Available online at www.jsan.org.np

Journal of Society of Anesthesiologists of Nepal

Original Article

A retrospective cross-sectional analysis of patient characteristics and outcome in the intensive care unit in a tertiary trauma center in the capital city of Nepal

Tamanna Bajracharya, Ayusha Poudel, Prastab Parajuli, Yashasa Poudel

B&B Hospital, Gwarko, Lalitpur, 44700, Nepal

Abstract

Introduction: The intensive care unit provides intensive care for critically ill or injured patients that is staffed by specially trained medical personnel and has equipment that allows for continuous monitoring and life support. B & B hospital is a tertiary referral center in Nepal with a 13 bedded multispeciality level III unit that predominantly caters to trauma cases. The study aims to identify the cases admitted in the unit, their baseline characteristics and outcomes.

Methods: A descriptive retrospective study of intensive care unit patients of one year was undertaken. Qualitative and quantitative data from all the eligible patients (N=566) admitted from April 14 2019 to April 30, 2020 were included in the study. The prevalence of various diseases including trauma cases and the patient outcomes were analyzed.

Results: A total of 566 patients were admitted among which, 361 (63.78%) were male and 205(36.22%) were females. Among them, 500 (88.33%) were discharged, 40 expired (Mortality Rate=7.06 %) and 26 (4.59%) left against medical advice (LAMA). Most common cause of admission was road traffic accidents accounting for 167 (29.5%) of the total cases followed by fall injury (6.3%) and chronic obstructive lung disease cases (5.9%). Most common causes of infection were urinary tract infection and chest infection accounting for 3.8% The mean duration of stay was 5.89±5.45 days. The mean duration of ventilator use was 4.87±4.069 days.

Conclusions: Traffic accidents are the most common cause of admission. The overall mortality rate is 7.06 % . The major contributor of mortality in trauma cases being severe head injury .

Keywords: Chronic Obstructive Pulmonary Disease; Intensive Care Units; Traffic Accidents; Ventilators.

Introduction

Being a valuable discipline of medicine, development of intensive care with specially trained staff and equipment makes both surgery and anesthesia safer. [1],[2] Improving the quality and availability of the Intensive Care Unit (ICU) helps, reduce the deaths in the hospital.[3]

Corresponding Author
Tamanna Bajracharya, MD
https://orcid.org/0000-0002-9201-8704
B&B Hospital, Gwarko, Lalitpur, 44700, Nepal
Kist Medical College, Gwarko, Lalitpur, Nepal
Email: drtamannabaj@gmail.com

Article History

Received	06th June 2021
Accepted	28th February 2021
Published	10th June 2022

How to cite this article: Bajracharya T, Poudel A, Parajuli P, Poudel Y. A retrospective cross-sectional analysis of patient characteristics and outcome in the intensive care unit in a tertiary trauma center. Journal of Society of Anesthesiologists of Nepal (JSAN) 2021;8(2):e317.

Commenced in the early 1950s, ICU has emerged as a multidisciplinary unit headed by intensivists.[4,5,6]A global picture of epidemiological data regarding patients' characteristics and outcomes in the ICU is still lacking. [7]

Started in Nepal in 1973, the demand for ICU has increased but with sluggish progress.[8,9]The services and outcomes of these ICUs have rarely been published in low-income countries like ours.[10-16]. B and B hospital is equipped with 100 beds and provides multispecialty services. ICU is a 13 bedded multidisciplinary unit with 8 ventilators. The hospital is a well-known center for trauma cases .The study aims to find out the current status of critical care in this tertiary trauma center in terms of the disease prevalence and outcome.

Methods

A retrospective cross sectional descriptive study was performed on all the patients who were admitted in the ICU of B&B Hospital from April 14, 2019 to April 13, 2020.Institutional review board approval was obtained from the hospital review committee. Individual patients are taken as a sampling unit. A total of 566 patients admitted in the ICU during the specified period were included in the study.

The criteria set for ICU admissions were basic and advanced respiratory monitoring and support, circulatory support, neurological monitoring and support. Other criteria include severity of illness, age of the patient, coexisting diseases, physiological reserve, availability of suitable treatment, prognosis, anticipated quality of life and patients' wishes. We excluded patients if any pertinent data of a particular patient is missing and cases without a definite outcome at the end of study period. Information regarding patients were extracted from the ICU register and patient folders which were maintained in Microsoft Excel sheets. Selection bias was minimized by conducting the study over the period of one year and taking a larger sample size.

