https://doi.org/10.4038/sljma.v26i2.5559

The Sri Lanka Journal of Medical Administration

https://sljma.sljol.info/ Original Article Volume 26 Issue 02

Providing Beds for All Inward Patients Admitted in Medical Units in the Teaching Hospital Batticaloa. A Strategic Approach

Mayuran N[1], Sasikumar T[1], Barthelot M[2]

[1]Post Graduate Institute of Medicine, University of Colombo, [2]Teaching Hospital, Batticaloa

Correspondence to:
N Mayuran

E-Mail
nmayuran@gmail.com

Key Words:

Bed occupancy rate, admission policy, medical wards, Teaching Hospital Batticaloa, patient allocation

Abstract

Introduction: Teaching Hospital Batticaloa (THB), the only tertiary care center in the Eastern Province of Sri Lanka, serves over two million people across six districts. The hospital has a total bed capacity of 1,257, with the medical specialty comprising four units, including a professorial unit (242 beds). Despite this allocation, inequitable patient distribution resulted in persistent overcrowding in casualty and post-casualty wards (BOR >100%), while non-admission wards remained underutilized (BOR <65%).

Objective: To ensure that all inward patients admitted to medical units were allocated an inpatient bed by implementing a revised admission policy, and to evaluate its effect on BOR distribution across wards.

Methods: This was an interventional before-and-after study designed to evaluate the impact of implementing a revised admission policy on bed occupancy rate (BOR) in medical wards of THB. Secondary data on BOR were analyzed alongside key informant interviews with the Director, Consultant Physicians, and Emergency Physicians. A focus group discussion with nursing officers further informed the design of a "Revised Admission Policy for Medical Wards." The strategy directed daytime admissions (8.00 am–4.00 pm) based on patient category: Categories I–II to the casualty ward, and Categories III–IV alternately to non-admission (Sub-casualty wards) wards using two time slots. From 4.00 pm–8.00 am, all categories were admitted to the casualty ward.

Results: One-month post-implementation, BOR data showed a marked improvement in patient distribution. BOR in casualty and post-casualty wards, previously exceeding 100%, declined to 91.0% and 69.4% respectively, while sub-casualty and non-admission wards maintained BOR around 61–74%. Overall, all medical units operated below 100%, eliminating overcrowding and ensuring equitable bed allocation.

Conclusion: A structured admission policy improved equity in patient distribution, optimized bed utilization, and reduced overcrowding. Sustained implementation with periodic review is recommended, with potential applicability to other specialties facing similar challenges.

Introduction

Hospital bed availability is a critical determinant of healthcare delivery and patient satisfaction. Globally, overcrowding in medical wards is a persistent challenge in tertiary-care hospitals, often leading to compromised quality of care, poor patient outcomes, and staff burnout (1). In Sri Lanka, where the healthcare system is publicly funded and tertiary hospitals act as referral centers for large populations, the issue of optimal utilization of hospital beds becomes even more significant (2).

Teaching Hospital Batticaloa (THB), the only tertiary-care and teaching hospital in the Eastern Province, caters to over two million people across six districts. It has a total bed capacity of 1,257 and a workforce of nearly 1,900 staff, delivering services in more than 20 subspecialties in addition to four major specialties. The medical specialty, one of the busiest departments, comprises four medical units including a professorial unit, with a combined bed strength of 242 (128 beds in male wards and 114 in female wards).

Despite this allocation, a major issue persisted: overcrowding in the casualty and post-casualty medical wards, with bed occupancy rates (BOR) consistently exceeding 100%, while two other medical wards remained underutilized with BORs below 50%. This uneven distribution of patients not only caused distress for patients and their families but also created significant strain on healthcare staff, particularly in casualty wards.

The root cause was the absence of a structured admission policy for medical patients. Casualty wards admitted the bulk of patients, while other units were perceived as "non-admission wards," receiving fewer patients despite available beds. This resulted in avoidable inequities in workload distribution, inefficient use of resources, and overcrowding-related patient safety risks.
Therefore, this study aimed to ensure that all inward patients admitted to medical units were allocated an inpatient bed by implementing a revised admission policy, and to evaluate its effect on BOR distribution across wards

Description of the Intervention

To address the problem, hospital leadership initiated a structured intervention "Revised Admission Policy for Medical Wards" after stakeholder engagement, categorization of patients, and the design of a rotational admission system. This policy was excluded for weekend and public holiday admissions and those day admissions remained same with previous admission policy (3).

