International Surgery Journal
Jotham S et al. Int Surg J. 2025 Jul;12(7):1074-1079
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: https://dx.doi.org/10.18203/2349-2902.isj20251897

Original Research Article

Intensive care unit admission trends among surgical patients: insights and recommendations from two regional referral level hospitals in Tanzania

Seth Jotham[1]*, Yasin Munisi[2], Jacqueline Kilasi[3], Ally Rashid[4]

[1]Department of Surgery, St. Francis University College of Health and Allied Sciences, Ifakara, Tanzania
[2]Department of Surgery, Bugando Medical Centre, Mwanza, Tanzania
[3]Department of Surgery, Tumbi Regional Referral Hospital, Education Centre, Kibaha, Tanzania
[4]Department of Surgery, Tayma Hospital, Dar es salaam, Tanzania

Received: 21 April 2025
Revised: 14 May 2025
Accepted: 26 May 2025

***Correspondence:**
Dr. Seth Jotham,
E-mail: jothamambele@gmail.com

ABSTRACT

Background: The ongoing needs of surgical services in Tanzania has attracted the necessity to address practical challenges faced in the provision of surgical care. The challenges are not only limited to the respective human resources, but also to the essential surgical-medical amenities like an Intensive Care Unit (ICU) which functions as a bay for optimization and post-operative care for the critical surgical patients.
Methods: A two-center prospective longitudinal study was conducted from April 2024 to January 2025. Standardized checklist was used to collect data from eligible patients in the Intensive Care Units of the two hospitals. Data were descriptively summarized and chi square test was used to assess for association between variables, p-value of < 0.05 was considered statistically significant.
Results: Most of the patients were admitted from Theatre (43, 40.19 %) with trauma being the leading diagnosis (51, 47. 66%). The mean ICU duration of stay was 6.58 days (3.03 SD) whereby 59.81 % of all admissions were transferred to normal ward post stabilization. Indication for admission, comorbid conditions and duration of stay were significantly associated to the outcomes of interest with the p values of < 0.001, 0.02 and 0.01 respectively.
Conclusion: The observed trends of admission in the ICU stresses on the importance of having a stable unit capable of rendering essential critical care to surgical patients. Furthermore; the establishment of a High Dependency Unit (HDU) in surgical wards will significantly reduce unnecessary admissions and work-load to the Intensive Care Unit.

Keywords: Admission, High dependency unit, Intensive care unit, Surgery, Trends

INTRODUCTION

The world federation of societies of intensive and critical care medicine (WFSICCM) convened in the year 2014 to answer some basic questions, one of it being "what is an intensive care unit (ICU)?" and proposed it to be defined as; an organized system for the provision of care to critically ill patients that provides intensive and specialized medical and nursing care, an enhanced capacity for monitoring, and multiple modalities of physiologic organ support to sustain life during a period of acute organ insufficiency. Though confined as a specialized hospital's geographical unit, its activities must be extended beyond so as to ensure continuation of care in the normal wards and post discharge clinical follow-up.[1,2] Parameters such as space and tools, available skilled personnel (to cutter multidisciplinary patient's approach) with a well-established monitoring

system have guided the grading of the unit from level 1 to 3. Level 1 ICU among other services it provides noninvasive monitoring with an advanced intensive nursing care as compared to essential wards. Level 2 is capable for more invasive monitoring and some basic life support in short period of time. Level 3 is more advanced as it has unconventional technologies and personnel from multiple disciplines equipped with all necessary skills that not only serve as the focal regional point for the care of medical and surgical critical patients, but also to play a pivotal role in education and research to support the development of the given specialty.[1,3,4]

Surgical patients appear to significantly contribute to admissions in the ICU aiming at reducing morbidity and mortality especially in the immediate post-operative course.[5] Various indications and causes of ICU admission among surgical patients has been documented; including septic shock, anesthesia related incidences and gastrointestinal malignancies.[6,7] The admissions can further be classified into Planned and Unplanned ones whereby; planned surgical admissions are contributed by pre-operative medical illnesses, expected long duration of surgery, anticipated blood loss and the need for mechanical ventilation. Unexpected admissions are contributed by the intraoperative unexpected events like respiratory problems as manifested by failure to maintain spontaneous respiration, major primary and reactional hemorrhagic events.[8]

The interaction between patients' initial diagnoses with or without surgical intervention and the underlying conditions are among the documented determinants of outcomes, including but not limited to the length of stay, planned discharge, and post-discharge mortality in different settings.[6,8,9] In developing countries, including Tanzania, there has been a significant rise in surgical interventions for both traumatic and non-traumatic conditions.[10] This growing demand has necessitated improvements in intensive care services across different healthcare frameworks. Moreover, the increased need for critical care has placed a considerable strain to the healthcare providers and the overall healthcare system.

