



Original Article: **A Scientific Approach for Optimizing Patient Bed Occupancy in an Overcrowded Teaching Hospital in Sri Lanka**

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Keywords: Bed Occupancy, CSTD, Overcrowding

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Abstract

Background: In Sri Lanka, the healthcare system predominantly relies on the public sector, which delivers nearly 95% of inpatient care and approximately 50% of outpatient care. Effective monitoring of bed occupancy rates is crucial for optimizing resource allocation amidst limited hospital resources and fluctuating patient demands.

Objectives: This study aims to develop a scientific approach to enhance patient bed utilization at Colombo South Teaching Hospital (CSTD) in Sri Lanka.

Methodology: A mixed-method approach was employed, integrating quantitative analysis of historical patient data from CSTD's medical record room with qualitative insights from key stakeholders, including hospital administrators, consultants, medical officers, and nursing staff.

Results and Discussion: In 2023, CSTD reported an overall bed occupancy rate of 80%, surpassing both national and

global averages, indicating strain on healthcare delivery. The study identifies disparities in occupancy rates across different wards, highlighting overcrowding in medical and surgical units alongside underutilization in other specialities.

Recommendations and

Conclusions: Revising the consultant-based ward allocation system, implementing patient-centric ward clustering based on occupancy rates, appointing bed managers, and expanding facilities in high-demand units like Medical, Accident Service Unit, Emergency Treatment Unit, and Nephrology. Implementing these strategies could mitigate overcrowding, improve bed availability, and enhance the quality and safety of patient care services at CSTD.

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Introduction

In Sri Lanka, healthcare facilities are easily and freely accessible and of good quality. The public sector provides nearly 95% of inpatient care and around 50% of outpatient care. The Ministry of Health (MOH) is responsible for stewardship functions such as policy formulation, health legislation, program monitoring, technical oversight, management of health technologies, and human resources. In 2022, there were more than 1,500 healthcare institutes in total, of which 588 were hospitals, and 517 were primary care institutes (1).

Colombo South Teaching Hospital (CSTH)

Colombo South Teaching Hospital (CSTH) is the second-largest government hospital in the Colombo District, located in Kalubowila, Dehiwala. The hospital has a bed strength of 1,249, with approximately 2,612 staff involved in patient care. It provides treatment to about 168,500 inpatients and 1,500,000 outpatients per year. The mission of the hospital is to ensure the provision of safe and quality healthcare services in a customer-friendly environment by utilizing scarce resources optimally, along with undergraduate and postgraduate training up to international standards, in order to fulfil the nation's requirements.

This hospital serves as the referral centre for the peripheral hospitals situated in this region and for some specialties like endoscopy procedures; it also serves as a national referral centre and is the teaching hospital of the Faculty of Medical Sciences, University of Sri Jaywardenepura.

A notable increase in demand has been recognized recently due to the current economic crisis. With limited resources in

hospitals, where no infrastructural developments have occurred in the last 20 years, this hospital is striving to serve the public to the best of its ability. Hospital authorities are facing significant challenges in providing beds to patients at CSTH, particularly in certain units within the hospital, such as medical, surgical, and orthopaedic wards.

This article analyzes patient bed allocation practices at Colombo South Teaching Hospital (CSTH), highlighting current challenges and proposing evidence-based strategies and innovative solutions to address identified gaps.

Justification of Study

Monitoring bed occupancy rates is essential for hospital administrators to ensure optimal resource allocation and anticipate and address demand fluctuations. By analyzing trends in bed occupancy rates, healthcare facilities can make informed decisions about staffing levels, capacity planning, and resource allocation to maintain high-quality patient care while maximizing efficiency. Bed occupancy rates play a significant role in healthcare planning and policy-making at both the institutional and national levels.

General Objective

Discover a Scientific Approach to Improve Patient Bed Utilization at Colombo South Teaching Hospital in Sri Lanka.

Specific Objectives

1. To describe the current bed allocation practices at Colombo South Teaching Hospital.
2. To explore better bed allocation practices to suit Colombo South Teaching Hospital.