"Revised Admission Policy for Medical Wards"

a. *Stakeholder Engagement:* Recognizing that any admission policy would impact multiple departments, a collaborative approach was adopted. Key informant interviews were conducted with the Hospital Director, Consultant Physicians, Consultant Emergency Physician, and a focus group discussion was held with in-charge nursing officers of the medical wards. Their perspectives helped identify challenges and practical solutions to ensure policy acceptance and sustainability.

b. *Patient Categorization:* Patients admitted through the Accident and Emergency (A&E) Department were categorized based on clinical severity and urgency (Figure 1). This categorization allowed more efficient allocation of patients to appropriate wards.

c. *Principles of Revised Admission Policy of Medical wards:* The admission policy was designed with the following principles in figure 2.(**Sub-casualty ward – ward where the patients' categories III and IV are admitted time slot A and B.)* Time slots were selected based on routine admission flow patterns in the medical units. The period from 08:00–16:00 represents peak hours for admissions and transfers following morning clinical rounds, investigations, and A&E decision-making. Therefore, this window was divided into two operational blocks (08:00–12:00 and 12:00–16:00) to allow equitable patient allocation between sub-casualty wards while maintaining feasibility for nursing and medical handovers. The period 16:00–08:00 was considered off-peak with limited staffing and was maintained as centralized admission to casualty wards to ensure safety and operational simplicity.

<u>Time Slot A (8:00 am – 12:00 pm)</u>

Category I and II patients were admitted to the casualty ward.

Category III and IV patients were admitted to Sub-casualty - 1 ward based on a rotational time-slot system:

<u>Time Slot B (12:00 pm – 4 pm)</u>

Category I and II patients were admitted to the casualty ward.

Category III and IV patients were admitted to Sub-casualty - 2 ward based on a rotational time-slot system:

<u>Time Slot C (4:00pm – 8:00am)</u>

All patients, irrespective of category, were admitted to the casualty ward to streamline admissions during off-peak hours.

Category	Description
Category I	Critically ill patients requiring immediate admission to a high-dependency setting.
Category II	Patients with acute but manageable conditions requiring close monitoring.
Category III	Patients with stable conditions requiring inpatient care but not intensive monitoring.
Category IV	patients with chronic or less urgent conditions requiring hospital observation.

Figure 1: Patient categorization at Triage

Wards	Time Slot A (8am – 12pm)	Time Slot B (12pm – 4pm)	Time Slot C (4pm – 8am)
Casualty ward	Category 1 and 2	Category 1 and 2	Category 1 – 4
*Sub-Casualty ward - 1	Category 3 and 4	No admission	No admission
*Sub-Casualty ward - 2	No admission	Category 3 and 4	No admission
Non-admission ward	No admission	No admission	No admission

Figure 2: Principle of revised admission policy of medical wards

d. *Categorization Responsibility:* The A&E Department team was responsible for assessing and categorizing patients before allocation, ensuring clinical appropriateness.

Responsibility of Roster
Medical Officer – Quality and Safety is the responsible person for preparing monthly roster.
The intervention thus introduced equity into the admission process, optimized bed utilization across all medical wards, and reduced pressure on casualty wards.

Methods Used for the Evaluation

Study Design
This was an interventional before-and-after study designed to evaluate the impact of implementing a revised admission policy on bed occupancy rate (BOR) in medical wards of Teaching Hospital Batticaloa. No randomization or control ward was used, as the intervention was implemented as a hospital-wide service improvement initiative. (4).

Data Sources
- Secondary Data: Bed Occupancy Rate (BOR) data were retrieved from the hospital's online Hospital Statistics system for all four medical units. BOR is defined as the percentage of available beds occupied over a specific period.
- Qualitative Data: Perceptions and experiences of staff were collected during key informant interviews and focus group discussions.

Data Collection Period
- Pre-intervention: BOR of first quarter of 2025 was analyzed and gap identified.
- Post-intervention: Post-intervention BOR was assessed one month after implementation to capture the early operational effect of the intervention after stabilization of ward practices, while minimizing contamination by additional administrative changes (e.g., staffing transfers and bed reallocations) that typically occur over longer timeframes.

To reduce seasonal variation, pre-intervention BOR was taken from the first quarter of 2025, and post-intervention BOR was collected during the comparable routine service period immediately after implementation. No major outbreaks, disasters, or bed-capacity expansion occurred during the evaluation period. Weekend and public holiday admissions were excluded from the intervention as the policy remained unchanged during these periods. However, residual confounding due to seasonal morbidity trends and patient inflow variation cannot be fully excluded.

