Improving the emergency services using quality improvement project and Donabedian model in a quaternary teaching hospital in South India

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ABSTRACT

Introduction The primary goal of quality improvement is to enhance patient outcomes, particularly in the emergency department (ED). Timely and effective care is crucial in these situations. By comprehending the challenges, evaluating current performance and implementing quality improvement projects, areas in need of enhancement can be pinpointed and addressed, resulting in better outcomes.

Methodology This interventional study explores the implementation of quality improvement in the ED of a quaternary care teaching hospital in South India. It follows the Plan-Do-Check-Act (PDCA) cycle guided by the Donabedian model. Descriptive statistics were employed to measure changes in outcomes before and after implementation. To improve processes, Donabedian principles were applied, and a performance audit was conducted based on patient feedback and stakeholder input. Various ED indicators were measured. To address identified issues, formal root cause analysis was performed, leading to the generation of PDCA rapid change cycles. These cycles were implemented over 6 months, with two cycles executed, followed by postimplementation evaluation.

Results Post implementation, improvements were observed in several aspects of ED operations. These included reduced ED average length of stay, decreased time to analgesia, shorter cross-consultation time, faster transfer time from ED and improved investigation turnaround time (TAT). Additionally, there was a reduction in revisits to ED within 72 hours and a decrease in patients who left without being seen. These positive changes demonstrate the effectiveness of the quality improvement intervention using the PDCA cycle.

Conclusion A comprehensive understanding of patient profile in the ED and factors influencing care is essential for the hospital to ensure sufficient resources and skilled emergency medicine physicians are available 24/7. By enhancing services in the ED, reducing patient waiting times and improving TAT, the overall efficiency of services can be improved. This leads to provision of timely quality care to patients and ultimately improves their outcomes.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Factors affecting the emergency department's performance such as waiting time, overcrowding, delays, high turnaround time, wait time to triage, the causes of such phenomenon, the effect on patient outcome and the limited interventions suitable for high-resource setting.

WHAT THIS STUDY ADDS

⇒ This paper presents a successful redesign of the delivery of care through Emergency Department Quality Improvement process and team. The study focuses on a low-resource setting, where there is a lack of literature on Quality Improvement projects using the Donabedian model for process improvement and outcome measurement. Therefore, this research outlines the effective implementation of the Quality Improvement initiative, highlighting its positive outcomes.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This model can be applied to a low-resource setting towards change sustainability from a hospital-wide initiative to improve patient safety and quality. An empirical evidence and actionable guide to assist emergency departments of low-resource settings.

INTRODUCTION

The ability to provide quality emergency care services depends on various factors, including a well-trained workforce, acuity level, available resources, leadership and management. Prompt and efficient service delivery during emergencies is crucial for better health outcomes.[1] Numerous studies have highlighted challenges and operational issues in the emergency department (ED), such as overcrowding, insufficient inpatient beds, prolonged length of stay (LOS), high inpatient census and improper resource allocation.[2–4] To enhance care delivery,

hospital administrators must streamline processes, allocate resources appropriately, monitor and evaluate outcomes.

The WHO defines quality health services as timely, equitable, integrated and efficient.[5] In low- and middle-income countries (LMICs), poor quality care contributes to a significant number of deaths, ranging from 5.72 to 8.4 million annually, accounting for up to 15% of overall deaths in these countries.[6] Despite an increasing body of literature on healthcare quality implementation, most of the focus has been on improvement programmes in high-income countries, leaving a notable knowledge gap regarding the implementation of quality improvement (QI) programmes in LMICs. Facility-based emergency care delivery in LMICs is expanding rapidly. However, these efforts often lack measurement of care quality and its impact, which is crucial for enhancing care provision.[7] This study addresses these concerns and focuses on a quality improvement project (QIP) aimed at enhancing emergency service delivery. It investigates priorities and explains the implementation of QI using the Plan-Do-Check-Act (PDCA) cycle and the Donabedian model at the ED of a quaternary teaching hospital in South India.

Rationale

After analysing patient dissatisfaction with the emergency services, a quality team was formed to identify and address the issues. The team conducted a baseline audit of the ED, evaluating various aspects like triage system, throughputs (eg, average length of stay (ALOS), time to analgesia, cross-consultation time, transfer time, turnaround time (TAT) for investigations, clinical correlation between complaints and diagnosis, revisits within 72 hours, and patients who left without being seen). The existing triage system lacked infrastructural divisions and specialist manpower, resulting in patients with less severe symptoms receiving earlier care compared with those with more urgent needs. The team identified factors affecting ALOS, such as time taken for patient assessment, reassessment, cross-consultations, TAT for investigations, non-availability of orderlies and beds in inpatient areas for intensive care, and organisational issues like communication and time management by nursing and clinical staff. Disposition of patients from the ED to inpatient areas was not adequately managed, leading to increased LOS and overcrowding in the ED. The lack of a standardised approach, target times, defined roles, responsibilities and performance monitoring also contributed to operational issues. To address these challenges, the team engaged a dedicated intensive care unit (ICU) and a team of emergency medicine department physicians to improve triaging, ensure prompt treatment and efficient monitoring of patients in the ED. These interventions aimed to break the vicious cycle affecting ED service delivery and improve overall patient satisfaction.