Authors therefore embarked on a ten-month observational journey to assess admission trends and factors influencing outcomes among surgical patients in different levels of ICUs across two regional referral hospitals in Tanzania.

METHODS

Study design and setting

This was a prospective longitudinal study involving surgical patients admitted in the ICUs at Morogoro Regional Referral Hospital (MRRH) and St. Francis Regional Referral Hospital (SFRRH), conducted from April 2024 to January 2025. SFRRH and MRRH are two referral hospitals in Morogoro region located 235 kilometers apart in the Mid-Eastern portion of the mainland Tanzania. These facilities together serve as referral centers in the region by providing health services to a population of more than 3 million. They offer specialized surgical with categorized intensive care services as per their individual capacity, also function as teaching hospitals for St. Francis University College of Health and Allied Sciences.

Study participants and data collection

The study included all patients who were admitted to the hospitals' ICUs during the period of study, those of 18 years of age and above were involved in the study given that they consented/assented to participate. The study excluded all patients who were originally admitted due to other non-surgical reasons but developed surgical complication(s) such as pressure sores while in the ICU. Taro Yamane formula was used giving a minimal sample size of 100 patients. We accessed 112 patients, 5 excluded as per the set criteria and 107 were enrolled for the entire study course. A standardized checklist was used to primarily collect data, the study did not in either way influence the management of the patient.

Data analysis

Data collected were first entered into an excel sheet, cleaned, checked for accuracy and then transferred to Stata version 15 for analysis. With descriptive statistics, data were well summarized to characterize the variables. Mean and standard deviation were used for continuous variables, categorical variables were summarized inform of proportion and frequency tables. Chi square test was used to assess association of different variables to the outcomes of interest where p–value of < 0.05 was considered to be statistically significant.

Ethical considerations

Ethical approval was obtained from the SFUCHAS Institutional Review Board prior initiation of this study. The study ensured the confidentiality of participants by collecting their data with strict privacy safeguards. Patient's decision to withdraw from the study at any point did not in either way influence or affect the course of management with in a given unit.

RESULTS

Patients' demographics and clinical profiles

The average age of patients in this study was 45.52 years (SD=14.89 years). The number of males were almost twice that of female patients at a ratio of 1.9:1. Majority (40.19%) of patients were admitted from theatre after undergoing a major operation followed by a direct Emergency Department admission by 34.58%. Trauma was the most common cause of ICU admissions (47.66%) of all studied patients. surgical events and sepsis almost

contributed equally at 21.50% and 22.43% respectively. More than 80 % of the participants stayed in the ICU for more than 3 days with the significant proportion (39.25%) having a prolonged duration of more than 7 days in ICU, the mean duration of stay was 6.58 days (SD=3.03 days). While no single patient was discharged home directly from the ICU, 59.81% were transferred to normal wards for further observation and the overall mortality rate was 19.63 % (Table 1 and Table 2).

Table 1: Demographic characteristics of surgical patients admitted to the ICUs.

Gender	Age (in years) N (%)			Total (%)
	18–40	41-60	>60	
Male	31 (44.29)	30 (42.86)	9 (12.86)	70 (100)
Female	10 (27.03)	17 (45.95)	10 (27.03)	37 (100)
Total	41 (38.32)	47 (43.93)	19 (17.76)	107 (100)

Table 2: Clinical profiles of patients admitted to the ICUs.

Clinical profile	Frequency	Percentage
Admission source		
EMD	37	34.58
Theatre	43	40.19
Ward transfer	27	25.23
Indication for admission		
Trauma	51	47.66
Surgery events	23	21.50
Sepsis	24	22.43
Others	9	8.41
Duration of stay (days)		
1–3	21	19.63
4-7	44	41.12
>7	42	39.25
Outcome		
Recovered and discharged	0	0.00
Transfer to normal wards	64	59.81
Referral to higher facilities	22	20.56
Death	21	19.63

Table 3: Factors associated with the outcomes.