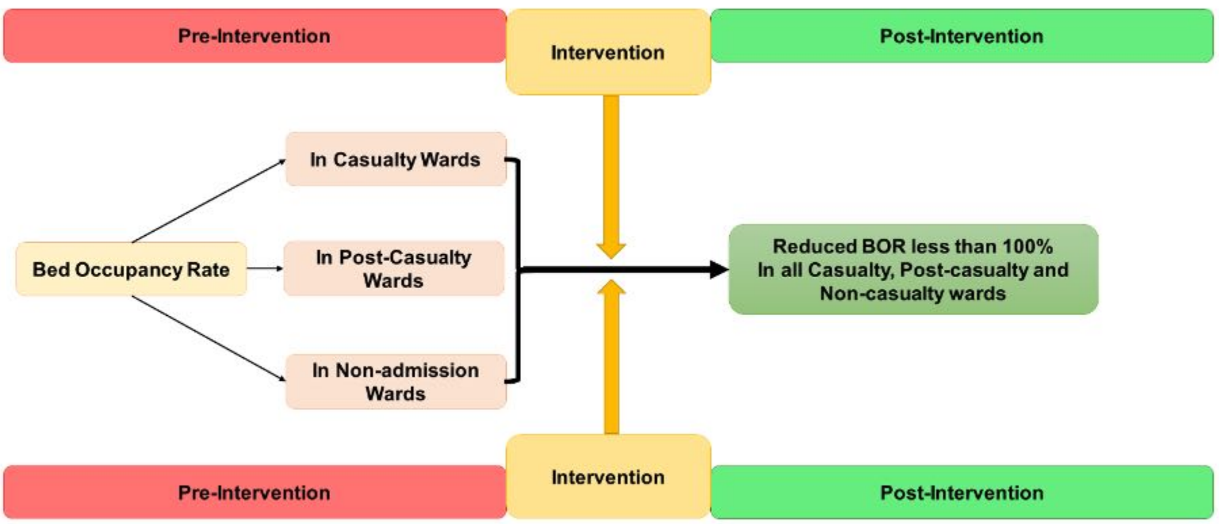

Figure 3: Schematic map of the project

Study Population
This study conducted in medical units in Teaching Hospital Batticaloa. Teaching Hospital Batticaloa consists of 4 Medical Units (Figure 4).

Unit	Category	Bed capacity
Unit 1	Male	29
	Female	33
Unit 2	Male	32
	Female	25
Unit 3	Male	35
	Female	23
Unit 4	Male	32
	Female	33
Total beds		**242**

Figure 4: Details of Medical wards in Teaching Hospital Batticaloa

Analysis
BOR trends were compared across the four medical units before and after implementation. Qualitative data were analyzed thematically to identify facilitators and challenges of policy implementation.

Ethical Considerations
This was a quality improvement initiative conducted within the hospital system. Data were anonymized, and the intervention was approved by hospital leadership as part of routine service optimization.

Results

Bed Occupancy Rate Trends during pre- and post-intervention phase
Across all four units, pre-intervention BOR consistently exceeded 100%, reflecting overcrowding and demand beyond the available bed capacity. After the intervention, BOR in almost all subgroups decreased to below 100%, suggesting that bed use returned to a more manageable level.
Overall, the combined BOR across the ward declined from 112.9 ± 17.6 pre-intervention to 91.0 ± 10.4 post-

Table 1. BOR in Casualty wards during Pre- and Post-intervention

Unit	Male/Female	Pre-intervention	Post-intervention
		BOR in % (Mean + SD)	BOR in % (Mean + SD)
Unit 1	Male	120.7 ± 25.0	95.2 ± 9.3
	Female	106.6 ± 16.4	81.2 ± 7.8
Unit 2	Male	103.1 ± 5.7	97.4 ± 9.4
	Female	126.0 ± 7.7	92.0 ± 11.9
Unit 3	Male	103.4 ± 9.1	86.9 ± 13.0
	Female	129.3 ± 25.7	87.8 ± 10.4
Unit 4	Male	115.0 ± 10.0	87.5 ± 5.0
	Female	100.8 ± 3.8	99.2 ± 4.5
Overall		112.9 ± 17.6	91.0 ± 10.4

Table 2. BOR in Post Casualty wards during Pre- and Post-intervention

Unit	Male/Female	Pre-intervention	Post-intervention
		BOR in % (Mean + SD)	BOR in % (Mean + SD)
Unit 1	Male	114.7 ± 20.2	56.9 ± 32.9
	Female	97.7 ± 11.4	38.6 ± 18.7
Unit 2	Male	105.6 ± 18.0	86.9 ± 28.4
	Female	124.0 ± 31.4	80.8 ± 29.7
Unit 3	Male	95.7 ± 7.2	82.9 ± 32.9
	Female	109.6 ± 5.7	80.0 ± 46.9
Unit 4	Male	106.7 ± 16.7	54.7 ± 18.5
	Female	102.3 ± 15.7	66.1 ± 11.4
Overall		107.5 ± 18.2	69.4 ± 30.9