METHODS
Measurement

A QI team, consisting of physicians, staff nurses, managerial nurses, a facility safety team, and a quality advisor, was formed to improve service delivery in the ED. They conducted an in-depth literature search to review existing processes aimed at enhancing care. Subsequently, a performance audit was carried out on 1200 patients who visited the ED between January 2018 and April 2018. The audit assessed various factors, including LOS, time to analgesia, cross-consultation time, transfer time to other hospital areas, TAT for investigations, clinical correlation between complaints and diagnosis, revisits within 72 hours, and patients who left without being seen. To identify areas of improvement, the team performed a cause-and-effect analysis, involving staff members to gain support and plan PDCA cycles. The identified gaps in care were thoroughly discussed and brainstormed to develop a structured, evidence-based, and sustainable strategy. Drawing from concepts of the Donabedian framework, the project team aimed to establish an efficient and effective system, recognising that improvements were required at all levels in the ED (figure 1).

Design

The QI process was implemented through two cycles of the PDCA to achieve the desired outcome. Donabedian framework was applied to conceptualise, plan and evaluate interventions. Internal audit and reaudits were performed to measure compliance post implementation for 6 months, and outcomes were measured. This was further followed by an external audit by an accredited board to ensure quality assurance and certification.

PDCA cycle 1

After obtaining approvals from hospital leadership, the QI team conducted a meeting with the ED workforce to secure their support and cooperation. Table 1 details the action plan for all strategies during PDCA cycle 1. The team designated a specific area for rapid patient assessment and prioritisation, implementing the Emergency Severity Index (ESI) system of triaging to expedite care delivery.

Structural changes were made to accommodate different triage levels, aiming for faster TAT and improved care delivery. On-the-job training sessions were organised for nurses and resident doctors, covering essential topics such as ESI triaging system, assessment, reassessment, escalation and de-escalation of care, disposition and discharge. Protocols, work instructions and policies were developed based on the best practices and evidence-based medicine by the quality assurance and emergency teams. Sensitisation sessions were conducted for the medical imaging and laboratory teams, emphasising the importance of meeting expected TAT for investigations, verification, certification and reporting. To ensure the maintenance of TAT, a short turnaround time (STAT) lab for laboratory investigations and point-of-care
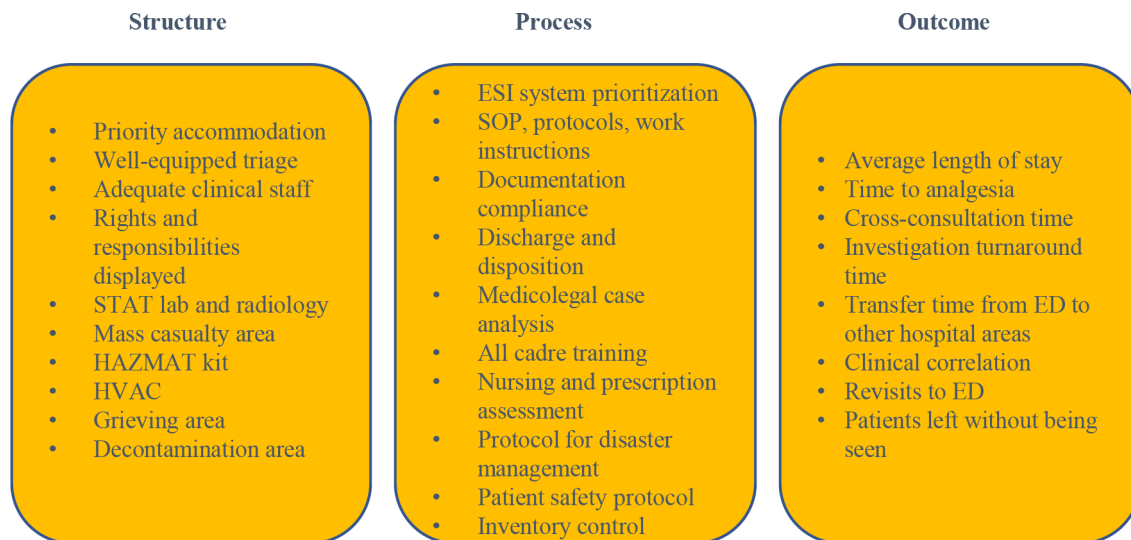
Structure	Process	Outcome
• Priority accommodation • Well-equipped triage • Adequate clinical staff • Rights and responsibilities displayed • STAT lab and radiology • Mass casualty area • HAZMAT kit • HVAC • Grieving area • Decontamination area	• ESI system prioritization • SOP, protocols, work instructions • Documentation compliance • Discharge and disposition • Medicolegal case analysis • All cadre training • Nursing and prescription assessment • Protocol for disaster management • Patient safety protocol • Inventory control	• Average length of stay • Time to analgesia • Cross-consultation time • Investigation turnaround time • Transfer time from ED to other hospital areas • Clinical correlation • Revisits to ED • Patients left without being seen

Figure 1 Donabedian model as a framework for emergency department (ED). ESI, Emergency Severity Index; HAZMAT, hazardous materials; HVAC, heating, ventilation, and air conditioning; STAT, short turnaround time.