Determinant	Outcome N (%)			Chi-square P value
	Ward transfer	Referral	Death	
Age (in years)				
18-40	31 (75.61)	5 (12.20)	5 (12.20)	X^2=18.35 P=0.07
41-60	29 (61.70)	11 (23.40)	7 (14.89)	
>60	4 (21.05)	6 (31.58)	9 (47.37)	
Indication for admission				
Trauma	31 (60.78)	11 (21.57)	9 (17.65)	X^2=14 P<0.001
Surgery events	21 (91.30)	2 (8.70)	0 (0.00)	
Sepsis	11 (45.83)	4 (16.67)	9 (37.50)	
Others	1 (11.1)	5 (55.56)	3 (33.33)	
Comorbid				
Yes	11 (40.74)	6 (22.22)	10 (37.04)	X^2=7.82 P=0.02
No	53 (66.25)	16 (20.00)	11 (13.75)	
Duration of stay (days)				
1–3	9 (42.86)	5 (23.81)	7 (33.33)	X^2=13 P=0.01
4-7	35 (79.55)	6 (13.64)	3 (6.82)	
>7	20 (47.62)	11 (26.19)	11 (26.19)	

Factors associated with outcomes

Ward transfer from ICU, referral to higher centers and death were the studied outcomes of interest. Age did not show any association to the outcomes, however indications for ICU admission among surgical patients were statistically significant. Traumatic patients and those admitted due to surgical events (intra/post-operative complications and anesthesia related events) were more prone to be referred to higher center or to succumb secondarily to different acquired pathologies on the course of the intensive care management (p value<0.001).

About 22.22% of patients referred to higher centers had an associated comorbid condition and 37.04 % of those admitted to the ICU with one or more associated comorbid conditions died during the study period. Having comorbid conditions were shown to be significantly associated with the studied outcomes of interest (p=0.02). Patients with prolonged duration of ICU stay (>7 days) had higher probability of not only being referred to higher facilities (26.19%) but also to succumb on the course of management (26.19%) and the association were significant (p=0.01).

DISCUSSION

Worldwide, different factors have been studied and seen to contribute to the documented pattern and outcomes of the patients admitted to the ICU. These patients are not only from a single discipline, but rather includes varieties of patients from both medical and surgical specialties'.[11] The essential and critical services have been affected by the limited available resources, infringed availabilities and the high cost of services as reflected in the unit cost of medical equipment and supplies to cutter the needs in the countries like Tanzania where most of the ICU's are mainly located in the Urban areas.[12]

This reflected burden is contributed by a significant increase in need of the intensive care services among Surgical patients along all its disciplines leading to discrepancy between the demand and supply of the services not only in frequency but also the duration of stay as manifested by the bed occupancy rate of above 80%, a rate that has been seen to direct affect the outcomes including mortality.[11,13] The number of males observed in our study were more than that of females, this is the same as the observation by Onyekwulu et al in Nigeria with the male to female ration of 1.9:1 giving a mirror image to our study.[14] Fausta et al in their study to assess the indications with the common predictors of Intensive Care Unit admission in one of the tertiary hospitals in Tanzania also had similar observation as in this study.[10]

As further observed in Ethiopia, another multicenter analysis in British Columbia revealed greater number of males admitted in the Intensive Care Unit than females.[6,15] This similarity might be explained by the fact that most of the patients in all studies had trauma and males are thought to be predisposed more to events like motor traffic accident (MVA) as per their activities and occupation, nevertheless; Males are more likely to present late in the hospital with advanced pathologies which are likely to precipitate intensive care unit admissions especially after surgical interventions. As in other studies, age is an important factor that has been studied and perceived to have some impacts on the course of management among the ICU admitted patients. The mean age observed in our study is the same as that by Skinner et al and Kirubel et al in South Africa and Ethiopia respectively however, in a systematic review by Loris et al the mean age of the patients was 60 years, this study constituted more of an elderly population above 6th decade of life with the diagnosis of COVID-19, their age acted as an independent predictor for COVID-19 associated complications which culminated to more ICU admissions. This has brought a gross difference to our observation which included only surgical cases.[6,9,16]

In one of the descriptive studies in Tanzania on the Indications and early outcomes of the surgical patients admitted in the ICU, most of the patients were admitted from the operating room followed by the emergency department and ward transfer by 63.3 %, 22.1 % and 14.6 % respectively.[10] This exact trend was observed in our study and the reason for this similarity might be brought by the nature of the surgical conditions that preceded most of the emergency surgeries done, acute traumatic events with the need of intensive care for those surgical patients with unpromising progress after a prolonged general ward stay.