Table 3. BOR in Non-admission during Pre-intervention and Sub-casualty ward during post-intervention

Unit	Male/Female	Pre-intervention	Post-intervention
		BOR in % (Mean + SD)	BOR in % (Mean + SD)
Unit 1	Male	67.0 ±14.6	83.4 ± 39.9
	Female	70.3 ± 25.8	70.3 ± 29.3
Unit 2	Male	64.1 ± 30.8	43.1 ± 20.9
	Female	78.4 ± 27.4	44.0 ± 19.1
Unit 3	Male	57.1 ± 28.0	59.7 ± 29.5
	Female	62.1 ± 33.3	55.1 ± 28.5
Unit 4	Male	65.5 ± 22.1	66.0 ± 27.9
	Female	55.1 ± 21.6	65.2 ± 25.2
Overall		64.6 ± 26.0	61.7 ± 30.1

Table 4. Overall BOR during Pre- and Post-intervention phase

Unit	Pre-intervention		Post-intervention		P Value
	No. of Days	BOR in % (Mean + SD)	No. of Days	BOR in % (Mean + SD)	
Casualty ward	37	67.0 ±14.6	40	83.4 ± 39.9	t=6.58, df~57.5 p<0.001
Post-Casualty ward	36	70.3 ± 25.8	38	70.3 ± 29.3	t=6.50, df≈60.5 p<0.001
Sub-Casualty ward	-	64.1 ± 30.8	77	43.1 ± 20.9	-
Non-admission ward	79	78.4 ± 27.4	5	44.0 ± 19.1	-

intervention, confirming that the intervention effectively reduced overcrowding and brought BOR under 100%.

Overall BOR across post-casualty wards fell from 107.5 ± 18.2% before the intervention to 69.4 ± 30.9% after the intervention, demonstrating a clear reduction from overcrowding (>100%) to under-capacity (<100%).

At the overall level, the BOR averaged 64.6 ± 26.0% pre-intervention in the non-admission ward and 61.7 ± 30.1% post-intervention in the sub-casualty ward.
Importantly, unlike the casualty and post-casualty wards, BOR values in both non-admission and sub-casualty wards were consistently below 100%, indicating that these wards did not experience overcrowding either before or after the intervention.

The mean bed occupancy rate (BOR) in the Casualty ward showed a marked reduction following the intervention. The pre-intervention BOR was 112.9 ± 17.6 (n=37), which decreased to 91.0 ± 10.4 (n=40) post-intervention. This reduction was statistically significant (t=6.58, p<0.001).
Similarly, in the post-casualty ward, the mean BOR decreased from 107.5 ± 18.2 (n=36) before the intervention to 69.4 ± 30.9 (n=38) afterwards. The difference was highly significant (t=6.50, p<0.001).
For the Sub-Casualty ward, only post-intervention data were available (mean BOR 61.7 ± 30.1, n=77). Hence, no statistical comparison was possible; however, the descriptive statistics suggest a relatively lower occupancy compared to other wards.

In contrast, the non-admission ward demonstrated no significant change in BOR. The mean BOR increased slightly from 63.9 ± 26.1 (n=79) pre-intervention to 74.9 ± 24.1 (n=5) post-intervention. For the non-admission ward, post-intervention observations were limited (n=5), therefore only descriptive comparison is presented, and no valid statistical inference was performed.

Overall, the intervention was associated with a significant reduction in BOR in the Casualty and Post-Casualty wards, while no significant changes were observed in the Non-admission ward.

Summary

Pre-intervention, BOR showed significant disparities

- Casualty and post-casualty wards: >100% (severe overcrowding).
- Other two medical wards: <65% (underutilization).

After one month of implementing the new admission policy:

- BOR across all four medical units was balanced and consistently maintained below 100%.
- Casualty ward BOR reduced significantly, easing overcrowding.
- Previously underutilized wards achieved more efficient bed use.

Staff Perceptions

- Hospital Director: Highlighted smoother patient flow and reduced complaints from patients' families regarding lack of beds
- Consultants: Expressed satisfaction with equitable case distribution, allowing fair teaching opportunities for medical students and trainees.
- Nursing Officers: Reported improved workload distribution, reduced stress, and better capacity to provide quality care.

Patient Care Outcomes

Although formal clinical outcomes were not measured, anecdotal reports indicated

- Reduced delays in bed allocation.
- Decreased incidence of patients being treated in corridors.
- Improved patient and family satisfaction.