(POC) testing in the ED were established, along with a dedicated radiology room for faster imaging of trauma cases. In cases of unavailability of beds, the manager on duty was promptly contacted to address the issue. Additionally, an alert system was designed and implemented to inform the concerned physician about the need for cross-consultation.

PDCA cycle 2

During PDCA cycle 2, the focus was on improving the communication process among clinical and nursing staff, as well as support departments (both clinical and non-clinical). Table 2 outlines the action details for all strategies implemented during this cycle. To enhance communication and information dissemination, the triage algorithm, patient rights and responsibilities were prominently displayed at the entrance of the ED. All developed policies, protocols and work instructions were made easily accessible within the department to guide service delivery. To streamline processes and reduce delays, the test requisition for laboratory work was digitalised, and an automated scheduler was introduced at the radiology department. Critical values were promptly communicated to the on-call physician.

On arrival at the ED, designated triage-trained nurses conducted an initial brief assessment to prioritise cases, documenting the details on an assessment form. The patients were then handed over to the assigned nurse in the triage assessment room for further clinical and nursing management. The designated ED physicians escalated care as per clinical requirements. To facilitate cross-consultations, nurses communicated the need to the consultant, and short message service reminders were generated to avoid any delays with prioritisation of consultation. Emphasis was placed on improving communication between healthcare professionals, nurses and patients to ensure enhanced and effective communication throughout the process. Efforts were made to streamline

handing over during shift transfers to other departments, discharge summaries and disposition summaries. Internal audits and reaudits were conducted over a 6-month period to reinforce and improve these changes. Additionally, an external audit by a third party was implemented to ensure quality assurance. Throughout the improvement process, the project team relied on concepts from the Donabedian framework to establish an efficient and effective system, recognising the importance of effective communication in delivering quality emergency care services.

RESULTS

The analysis of preimplementation and postimplementation data for the ED outcome parameters (as mentioned in figure 1) demonstrated improvements in the postimplementation phase. The QIP and the strategies implemented during the PDCA cycles had a positive impact on various aspects of the ED services.

LOS in ED and factors affecting it

In the postimplementation phase, the results showed an improvement in reducing the ALOS in the ED (figure 2A). During the preintervention phase, the percentage of patients with ED LOS less than 2 hours was 21%, and those with LOS between 2 and 4 hours accounted for 41%. However, after the intervention, these figures increased to 30% and 48%, respectively, regardless of the patient's clinical presentation and pain level. Furthermore, the percentage of patients with ED LOS between 4 and 6 hours and beyond 6 hours decreased by 9% and 7%, respectively, post intervention. This indicates a reduction in the number of patients experiencing prolonged stays in the ED. To investigate the reasons for the prolonged LOS, a cause-and-effect diagram (commonly known as a Fishbone or Ishikawa diagram) was used (figure 2B). This diagram helps identify potential factors that contribute to the extended ED stays. By visually mapping out these

Table 1 PDCA cycle 1 strategy details

Action aimed	Action details	Responsibility special point of contact	Timeline
Redesign structural changes	1. Patient arrival area to identify level of urgency 2. Dedicated room space for different levels of triage 3. Dedicated chest pain and stroke priority area 4. Green outpatient department (OPD) for patients requiring ambulatory care 5. Temporary buffer and discharge area for hosting patients who need less treatment, are waiting for transportation, or are going to be admitted to inpatient care 6. Sound absorbing tiles and walls	► Projects and Operations department ► Quality assurance department	May–July
Care transition	1. Handover tools 2. Discharge planning 3. Discharge communication 4. Handover training 5. Dedicated offload nurse for triaging and assessing emergency medical services patients 6. Nurse discharge coordinators	► Clinical team ► Nursing team ► Quality assurance department ► Medical committee	July–August
Policies, protocols and work instructions	1. Patient triage 2. Patient management/ care protocols 3. Patient transfer and/or referrals	► Clinical team ► Nursing team ► Quality assurance team	July–August
Pharmacy turnaround time	1. Pharmacotherapy recommendations 2. Audits by clinical pharmacist tracking patient medication due times for repeat medications, completing medication histories, documenting patient body weight, height and allergies 3. Patient follow-up on culture and sensitivity results, adjusting or discontinuing therapy as needed	► Pharmacotherapeutic committee	July–August
Training	1. Disaster preparedness and management 2. Skill-based training for paramedical and emergency medicine technician 3. Communication skills training 4. Standard treatment guidelines for emergencies	► Disaster management committee ► Nursing team ► Medical committee	May–July
Radiology and lab TAT	1. STAT lab with rapid response capability 2. Point of care testing 3. Effective communication and channels of communication 4. Picture archiving and communication system (PACS)	► Lab committee ► Operations department ► Quality assurance department	July–August
Patient throughput	1. Nurse floor coordinator 2. Early assessment investigation and initial treatment (EAII) 3. Additional location for surges 4. Team composition interventions 5. Time to analgesia<20 min	► Nursing team ► Medical committee	May–July

HAZMAT, hazardous material; HVAC, heating ventilation airconditioning; PDCA, Plan-Do-Check-Act; STAT, short turn around time.

factors, the QI team can gain insights into the root causes and address them effectively.