The qualitative and quantitative data were analyzed using SPSS version 26. Data was presented as mean values, with standard deviations, unless otherwise indicated. The variables analyzed includes the patient baseline characteristics which includes age and sex, diseases, co-morbidities, duration of stay in the ICU, and discharge to respective wards and use of ventilators.

Outcomes of the patients were recorded either as successful transfer back to the wards, discharged from the ICU (including discharge on patient's request) or mortality. The patients who were taken against medical advice were recorded as LAMA. The age and comorbidities of the patients may act as potential effect modifiers.

The primary aim of the study is to determine the outcome of the admitted patients. The secondary objective is to find the prevalence of diseases in the ICU along with baseline patients' characteristics. Patients were classified based on age and gender. Fractures, neurological trauma, vertebral injuries and soft tissue trauma were separately studied as our hospital is predominantly a trauma center. In addition, outcomes of patients that required mechanical ventilation and the mean duration of ventilator use were also assessed.

Results

A total of 566 patients were admitted in the study period of one year. Among them, 361 (63.78%) were male and 205(36.22%) were females. The age ranged from 1 year to 94 years with a mean ± SD of 48.19± 22.84 years. Majority of cases were admitted from the department of orthopedics (36.1%) followed by the department of medicine (21.8%).

Patient distribution according to the department is represented in figure 1. The patients were admitted mainly from the emergency department (50.1%). Second common department to admit patients into ICU was wards (29.9%), The patients admitted in the ICU presented with the diagnoses shown in the table 1. ICU nurse to patient ratio is 1:1 to 1:2 depending on the requirement. ICU medical officer to patient ratio is 1: 13. The bed occupancy rate is 80-85%.

Table 1: Age wise distribution of duration of ICU stay, ventilator use and outcomes

Age in years	Total ICU days (mean+-SD)	Total days on ventilator (mean+-SD)	Discharged	Death	LAMA*
<=18 (n=41)	5.26±4.89	7±5.05	40	1	0
19-40 (n=210)	6.51±5.40	4.78±3.34	193	10	7
>40 (n=315)	5.55±5.55	4.72±4.52	267	29	19
Total			500	40	26

Table 2: Sex differences in the duration of ICU stay, ventilator use and outcomes

Sex	Total ICU days	Total ventilator days	Discharged	Death	LAMA*
Male (n=361)	6.23±6.0	5.05±4.14	313	28	20
Female (n=205)	5.29±4.30	4.58±3.98	187	12	6
Total			500	40	26

Out of the total 566 admissions, 500 (88.33%) were discharged, 40 expired (Mortality Rate=7.06 %) ,26 (4.59%) left against medical advice and a case was referred to Gangalal Cardiothoracic center. A total of nine readmissions were recorded. Most common cause of admission was road traffic accident (RTA) accounting for 167 (29.5%) of the total cases followed by fall injury (6.3%) and COPD cases (5.9%). RTA led to outcomes such as fracture or

fracture-dislocations mostly of tibia and fibula, facial bones, clavicle, ribs, acetabulum. RTA also led to head and soft tissue injuries. Similarly, fall injuries lead to fracture dislocation, compartment syndromes and crush injuries. Most common causes of infection were urinary tract infection and chest infection accounting for 3.8%. The infections were diagnosed based on culture reports. The cases of poisoning in a year were 11 and the most common cause was noted to be organophosphates followed by acetaminophen. The range of ICU stay was a minimum of 1 day and maximum of 58 days. The range of ventilator use with a minimum stay of 1day and maximum stay of 21 days. Age wise distribution of the total days on ventilator and mean number of days in ICU and outcomes of the patient based on age is given in table1. The difference in patient outcomes based on sex is illustrated in table 2. Diagnosis wise outcome of patients is given in table 3.

Table 3: Patient outcomes based on diagnosis at admission

Diagnosis	Discharged	Death	LAMA
RTA	146	15	5
Fall injury	29	3	7
COPD	24	3	3
Fracture dislocation	21	2	2
CVA	36	6	0
Cancer	17	3	2
Poisoning	11	0	0
Others	216	8	7
Total	500	40	26

Most cases admitted to the ICU present following a RTA or fall injuries. The consequences of these modality of injuries range from various types of fractures to internal injuries and spinal compression/ burst fracture. The frequency of various fractures is represented in figure 1. The mean age of various fractures is presented in supplementary files.