3. To provide beds for all patients admitted to Colombo South Teaching Hospital.

Literature Review

The availability of a bed in the hospital is one of the basic expectations of every patient, valued almost equally to the treatment they receive. There is a general perception among the public that government hospitals are fully occupied with patients. Efficient patient bed allocation is critical. A hospital bed is an expensive asset in healthcare services. The availability of beds is possibly the most vital factor in deciding the usage of hospitals in the country.

Bed occupancy rate (BOR) is an important index in healthcare management that indicates the percentage of inpatient beds occupied over a given period. It is typically expressed as a percentage and calculated by dividing the total number of occupied beds by the total number of available beds, then multiplying by 100.

Among non-specialized Teaching Hospitals, the highest Bed Turnover Rate has been recorded at Colombo South Teaching Hospital (129.28), followed by Colombo North Teaching Hospital (Ragama) (109.61). The Bed Occupancy Rate ranges between 54% and 86% in all non-specialized Teaching Hospitals. The highest rate has been reported from Karapitiya (85.79%), and the lowest rate from Sri Jayawardanapura (54.73%) (2).

A study conducted to explore the association between bed occupancy rates and hospital quality in the British National Health Service revealed that high bed occupancy rates are associated with lower quality. It also indicated a negative association between higher bed occupancy

and certain quality indicators such as overall and surgical mortality, and health gains (3).

Methodology

This study employs a mixed-methods approach, combining quantitative analysis of historical patient data from the medical record room of the Colombo South Teaching Hospital with qualitative insights from key stakeholders, including hospital administrators, consultants, medical officers, and nursing staff. Additionally, surveys and interviews are conducted to gather feedback on the perceived effectiveness of existing bed allocation processes and to solicit suggestions for improvement.

Bed and Ward Allocation Practices at CSTH

The four major medical specialties, Medicine, Surgery, Pediatrics, and Obstetrics and Gynecology wards, cater to direct admissions from the outpatient department, in addition to the accident and emergency units. All other specialties receive referral patients from these major specialties. In addition to the above admission procedures, the Ward In charge consultants admit patients directly to the ward by making a request to the admitting medical officer. This is the patient admission practice followed in Colombo South Teaching Hospital as well as in other hospitals in Sri Lanka.

Ward Allocation

Wards are allocated for consultant units; usually, a male and female ward is allocated for each consultant name basis, but pediatric consultants will get one ward, and obstetrics and gynaecology units get three wards: antenatal, postnatal, and

gynaecology units. Some wards are shared by several consultant units in Colombo South Teaching Hospital. Each unit is headed by one or two consultants. Medical officers, nursing officers, and other supporting staff are part of the consultant's team for patient management. Various wards contain a different number of beds, and in total, CSTH contains 1249 beds. This consultant based ward allocation is the traditional practice in Colombo South Teaching Hospital as well as in Sri Lanka.

Patient Admission and Management

All patients seeking hospital admission or referred for hospital admission will undergo an initial assessment by the medical officer acting as the admitting doctor. He/she will decide on admission with the initial treatment recommendations for the suitable speciality or emergency unit.

Admissions to wards are allocated on a regular daily roster. The admission wards are called casualty wards. Once a patient is admitted to a casualty ward, that patient is registered under a casualty consultant's care, after the initial assessment by the medical team, the patient will be given a bed based on the clinical condition and the bed availability. The front beds, which are close to the nursing station, are allocated for patients who need close observation, and the remaining beds are given to other patients.

Some casualty wards are flooded with patients on admission days, and no beds are available for them, while some other wards don't have enough patients to fill the beds available in this traditional bed allocation practice.

Ward Allocation and Bed Occupancy Rate at Colombo South Teaching Hospital

Patients admitted under particular consultants will receive treatment in their ward under their supervision. Whenever an opinion is needed from other consultants/specialities, referrals are made. In this approach, the continuity of patient care is considered; however, bed availability is not taken into account. This method was followed in all the government hospitals

In this method, the continuity of patient care is considered as a first priority rather than bed availability.