Various factors affect the LOS in the ED. In both the preintervention and postintervention phases, we gathered data on the time to analgesia (figure 2C). A variation was observed between these phases. Percentage of patients with time to analgesia less than 20 min increased by 15% (ie, from 32% to 47%), and with more than 20 min reduced by 15% (ie, from 68% to 53%). Causes leading to delayed time to analgesia were studied and are shown in (figure 2D).

Time taken by various departments to respond to the cross-consultation calls from the ED also affects LOS (figure 2E). A reduction in cross-consultation time was

Table 2 PDCA cycle 2 strategy details

Action aimed	Action details	Responsible	Timeline
Professional development	1. Customer service training 2. Resolution of expectations and negotiating agreement 3. Skills audit and feedback benchmarks 4. Workshops	► External support ► Quality assurance department ► Human resource department	August–September
Communication and technology	1. Process-driven checklist 2. E test requisition and radiology scheduler 3. Prehospital communication for ambulance 4. Critical report alert system 5. Monitoring frequency of communication and audit for failed communication 6. Communication scheme for example, whiteboard, text, cell phones	► Information technology team ► External vendors	August–September

PDCA, Plan-Do-Check-Act.

observed for all the departments post implementation. The urology department had the longest response time to cross-consultation calls, while both the orthopaedics and psychiatry departments had the shortest response time, both before and after implementation. Departments like medicine and surgery, which had a huge number of cross-consultations, also showed reduction in this time post implementation but still averaged ~25 min.

Common investigations ordered in the ED and the time taken to obtain their results were examined preimplementation and post implementation (figure 2F). The overall TAT was improved post implementation, as evidenced by the decrease in TAT for various investigations. TAT for X-ray reduced by 12 min, CT by 14 min, MRI by 8 min, Doppler by 7 min, focused assessment with sonography for trauma (FAST) scan by 9 min, ultrasonography (USG) by 12 min, ECG by 2 min, and 2D echocardiogram by 6 min.

Time elapsed between the physician's advice to transfer the patient from ED to the actual transfer to another department impacts LOS. Average transfer time from the ED to other hospital areas showed improvements post implementation (figure 2G). Transfer time from ED to ICU reduced by 3.8 min (30%), high dependency unit (HDU) by 7.43 min (33%), ward by 4.11 min (22%), operation theatre by 2.9 min (28%), Cathlab by 1.4 min (23%), outpatient department by 2.85 min (26%) and dialysis unit by 2.32 min (22%). Factors affecting this transfer time were also investigated and illustrated in a cause-and-effect diagram (figure 2H).

Clinical correlation between type of complaint and diagnosis
Clinical correlation between the type of complaint and diagnosis was enhanced in the postimplementation phase (figure 3). In preimplementation phase, correlation between the type of complaint and the provisional diagnosis was 79% while after implementation, it increased to 84%. Similarly, correlation between the provisional diagnosis and final diagnosis was 92% in the preimplementation phase and increased to 95% post implementation.

ED patient revisits and left without being seen
Patients who revisited the ED within 72 hours after discharge decreased by 0.5% post implementation whereas patients who left without being seen reduced by 0.2% (figure 4A). Reasons for these unplanned returns were identified and mapped on a fishbone diagram (figure 4B).

DISCUSSION
The project improvement used targeted approaches to improve service delivery in the ED using QIP and the Donabedian model. Strategies to enhance ED functioning were developed and implemented through two PDCA cycles. One of the main focuses in PDCA cycle 1 was optimising the ED's design, including the waiting area, triage space, bed capacity and its location within the hospital, as these factors significantly influence the operational success of the ED. In addition, adhering to standardised protocols and work instructions in the ED played a crucial role in optimising emergency care delivery.[8] The ED must be prepared to handle unexpected patient flow and to meet unpredictable demands. Hence, disaster management preparation, skill-based training, utilisation of new technology and digitalisation were incorporated to support the provision of safe and quality care. Digitalisation also helps to redistribute non-clinical workload effectively.[9] The team composition interventions included incorporating advanced nursing roles, physiotherapy, pharmacy and physician assistance, and nurse practitioners into the ED setup. These team members played essential roles in providing comprehensive and efficient emergency care services.