Debilitating spinal injuries occur following the trauma. Most common among spinal injuries is thoracic vertebral burst/compression fracture followed by lumbar spinal fracture. Most common vertebrae affected was found to be

D10-D11. Spinal injuries are classified based on ASIA classification. Spinal injuries are represented on table 5. Similarly, various neurological sequelae following head injuries which are also illustrated in Table 5.

Table 4: Patient outcomes based on department through which the patient was admitted in the ICU

Department	Discharged	Death	LAMA
Orthopedics	190	7	8
Medicine	102	14	6
Surgery	80	6	3
Neurosurgery	84	8	7
Multispecialty	18	4	1
Others	92	1	1
Total	500	40	26

Figure 1: Prevalence of various fracture types in the ICU.

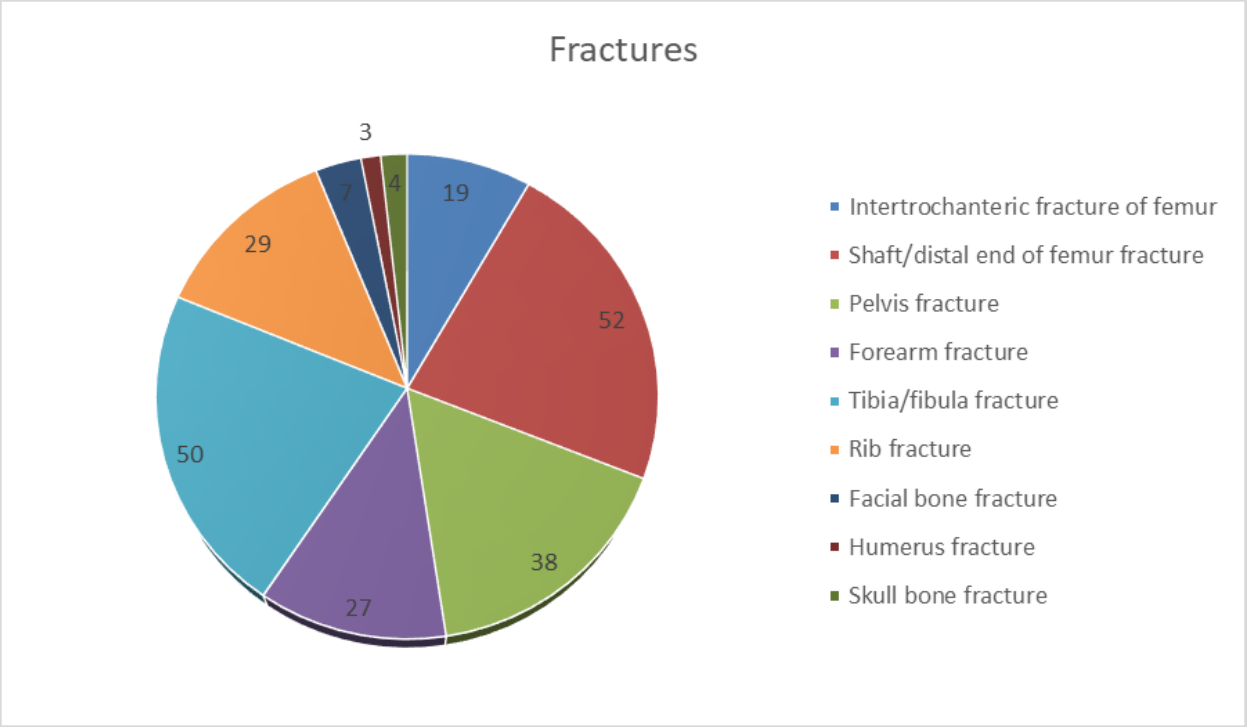

Table 5: Various injuries following trauma

Nature of injuries	Distribution	**Total number**
Vertebral injuries	Thoracic	19
	Lumbar	11
	Cervical	10
Intracranial Injuries	Diffuse axonal injury	4
	Subdural hemorrhage	8
	Extradural hemorrhage	12
	Subarachnoid hemorrhage	8
	Sub tentorial bleed	8
	Parenchymal bleed	3
	Intracranial contusions	10
	Crush injury	17
	De-gloving injury	17
	Amputation	3
	Compartment syndrome	4

Since the hospital is a predominant trauma center, the cause of mortality in trauma related cases have also been illustrated in table 6. There were a total of 15 road traffic accident related and three fall injury related deaths whose cause of deaths. The antecedent and immediate causes of deaths have been presented in the table. There were a total of 18 mortality cases caused due to trauma.