Most of the patients in our study were admitted due to trauma with isolated Severe Traumatic Brain Injury (STBI) being the commonest of all by 35 %. Study by Shaili et al observed the same with STBI being the commonest cause of ICU surgical admissions in an audit done at a tertiary care hospital in western India. A study in Nigeria also revealed the same whereby most of the admissions were due to trauma as dominated by STBI.[8,14] These correlations do not necessarily reflect on the general surgical admissions; however, it is possible that most of the patients with severe traumatic brain injury will almost always requires an ICU attention and hence the pilled-up number of such admissions as reported in the two prior observations and our study.

Sepsis and surgical events (procedural and anesthesia events) were the second and third in rank significantly contributing to the ICU admission by 22.43 % and 21.50 % respectively. This observation is different from that of Kirubel et al where sepsis and acute respiratory failure were the leading pattern to admission.[6] The possible reasons for this discrepancy might be due to the nature of the primary pathologies as Kirubel et al top two acute diagnoses were generalized peritonitis, secondary to perforated viscus followed by bowel obstruction of which

mostly culminated to systemic sepsis events as compared to our study which mostly included traumatic patients.

Furthermore, multiple studies done in Tanzania could have ascertained or at least give a picture of this observation especially if a component of Intensive care was included among the studied patients who underwent surgical procedures with or without trauma.[17-20] Majority of patients in this study spent one or more weeks in the ICU with an average of about 7 days. Most of the surgical ICU patients in one of the Ethiopian studies done by Kirubel et al spent an average of 7.3 days in the ICU as it is in our study.[6]

In our observations, we have enumerated the relationship between different factors that could have influenced the outcomes of interest. In other studies, predictors for the outcome of interest included urgency of admission and surgery, social demographics, physical and physiological determinants like APACHE II Score (acute physiology and chronic health evaluation) and ASA Score (American Society for Anesthesiologists), the need for mechanical ventilation, duration of ICU stay and whether there were any associated post-operative complications.[6,8,10]

In this study, indication for admission, comorbid conditions and the duration of ICU stay all showed positive association to the studied outcomes. Shail et al observed an increased mortality rate for patients who stayed in the ICU for more than 7 days, they further found a significant association between ICU readmission and mortality, an aspect that was not considered in our study.[8] Haller et al auxiliary reported an adjusted threefold increase in mortality among the studied patients who stayed in the ICU for 30 or more days, other observations might be different from our study as Heller et al also focused on the comparison between the planned and unplanned ICU admissions.[21]

In the study of Fausta et al among other factors, age showed degrees of significance to mortality where those with advanced age (> 65 years) were more prone to succumb during their ICU stay.[10] This is contrary to our observation as there was no statistical significance between age and mortality. The number of participants in the study and the nature/level of the facilities (the two in our study being at a regional referral level while Fausta et al study was done in a zonal referral level hospital) might explain these different observations.

The study has some limitations like the study was conducted in two regional referral health facilities, which may limit the generalizability of the findings. Variations in staffing structures, patient populations, clinical management protocols, and available resources could differ significantly from those in higher-level or differently located facilities, potentially affecting the applicability of the results to other settings.

CONCLUSION

This two-center observational study was conducted in level 2 and level 3 intensive care units (ICUs) in Tanzania. The study population had a higher proportion of males, with an average age of 45 years, and most patients were admitted from the Theatre and the Emergency Department. Trauma emerged as the leading cause of ICU admission, with the average length of ICU stay of about seven days. Key factors influencing patient outcomes included the reason for admission, existing comorbid conditions and the duration of ICU stay. The ICUs cared for both medical and surgical patients, highlighting the significant burden placed on the facilities and healthcare personnel.

Recommendations

Based on these findings, the study recommends the establishment of a dedicated Surgical Intensive Care Unit (SICU) that aligns with the existing staffing levels to better manage surgical patients. Additionally, the creation of a well-equipped high dependency unit (HDU) for surgical cases is suggested so as to ease the pressure on ICUs by accommodating patients who require level 1 and essential intensive care. Given that trauma is the most common reason for ICU admission, we also call for a larger multicentre investigation to better understand trauma patterns, management outcomes, and community-level risk factors, ultimately aiming to develop effective preventive strategies.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Marshall JC, Bosco L, Adhikari NK. What is an intensive care unit? A report of the task force of the World Federation of Societies of Intensive and Critical Care Medicine. J Crit Care. 2017;37:270-6.
2. Siaw-Frimpong M, Touray S, Sefa N. Capacity of intensive care units in Ghana. J Crit Care. 2021;61:76-81.
3. Pronovost P, Wu AW, Dorman T, Morlock L. Building safety into ICU care. J Crit Care. 2002;17(2):78-85.
4. Paul N, Buse ER, Knauthe AC, Nothacker M, Weiss B, Spies CD. Effect of ICU care bundles on long-term patient-relevant outcomes: a scoping review. BMJ open. 2023;13(2):70962.
5. Tomlinson J, Haac B, Kadyaudzu C, Samuel JC, Campbell EL, Lee CN, et al. The burden of surgical diseases on critical care services at a tertiary hospital in sub-Saharan Africa. Tropical Doctor. 2013;43(1):27-9.
6. Abebe K, Negasa T, Argaw F. Surgical admissions and treatment outcomes at a tertiary hospital