Table 1: Bed Occupancy Rates in Medical Wards at Colombo South Teaching Hospital during the year 2023

Ward no	Speciality	Available beds	BOR-%
1	Medical-Male	42	113.5 %
2	Medical-Male	38	92.6 %
3	Medical-Male	44	92.8 %
4	Medical-Female	42	105.4 %
5	Medical-Male	40	96.3 %
7	Medical-Female	43	113.6 %
9	Medical-Female	40	104 %
Total		289	102.6

Source: Medical Record Unit – CSTH

Taking into account the statistics, medical wards are nearly at full capacity, with an average bed occupancy rate of 102.6%. Information from ward staff highlights the high patient turnover and the challenges in providing adequate beds. In certain cases, two patients share a bed, and some even resort to sleeping on the floor. Despite the allocation of 289 out of 1249 beds (23.13%) to medical wards, it remains insufficient to meet the demand.

Table 2: Bed Occupancy Rates in Surgical and Orthopedic Wards at Colombo South Teaching Hospital during the year 2023

Ward no	Speciality	Available beds	BOR
11	Surgical-Female	41	73.3
15-B	Surgical - Female	40	71
15-A	Surgical(Male Surgical & Female orthopedics)	39	81.1
24	Surgical-Female	44	91.4
25	Surgical-Male	40	110.7
26	Surgical-Male	34	84.2
27	Surgical-Male	37	75.7
19	Orthopedics-Female	15	81.6
20	Orthopedics-Male	40	44
Total		330	79.22

Source: Medical Record Unit – CSTH

General surgical and orthopaedic wards maintain an average occupancy rate of nearly 80 per cent. Interviews conducted with the surgical ward staff reveal that the turnover in the surgical ward is also notably high, largely attributed to day care surgeries and same-day discharges. Frequently, nearly all beds are occupied by patients. Due to this swift turnover, it is not taken in to account for calculating the BOR

The Obstetrics and Gynecology Wards exhibit comparatively lower occupancy, with an average of 47.2% noted from the statistics. Interviews indicate a notable decrease in patient turnover and deliveries within these wards

Table 3: Bed Occupancy Rates in Obstetrics and Gynecology Wards at Colombo South Teaching Hospital during the year 2023

Ward no	Speciality	Available beds	BOR %
10	Gynecological	21	43.3
17	Ante-Natal & Postnatal	25	27.3
12	Gynecological	23	69.6
18	Ante-natal	24	40.7
16	Post Natal	35	29
21	Ante Natal	19	44.3
22	Post Natal	20	75.6
23	Gynecological	37	48
Total		204	47.226

Source: Medical Record Unit – CSTH

Table 4: Bed Occupancy Rates in Paediatric Wards at Colombo South Teaching Hospital during the year 2023

Ward	Speciality	Available beds	BOR %
41A	Paediatrics	33	83.2
41B	Paediatrics	33	53.8

Source: Medical Record Unit – CSTH

The utilization of beds in the Paediatric ward at CSTH is also relatively low, with an average bed occupancy rate of 68.5%. Interviews suggest that paediatric admissions are seasonal, leading to fluctuations in bed occupancy, with times when beds are fully occupied and other times when they remain unoccupied.

Table 5: Bed Occupancy Rates in Wards at Colombo South Teaching Hospital during the year 2023

Ward	Speciality	Available Beds	BOR - %
ASU	Accident Service	27	530
ETU	ETU	8	339
NU	Haemodialysis	7	325
38A	ENT(Male)	13	69.2
33A	Psychiatric (male)	10	65.3
28	Psychiatric (Female)	8	60.4
37A	Eye- (Female)	14	63
33B	Psychiatric (female)	17	54.4
29	Psychiatric (male)	11	54.1
38C	GI/GU(Male)	23	50.8
40	Cardiology-male	17	48.9
37A	ENT- (Female)	14	47.1
38A	Eye(Male)	15	43.4
39	Cardiology-Female	17	30.9
37B	Mixed Specialities (Female)	35	29.5
	Dermatology, Rheumatology, Neurology, OMF, Haematology		
38B	Mixed specialties (Male)	35	29.5
	Dermatology, Rheumatology, Neurology, OMF, Haematology		

Source: Medical Record Unit – Csth

The Accident and Emergency units and Nephrology unit consistently experience high bed occupancy rates, often resulting in

patients being unable to secure beds. Conversely, bed occupancy rates in other units are comparatively low. In certain wards, multiple consultants share space to oversee patient care, yet the bed occupancy rates remain low

Discussion and Conclusions

The number of hospital beds is a crucial metric for evaluating hospital capacity. High occupancy rates within a hospital often indicate strain on the healthcare system. Maintaining some extra bed capacity is essential to accommodate unforeseen emergencies in patients requiring hospitalization and to prevent hospital-acquired infections.