To summarize, among 566 patients, 500 (88.33%) were discharged, 40 expired (Mortality Rate=7.06 %) ,26 (4.59%) left against medical advice Most common cause of admission was road traffic accidents accounting for 167 (29.5%) of the total cases followed by fall injury (6.3%) and COPD (5.9%). Most common causes of infection were urinary tract infection and chest infection accounting for 3.8% The mean duration of stay was 5.885±5.458 days. The mean duration of ventilator use was 4.87±4069 days.

Discussions

This study offers a comprehensive insight into the epidemiology and outcome of critical illness in the tertiary, a predominantly trauma care setting of Kathmandu. The total ICU beds in Nepal until April 2020 is 1595 in 194 hospitals (approximately 6% of all hospital beds) and 50% of these are equipped with a total of 840 ventilators. These data show that Nepal has 2.8 ICU beds per 100,000 populations. [17] Currently, B and B hospital has a level III semi closed ICU running under a robust multidisciplinary team led by intensivist for two years along with the help of internists and anesthesiologists. The specialists in multiple departments of the hospital are consulted for opinion by the critical care team as per the patient's pathology and management plan. The most common admission

criteria to ICU are trauma, post-operative care and neurosurgical management. The patients remain under supervision of the Department of Anesthesia and Critical Care.

Table 6: Causes of death in trauma cases

S.No	Cause of Death	Total	Percentage
1	Sepsis with MODS	4	22.22%
2	Severe Head Injury	7	38.89%
3	FES with MODS	2	11.11%
4	Cardiogenic Shock	1	5.55%
5	ARDS with septic shock	1	5.55%
6	Pulmonary Embolism	1	5.55%
7	Hypovolemic Shock	1	5.55%
8	FES with severe ARDS	1	5.55%
	Total	18	100%

MODS: Multi-organ Dysfunction Syndrome, FES: Fat Embolism Syndrome, ARDS: Acute Respiratory Dysfunction Syndrome

ICU admission was most common following RTA and fall injuries. Medical conditions like COPD, infections and poisoning are other frequent causes. COPD was the most common medical condition leading to ICU admission. The ICU admission categories with the highest mortality rates were COPD, fall injuries and RTA. RTA and intracranial bleeding due to various causes account for 3.75% of mortality. Their contribution to overall deaths was significant. On analyzing ICU mortality per age group, a rising trend with the older age group curve was observed. These data suggest that ICU admission and mortality was higher in age groups more than 40 years of age which is comparable to other studies.

The incidence of patients being discharged against medical advice was slightly higher in males which is similar to other studies done in Nepal.[18,19] The proportion of ICU admissions is higher for males and trauma was found to be more prevalent among males. These factors might have been responsible for disproportionately higher leave against medical advice in males. Mortality rate among males and females was not statistically significant with a p value of 0.34 (Chi square statistics 0.7206).

Most cases are admitted from the orthopedics department following RTA and fall injury. Interventions to prevent death from critical illness in this hospital as well as similar other settings should focus on management of trauma patients. When analyzing the time point of ICU death, only a few cases died after prolonged ICU stay. Approximately 75% (30/40) of non-survivors died within the first five days of their ICU stay. In a trauma center study, only 4% of the patients ICU stay exceeds 30 days. The discharge rate in that study was found to be 88% which was similar to our study.[20] Out of 40 deaths, trauma is responsible for 14 cases of death. Another similar study in a trauma center showed that longer ICU stay is not necessarily associated with mortality or poor outcome with a survival rate of more than 87% in patients with more than 90 days of ICU stay. [21]

The ICU fulfills the guidelines formulated by the government in 2070 BS with regards to number of ICU beds (5% of total beds), ICU bed to ventilator ratio (1:2) and a requirement of an isolation room for illnesses like TB, HIV and HbsAg positive cases. Significant proportion of patients leaving against medical advice are seen.

