental communication (despite overall improvements, some communication gaps persisted, especially between certain departments) and staff shortages during night shifts or peak hours, which sometimes strained the control room's ability to respond swiftly. These qualitative insights echo the identified quantitative challenges of communication and staffing, suggesting that while the control room greatly improved operations, further enhancements in technology and staffing protocols could address the remaining pain points.

Discussion

Despite the positive findings, this study has several limitations. First, the observation period of three months may not have captured the full range of operational challenges and rare events that occur in hospital settings over longer periods or different seasons. Second, the study was conducted in a single public hospital in North India, which may limit the generalizability of the findings to other hospitals with different settings or resource levels. Third, the use of self-reported survey data from staff and patients introduces the possibility of response bias; participants' feedback might be influenced by personal experiences or expectations, and not all respondents may interpret survey questions in the same way. These limitations suggest caution in extrapolating the results universally, and they highlight the need for longer-term and multi-center studies in the future.[12]

Overall, the implementation of the Hospital Administration Control Room at SKIMS has proven to be a vital step in improving patient flow and crisis management at the institution. The survey data and statistical analyses indicate that fast response times and proactive resource management were strongly associated with higher patient satisfaction.[13] This finding underscores that the control room's ability to quickly react to issues – by reallocating beds, calling in staff, or coordinating services – directly enhanced the patient experience. It aligns with existing evidence that efficient hospital operations and reduced waiting times contribute to better patient satisfaction and outcomes.

Strengths

Real-Time Crisis Management

One of the key strengths demonstrated by the control room was enhanced real-time crisis management. By coordinating emergency responses centrally, the control room reduced delays in critical situations such as patient transfers, allocation of emergency beds, and deployment of essential equipment. During the study, when emergencies arose, this centralized approach allowed the hospital to respond in a more organized and efficient manner. For example, the control room could immediately mobilize additional resources (like calling in on-call surgeons or arranging emergency diagnostics) which in the past might have been delayed by fragmented communication. This proactive management style led to measurably shorter resolution times for urgent issues and was noted by staff as a major improvement in handling crises compared to previous workflows.[14]

Cross-Departmental Coordination

Another significant strength was improved cross-departmental coordination. The control room served as a hub for interdepartmental communication, which minimized the kind of siloed decision-making that often causes delays in patient care and diagnostics. Staff reported that many communication issues were resolved by having a single point of contact (the control room) that could quickly relay information and decisions across departments. For instance, if a patient needed to be moved from the Emergency Department to an ICU bed, the control room could coordinate with both departments simultaneously to streamline the transfer. This led to reduced wait times for patients and more synchronized efforts among units. Feedback from hospital staff indicated that since the control room's introduction, there was a perceptible improvement in how fast and efficiently information flowed between departments, attributable to faster decision-making facilitated by the control room.[15]

Areas for Improvement

Staffing Shortages

A recurrent issue identified in both the survey responses and incident reviews was the lack of adequate staffing during

certain high-volume periods or emergencies. While the control room improved many processes, it sometimes struggled when the hospital was understaffed. For example, if multiple incidents occurred simultaneously at night when on-call staff were limited, the control room had to triage issues due to insufficient personnel to address everything at once. This underscores that the control room's effectiveness is partly dependent on the availability of human resources. To further enhance performance, hospital administration may need to allocate additional staff during peak times or develop a more flexible staffing model (such as a floating pool of nurses or technicians who can be summoned as needed). Addressing staffing shortages by improving workforce levels or cross-training staff for multiple roles could significantly boost the control room's capacity to handle concurrent issues without compromising response times.[16]

Improved Communication Systems

Despite overall improvements in coordination, delays in communication between certain departments were still noted as a challenge. Some of these delays were attributed to limitations of the existing communication tools (for example, reliance on phone calls or physical movement of personnel to convey messages). To mitigate this, the hospital could adopt faster and more reliable communication technologies. Potential solutions include implementing a hospital-wide secure messaging system, using mobile alerts, or integrating the control room with digital dashboards accessible to all departments. These technologies can provide real-time updates to relevant staff and reduce the dependency on phone calls or face-to-face briefings, which can be slow during emergencies. By upgrading the communication infrastructure (for instance, ensuring redundant internet connectivity for the control room, or using walkie-talkie networks for critical staff), the remaining communication lags could be reduced, thereby further improving operational efficiency.[17] This recommendation is in line with broader trends in healthcare management that emphasize the use of information technology and electronic health systems to enhance coordination.

Conclusion

The introduction of a centralized hospital control room at SKIMS has significantly enhanced hospital operations, patient flow, and crisis management. This study's findings confirm that real-time monitoring of hospital metrics, rapid decision-making, and structured communication protocols contribute to improved resource allocation and faster emergency response times. For example, by reducing bed allocation delays by approximately 18.9%, the control room played a crucial role in optimizing patient flow and ensuring that emergency cases were handled more efficiently than before the control room was established.

Crucially, the success of the control room model at SKIMS highlights the importance of strong managerial and leadership competencies. Effective communication skills, the ability to manage crises proactively, and robust interdepartmental coordination were identified as key factors that enabled the control room to function optimally. The collaboration between administrative and clinical teams within the control room setting allowed for quicker collective decision-making and better utilization of hospital resources, ultimately leading to improved patient care outcomes. This kind of integrated approach — blending clinical insight with administrative oversight in real time — appears to be a valuable strategy for large hospitals facing complex operational demands.

Despite the successes observed, the study also identified areas that require attention. Staffing shortages, especially during nights or sudden surges of patients, remain a bottleneck that can limit the effectiveness of even the best systems. Additionally, while communication improved overall, there were still instances of interdepartmental communication delays that could impact care. Addressing these challenges should be a priority. Strategies such as increasing the surge capacity of the workforce (e.g., hiring additional float staff or better distributing staff across peak hours) and implementing advanced communication tools (such as integrated incident management software or AI-driven alert systems) could further enhance the efficiency of the control room. The incorporation of technology-driven solutions — for example, AI-powered patient tracking to predict bottlenecks, or automated incident reporting systems to flag issues as soon as they arise — holds promise for elevating the control room's ability to foresee and manage hospital-wide operational challenges in the future.

In conclusion, this study provides a potentially replicable framework for other public hospitals, particularly in resource-constrained settings, aiming to improve their operational efficiency and patient care through centralized coordination. The SKIMS control room experience demonstrates that significant improvements in patient flow and crisis management are achievable even in a resource-limited context by reorganizing existing processes and leadership structures. Hospitals considering similar interventions can draw valuable lessons regarding necessary infrastructure, staff training, and common pitfalls. Future research should explore the long-term impacts of centralized control rooms, including their cost-effectiveness and adaptability, perhaps through multi-center studies. Such studies could also examine how integrating more advanced data analytics and decision-support tools into control rooms might further optimize healthcare delivery. By continuously refining the control room model with new insights and technologies, hospital systems can strive toward a more resilient and efficient healthcare delivery model that ultimately benefits patient outcomes.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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