The focus on noise control is generally less emphasised; however, ambient noise can be associated with an increase in physiological parameters, stress among nurses and communication breakdowns. Communication weaknesses were identified, including the use of closed questions, poor explanations and negotiation, and lack of empathetic conversation through direct observations,
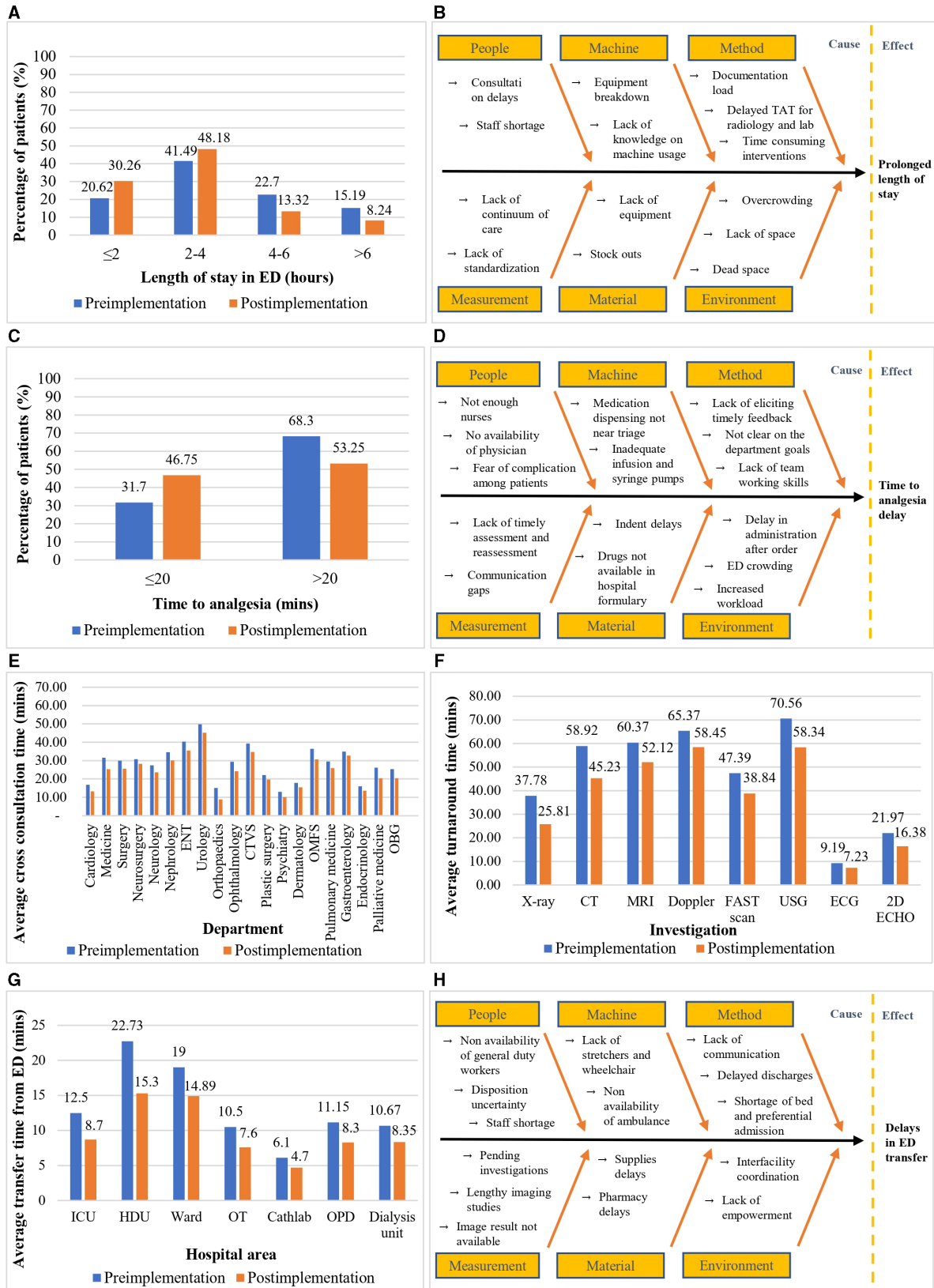
Figure 2 Analysis of length of stay (LOS) in emergency department (ED) and factors affecting it. (A) LOS in ED preimplementation and post implementation. (B) Cause-and-effect diagram for prolonged LOS. (C) Time to analgesia before and after intervention. (D) Cause-and-effect diagram for delay in time to analgesia. (E) Average cross-consultation time for departments preimplementation and post implementation. (F) Turnaround time (TAT) for investigations in ED. (G) Average transfer time from ED to other hospital areas. (H) Cause-and-effect diagram for delays in ED to other hospital area transfers. FAST, focused assessment with sonography for trauma; HDU, high dependency unit; ICU, intensive care unit; OPD, outpatient department; OT, operation theatre; USG, ultrasonography.
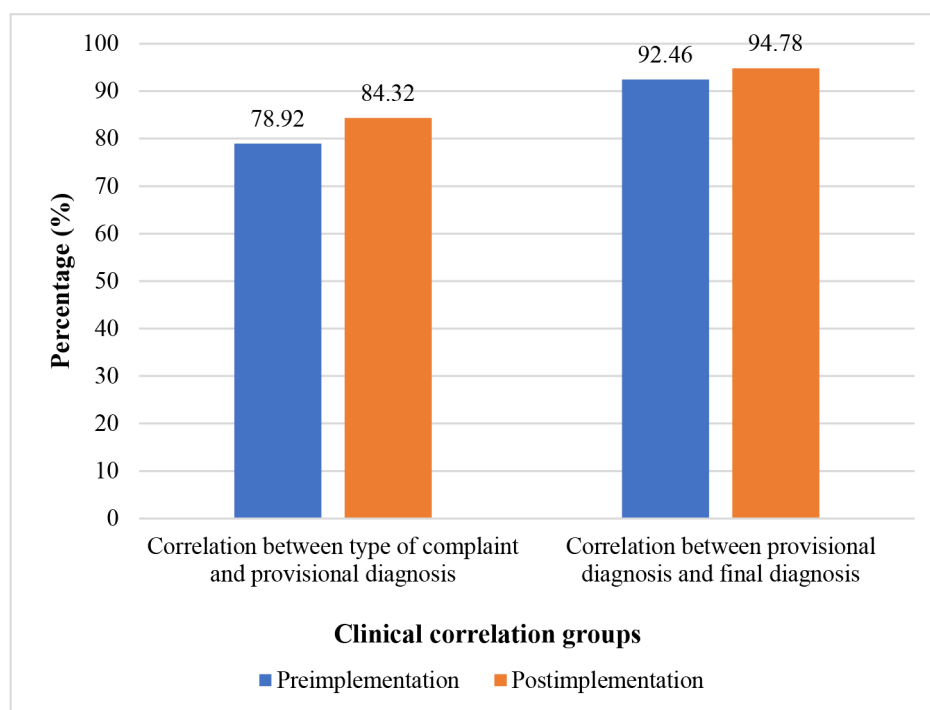
Figure 3 Correlation between type of complaint, provisional and final diagnosis.