While there are no set norms regarding the "optimal" occupancy rate, a rate of approximately 85% is often considered the maximum to mitigate the risk of bed shortages (4). As of 2021, the average worldwide bed occupancy rate stood at 69.8%. In Sri Lanka, reports indicate an average bed occupancy rate of 74%, with a maximum duration of stay of 3 days (5).

The Csth reported a bed occupancy rate of 80% in 2023, surpassing both the national and global averages, indicating strain on the healthcare system. To alleviate this pressure, it is important to implement both short-term and long-term strategies

The medical and some surgical wards at Csth are overcrowded with bed occupancy rates above 85%, while some wards are underutilized. This has resulted in patients in medical wards not having beds and sometimes sleeping on the floor, despite available beds in other wards. Considering the traditional patient allocation method based on the continuity of patient care services, equity of health care is challenged here

Globally, various bed allocation methods are followed. In some countries, a bed allocation manager is appointed and a bed management system is used to allocate beds to patients. Some countries even went beyond that and took initiatives to use artificial intelligence to assist in patient bed allocation. It's time to revise the traditional patient admission system and change it to a patient-centric approach.

Recommendations

1. The traditional consultant-based ward allocation system should be revised. Instead, patient-centric ward clustering methods (medical ward cluster, surgical ward cluster, obstetric and gynecology ward cluster) should be adopted, taking bed occupancy rates into account to ensure equitable bed allocation.
2. Appointing bed managers for each cluster to ensure bed for all patients.
3. Allocate one more ward to medical and surgical wards to reduce overcrowding and bring the bed occupancy rate to global standards (85%), improving the quality and safety of patient care services.
4. Gynecology and obstetrics wards are relatively underutilized (BOR-47.2%). There are two women specialty hospitals in Colombo district itself. These wards can be made cluster wards, and the above units should be shared on a basis. A ward can be removed from this cluster to accommodate patients from other units.
5. Pediatrics wards are also underutilized, but seasonal variations are noted, as per the detailed discussion with the staff. So, it is advised to continue the same practice in the above wards.
6. The ASU and ETU are also heavily overcrowded. To temporarily resolve the issue, they should be given some additional beds. In the long term, they should be expanded with adequate beds. The completion of the new A&E Unit will solve this problem.
7. The Nephrology unit is heavily overcrowded, 325%, and manages patients from other wards as well. A separate nephrology ward is also identified as an important need for the hospital.
8. Mixed Specialty wards are also underutilized (BOR of 29.5). To improve the BOR, more specialties can be added in addition to the existing ones.
9. Hospital Bed management system can be used to allocate and manage patients in the hospital.

References

1. Ministry Of Health Sri Lanka | Health Institutions In Sri Lanka [Internet]. www.health.gov.lk. Available from: <https://www.health.gov.lk/health-institutions-in-srilanka/#:~:text=In%20mid%202022%2C%20there%20were>.
2. Lanka S. Ministry of Health [Internet]. Available from: <https://www.health.gov.lk/wp-content/uploads/2022/12/AHB-2019-1.pdf>
3. Bosque-Mercader L, Siciliani L. The association between bed occupancy rates and hospital quality in the English National Health Service. *Eur J Health Econ*. 2023 Mar;24(2):209-236. doi: 10.1007/s10198-022-01464-8. Epub 2022 May 17. PMID: 35579804; PMCID: PMC9112248.
4. Chapter 39 Bed occupancy Emergency and acute medical care in over 16s: service delivery and organisation NICE guideline 94 [Internet]. 2018. Available from: <https://www.nice.org.uk/guidance/ng9>

- 4/evidence/39.bed-occupancy-pdf-172397464704
5. Health Statistics. (2014). Available at: <https://www.ips.lk/wp-content/uploads/2017/01/Health-statistics2013.pdf> [Accessed 20 Apr. 2024].