intensive care unit in Ethiopia: a two-year review. Ethiopian J Health Sciences. 2020;30(5):3246.
7. Bos MM, Bakhshi-Raiez F, Dekker JW, de Keizer NF, De Jonge E. Outcomes of intensive care unit admissions after elective cancer surgery. Euro J Surg Oncol. 2013;39(6):584-92.
8. Patel SK, Kacheriwala SM, Duttaroy DD. Audit of postoperative surgical intensive care unit admissions. Indian J Crit Care Med: peer-reviewed, official publication of Indian Soc Crit Care Med. 2018;22(1):10.
9. Skinner DL, De Vasconcellos K, Wise R. Critical care admission of South African (SA) surgical patients: Results of the SA Surgical Outcomes Study. South African Med J. 2017;107(5):411-9.
10. Liundi F, Kotecha V, Washingtone LA, Kenemo B, Chalya PL. Indications for admission and predictors of early outcomes among surgical patients admitted in the Intensive Care Unit at Bugando Medical Centre, Mwanza, Tanzania. Tanzania J Health Res. 2025;26(1):1808-28.
11. Vincent JL, Marshall JC, Ñamendys-Silva SA, François B, Martin-Loeches I. Assessment of the worldwide burden of critical illness: the intensive care over nations (ICON) audit. Lancet Resp Med. 2014;2(5):380-6.
12. Kazibwe J, Shah HA, Kuwawenaruwa A. Resource use, availability and cost in the provision of critical care in Tanzania: a systematic review. BMJ open. 2022;12(11):60422.
13. Phua J, Faruq MO, Kulkarni AP. Critical care bed capacity in Asian countries and regions. Crit Care Med. 2020;48(5):654-62.
14. Onyekwulu FA, Anya SU. Pattern of admission and outcome of patients admitted into the Intensive Care Unit of University of Nigeria Teaching Hospital Enugu: A 5-year review. Nigerian J Clin Pract. 2015;18(6):775-9.
15. Dodek P, Kozak JF, Norena M, Wong H. More men than women are admitted to 9 intensive care units in British Columbia. J Crit Care. 2009;24(4):630-1.
16. Roncon L, Zuin M, Barco S, Valerio L, Zuliani G, Zonzin P. Incidence of acute pulmonary embolism in COVID-19 patients: Systematic review and meta-analysis. European J Int Med. 2020;82:29-37.
17. Jotham S, Mahalu W, Chalya P, Mghanga F. Indications for Tube Thoracostomies and Factors Associated with Complications among Patients Admitted to Bugando Medical Centre, Mwanza, Tanzania. 2024.
18. Jotham S, Wambura E, Balthazary S, Giiti G. Etiologies, patterns and management outcomes among adult patients with intestinal obstruction: a 5 years' retrospective observation at a regional referral level hospital, Eastern Zone, Tanzania. Int Surg J. 2025;12(3):295.
19. Kilasi J, Jotham S, Kotecha V, Chalya P. Prevalence of malnutrition and its association with early outcomes among adult patients undergoing abdominal surgery admitted at Buganda medical Centre, Mwanza, Tanzania. 2024.
20. Rashid A, Jotham S, Kotecha V, Tegete F, Salim R. Indications and early outcomes of WALANT among patients undergoing surgical procedures at a tertiary care hospital, Mwanza, Tanzania. Dysphagia. 2024;2:6-8.
21. Haller G, Myles PS, Wolfe RS, Weeks AM, Stoelwinder JU, McNeil JJ. Validity of unplanned admission to an intensive care unit as a measure of patient safety in surgical patients. Anesthesiol. 2005;103(6):1121-9.

Cite this article as: Jotham S, Munisi Y, Kilasi J, Rashid A. Intensive care unit admission trends among surgical patients: insights and recommendations from two regional referral level hospitals in Tanzania. Int Surg J 2025;12:1074-9.