which can result in omissions and ambiguity with patients and other care providers.[10] Therefore, this aspect was exclusively focused on in the second cycle of PDCA. Some of the strategies were adapted from strategy reviews by Welsch *et al.*[11]

Post implementation of the PDCA cycles, the analysis of ED outcome parameters was conducted. One crucial performance indicator in evaluating the quality of care is the LOS of patients in the ED. Factors such as TAT for diagnostics and specialty consultation, triage level and bed availability can significantly impact the average LOS.[12–15] Through root cause analysis (RCA), internal audits and observations, the current project identified similar factors affecting LOS, along with other reasons such as patient flow, personnel shortage, lack of equipment/diagnostic aids and decisions regarding patient discharge or transfer. The project team addressed these issues by implementing relevant strategies. The postimplementation audit revealed a marked improvement in LOS, with 78.44% of patients being disposed of from the ED within 4 hours. The percentage of patients with LOS≤2 hours increased by 9.64%. These positive changes can be attributed to a reduction in transfer time from the ED to other areas, such as ICU, HDU, wards, and so on, and quicker disposition of non-urgent patients. Additionally, the reduction in TAT for investigations contributed to early transfers and decreased LOS. Studies have adopted various approaches, including Lean-based multidisciplinary initiatives for process improvement, ED redesigning and other interventions to reduce ALOS. Some of these efforts have successfully achieved a reduction in ALOS over a specific period.[16–18] While factors like

age, presenting complaint and comorbidities cannot be altered, their early identification and management are critical in minimising ED LOS. Addressing these factors and continuously improving the process can lead to enhanced efficiency and better patient outcomes in the ED.