Lessons Learned

1. Importance of Structured Admission Policies

The intervention demonstrated that clear admission guidelines can dramatically improve equity in bed allocation. Without structured policies, informal practices perpetuate imbalances, leading to overcrowding and inefficiency (5).

2. Stakeholder Engagement Ensures Sustainability

Early involvement of consultants, nurses, and hospital leadership was critical. Their ownership of the intervention fostered cooperation and adherence(6).

3. Flexibility is Key

The slot-based admission system allowed real-time redistribution of patients, ensuring no ward remained underutilized. However, night admissions were centralized for efficiency, reflecting the importance of balancing flexibility with practicality(7).

4. Data-Driven Decision Making

Routine hospital statistics provided a valuable evidence base for identifying problems and evaluating interventions. Strengthening hospital information systems can thus support continuous quality improvement(8) (9) (10).

5. Potential for Replication

The success of this initiative suggests it can be replicated in other specialties facing similar challenges, such as surgical or pediatric units. At a broader level, structured admission policies may contribute to improving hospital efficiency across Sri Lanka's tertiary-care system (11) (12).

Conclusion

This study demonstrates that implementing a structured admission policy significantly improved bed utilization and reduced overcrowding in the medical units of Teaching Hospital Batticaloa. By balancing patient allocation across all medical wards, the intervention ensured that every inward patient received a hospital bed while optimizing existing resources. Lessons from this initiative highlight the importance of stakeholder engagement, data-driven decision-making, and flexible policy design in addressing common challenges in resource-limited health systems. Sustaining and scaling such interventions across other clinical areas can contribute to strengthening hospital service delivery and patient-centered care in Sri Lanka.

References

1. Health at Glance. Health at a Glance 2023 [Internet]. OECD; 2023. (Health at a Glance). Available from: https://www.oecd.org/en/publications/health-at-a-glance-2023_7a7afb35-en.html
2. Ministry of Health. 2020 ANNUAL HEALTH BULLETIN MINISTRY OF HEALTH SRI LANKA [Internet]. 2020. Available from: www.health.gov.lk
3. Rahimzadeh V, Setoodehzadeh F, Salavati S, Khosravi M. The Impact of Health Transformation Plan on Bed Occupancy Rate, Average Length of Stay, and Bed Turnover Interval in a Deprived Region of Iran: An Interrupted Time Series. Health Scope. 2023 Oct 21;13(1)
4. Youthao S, Chaimay B, Woradet S, Bouyam C, Ruang-On S. Migration Letters Data And Statistics Of Hospital Beds And Staffs To Manage Health Information To Formulate Policies To Increase The Number Of Beds And Staffs In Thailand. 2023; Available from: www.migrationletters.com
5. Siyoto S, Tule AR. Analysis of Bed Occupancy Rate (BOR) in Terms of Internal Factors (Procedures, Doctor, Nurse, Facilities and Infrastructure). Glob J Health Sci. 2019 Nov 13;11(13):77.
6. Bosque-Mercader L, Siciliani L. The association between bed occupancy rates and hospital quality in the English National Health Service. European Journal of Health Economics. 2023 Mar 1;24(2):209–36.
7. Stevenson Bn J, Anderson Bn S, Veach Bn K, Cert G, Management H, Hine BA, et al. Senior Lecturer, School of Nursing and Midwifery, Queensland University of Technology. Vol. 29, AUSTRALIAN JOURNAL OF ADVANCED NURSING. 2024.
8. Ministry of Health. GUIDELINES FOR ACCIDENT AND EMERGENCY CARE SERVICES IN GOVERNMENT HOSPITALS IN SRI LANKA. 2016.
9. Huang J, Carmeli B, Mandelbaum A. Control of Patient Flow in Emergency Departments, or Multiclass Queues with Deadlines and Feedback. Oper Res [Internet]. 2015;63(4):892–908. Available from: http://www.jstor.org/stable/24540420
10. Kim JK. Enhancing Patient Flow in Emergency Departments: A Machine Learning and Simulation-Based Resource Scheduling Approach. Applied Sciences (Switzerland). 2024 May 1;14(10).
11. Scholarworks S, Jones JF. Strategies to Increase Emergency Department Patient Flow [Internet]. 2020. Available from: https://scholarworks.waldenu.edu/dissertations
12. Samadbeik M, Staib A, Boyle J, Khanna S, Bosley E, Bodnar D, et al. Patient flow in emergency departments: a comprehensive umbrella review of solutions and challenges across the health system. BMC Health Serv Res. 2024 Dec 1;24(1).