Recent studies have placed significant focus on the time to analgesia and its impact on patient outcomes. Patients expect to receive prompt analgesia, not only to improve their biological outcomes but also to alleviate anxiety. In the current study, the postintervention results showed that 46.75% of patients achieved time to analgesia ≤20 min, and the percentage of patients receiving analgesia after 20 min of presentation to the ED decreased by 15%–53.2%. This achievement was made possible by implementing a pain management protocol, conducting regular pain assessments and reassessments, and ensuring that analgesia was administered within 20 min of arrival. Similar approaches with nurse-led analgesia protocols have been adopted in several other studies.[19] While some studies have used pain scores as the outcome measure, others have focused on the time to analgesia.[20] Enhancing pain assessment, prompt delivery of analgesia and accurate record-keeping can be achieved by increasing awareness, conducting thorough assessments, and implementing supportive protocols. By implementing these measures, healthcare providers can improve pain management and enhance the overall patient experience in the ED. Another important factor affecting the ED LOS is the time spent waiting for various consultations requested by the emergency medicine physicians for diagnosis or treatment of patients requiring additional opinion and
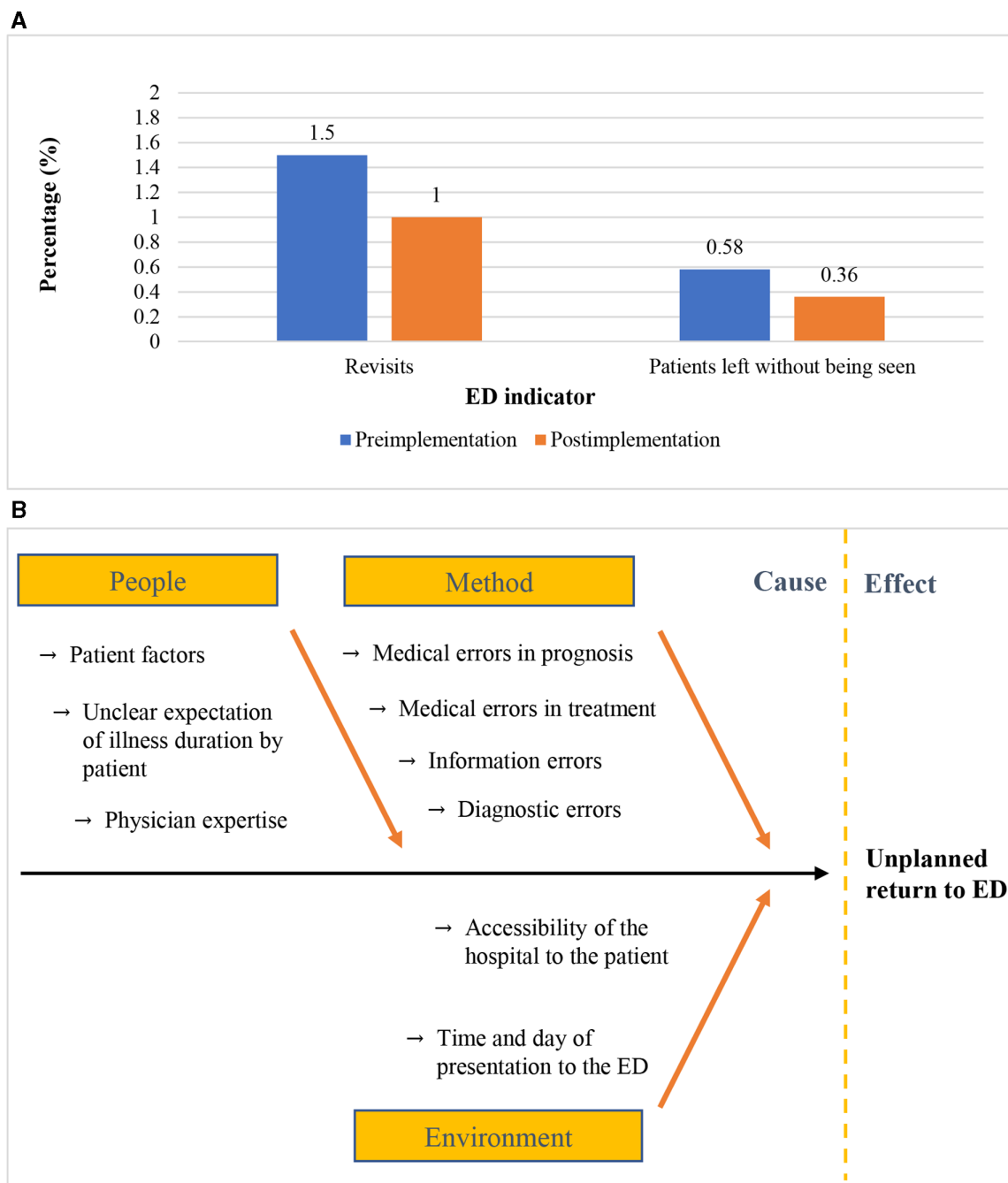
Figure 4 Analysis of emergency department (ED) patient revisits and patients left without being seen. (A) Percentage of revisits and patients left without being seen preimplementation and post implementation. (B) Cause-and-effect diagram for unexpected ED return visits within 72 hours.

management from different areas of specialty. Delays occurring due to cross consultations leads to congestion in the ED, shortage of beds, prolonged LOS and patient dissatisfaction. Post implementation, it was observed that the average cross-consultation time was reduced for all departments, signifying the importance of employing a data-driven approach and regular improvement cycles to enable transparency, equitable workload and reduced consultation times.[21]

Monitoring the variabilities in TAT helps us gain insights into the causes of delay. This, in turn, enables us to improve various aspects of our final processes and address related issues that may impair lab productivity and personnel efficiency. Consequently, evaluating TAT can significantly shorten delivery times, increase customer satisfaction and decrease costs. In other words, delayed TAT for investigations can have a notable impact on the LOS and clinical outcomes. Implementing more rapid testing can save time and consequently lead to cost savings.[22 23] With an average caseload of approximately 200 patients per day in the ED, it becomes imperative for the hospital to prioritise a faster bed turnover interval, efficient disposition and prompt patient transfers. Timely investigations turnaround is crucial for achieving faster

disposition and improved clinical outcomes. To expedite TAT, the hospital introduced a STAT lab, POC testing and a dedicated radiology unit in the ED. Additionally, a critical value reporting system was implemented to facilitate prompt clinical management. These initiatives have played a significant role in reducing TAT and optimising patient care.

The transfer of patients inside and between hospitals is a crucial aspect of patient care, often done to enhance the patient's existing management while maintaining the continuity of medical care. In a study by Kar *et al*, the impact of early patient transfer from ED to ICU (within 1 hour) on patient outcomes was investigated.[24] Patient transfers also have an effect on the LOS in the ED, making it essential to identify and address any bottlenecks in the process. After conducting an RCA and identifying factors such as lack of communication, staff shortages, inadequate availability of stretchers and wheelchairs, delays in supplies, and pending investigations, measures were implemented to tackle these issues and optimise the workflow. Ensuring appropriate communication and proper allocation of resources were among the steps taken to improve the transfer time from the ED to other hospital areas. The results of the postimplementation evaluation showed improvements in this indicator, reflecting the positive impact of the measures taken to streamline patient transfers. By addressing these factors and optimising the transfer process, the hospital can enhance patient care, reduce LOS and improve overall clinical outcomes. The improvements in reducing ALOS and identifying the reasons behind prolonged stays highlight the success of the QI project. The data suggests that the implemented strategies have positively impacted ED efficiency and patient care, resulting in better outcomes for patients seeking emergency services.

Gaps between provisional and final diagnoses, regardless of specific disease situations, serve as an important indicator of hospital performance, and aligning these diagnoses can lead to higher patient satisfaction and more efficient utilisation of health resources. In our study, the correlation between the type of complaint and the provisional diagnosis increased from 79% in the preimplementation phase to 84% in the postimplementation phase. Similarly, the correlation between the provisional diagnosis and final diagnosis improved from 92% to 95% after implementation. A preliminary diagnosis made by a doctor plays a crucial role in guiding subsequent care, and an accurate preliminary diagnosis significantly impacts the patient's outcome.[25] Therefore, the correlation between this preliminary diagnosis, the patient's symptoms and the final diagnosis holds particular significance in determining the patient's outcome. Notably, clinical correlation as a quality indicator has received limited attention in the literature, resulting in a paucity of studies on its effectiveness. However, similar gaps in diagnostic correlations have been observed in both private and public sector institutions, with higher gaps often found in the public sector.[26] These gaps present opportunities

for improvement through QI projects or the implementation of other effective novel models of care and service delivery. Addressing these gaps can lead to enhanced patient care and better clinical outcomes.

Understanding the causes of revisits to the ED within 72 hours and their impact on patient outcomes is a critical aspect of this study. During the postimplementation phase, the rate of patients revisiting the ED with similar problems within 72 hours of discharge was reduced to <1%, which is considered an acceptable rate by some studies. Several factors influence whether a patient will revisit the ED, including age, sex, time and day of presentation, type of complaint, triage acuity level, physician expertise, investigations, treatment provided and hospital accessibility.[27] By addressing these factors and implementing improvement strategies, the rate of revisits was successfully reduced in this study. Overcrowding in the ED is another concern, as it may lead to patients leaving the ED without being seen, which negatively affects patient satisfaction and compromises patient outcomes. However, post implementation, the percentage of patients leaving without being seen decreased due to better patient mobilisation and improved bed availability based on patient requirements.

This multidisciplinary initiative to enhance care quality in the ED will continue with further PDCA cycles, RCA and the implementation of improvement strategies. It is important to acknowledge the limitations of this study, including its single-centre nature and the fact that not all ED indicators were considered. Despite these limitations, the study demonstrates the effectiveness of the implemented interventions in improving ED performance and patient outcomes. Continual efforts to monitor and improve care quality in the ED will further enhance patient care and satisfaction.

CONCLUSION

In conclusion, this study successfully implemented a QIP at the ED of a quaternary teaching hospital in South India. Using the PDCA cycle guided by the Donabedian model, the project focused on improving various aspects of service delivery and patient outcomes. Through comprehensive assessments, performance audits and RCAs, the project team identified key areas for improvement. Additionally, the study highlighted the importance of effective communication, teamwork and standardised protocols in enhancing ED efficiency and patient care. The successful integration of a multidisciplinary team and the use of evidence-based practices contributed to the positive results. Overall, this study serves as a valuable contribution to the literature on QI in low-resource settings. By adopting targeted approaches and evidence-based practices, hospitals in similar settings can improve ED performance, enhance patient experiences and ultimately achieve better patient outcomes. The project team was able to identify the gaps in the ED using a systematic approach and making interventions that focused on these

gaps to minimise the risk of unsafe care. QI projects such as these have a great potential to strengthen the system of patient-centred and safe care, especially in LMICs.

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Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was approved by KMC-KH IEC. Participants gave informed consent to participate in the study before taking part.

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