Our study has some relevant limitations. The major limitation of our study is the retrospective nature of study. As a result, certain variables of potential interest were not recorded and hence could not be analyzed. One variable of special interest that was lacking was the burden of sepsis and outcome in ICU patients. Selection bias is also prevalent in our study represented in part by the rate of discharge against medical advice in ICU admitted patients. One of the potential reasons might be the financial burden of the patient treated in the ICU given the poor economic status of the majority of Nepalese people. Consequently, some patients may even opt out of ICU admission. The comorbidities of the patients may also play an important role in patient outcome which has not been analyzed in the study. Limb threatening and spinal injuries that could be used to calculate the disability of life index (DALY) especially in the young population is missing. Further data of interest like frequency of fat embolism syndrome (FES), MODS, blunt traumas were also not properly documented. The ratio of nurse to patient is supposed to be 1:1 according to 2070 BS guidelines, which may not be maintained at all times in our ICU.

The results of the study can be put to use when allocating the available resources to the ICU. It can be instrumental during the planned expansion of the ICU in the hospital as well. In addition, carrying out such audits helps realize the areas of improvement for better clinical care and administrative decisions.

The pertinent limitations of the study are lack of data on central line associated infection, catheter induced urinary tract infection and surgical site infections. Updating ICU registry, incorporating safety check list and assessing burden of sepsis and various diseases in the ICU is required so that the staff are better prepared to manage the cases. Nursing staff may need to be increased to meet the national protocol. Census on acute renal failure, nutrition, patient safety protocols and pain management protocols, do not resuscitate (DNR) records, fumigation, sterilization and disinfection routines are missing which can be better addressed in the coming years.

Conclusions

Our study gives a comprehensive overview of the epidemiology and outcome of critical illness in a large trauma center of Kathmandu Valley. It represents the patient baseline characteristics' and outcome in the ICU of a private hospital in Lalitpur and serves as an important reference for other similar settings where there is a paucity of data, offering a greater understanding of the outcomes and characteristics' of ICU patients. Although this study is only descriptive in nature, it provides enough information that can be used.

Ethical Approval: IRC_2020_10_20_6 (B&B Hospital)

Conflict of Interest: The authors have filled the ICMJE COI form and state that they have nothing to disclose.

Acknowledgements: None

Source of funding: Self Funded

References

1. Acharya SP. Critical Care Medicine: An emerging super specialty in Nepal. Journal of Society of Anesthesiologists of Nepal [Internet]. Nepal Journals Online (JOL); 2015 Oct 3;1(2):55–8. Available from: http://dx.doi.org/10.3126/jsan.v1i2.13570
2. Weil MH, Tang W. From Intensive Care to Critical Care Medicine. American Journal of Respiratory and Critical Care Medicine [Internet]. American Thoracic Society; 2011 Jun;183(11):1451–3. Available from: http://dx.doi.org/10.1164/rccm.201008-1341oe
3. Turner HC, Hao NV, Yacoub S, Hoang VMT, Clifton DA, Thwaites GE, et al. Achieving affordable critical care in low-income and middle-income countries. BMJ Global Health [Internet]. BMJ; 2019 Jun;4(3):e001675. Available from: http://dx.doi.org/10.1136/bmjgh-2019-001675
4. Pincock S. BjørnAage Ibsen. The Lancet [Internet]. Elsevier BV; 2007 Nov;370(9598):1538. Available from: http://dx.doi.org/10.1016/s0140-6736(07)61650-x
5. Berthelsen PG, Cronqvist M. The first intensive care unit in the world: Copenhagen 1953. Acta Anaesthesiologica Scandinavica [Internet]. Wiley; 2003 Nov;47(10):1190–5. Available from: http://dx.doi.org/10.1046/j.1399-6576.2003.00256.x
6. Grenvik A, Pinsky MR. Evolution of the Intensive Care Unit as a Clinical Center and Critical Care Medicine as a Discipline. Critical Care Clinics [Internet]. Elsevier BV; 2009 Jan;25(1):239–50. Available from: http://dx.doi.org/10.1016/j.ccc.2008.11.001
7. Vincent J-L, Marshall JC, Ñamendys-Silva SA, François B, Martin-Loeches I, Lipman J, et al. Assessment of the worldwide burden of critical illness: the Intensive Care Over Nations (ICON) audit. The Lancet Respiratory Medicine [Internet]. Elsevier BV; 2014 May;2(5):380–6. Available from: http://dx.doi.org/10.1016/s2213-2600(14)70061-x
8. Marasini BR. HEALTH AND HOSPITAL DEVELOPMENT IN NEPAL: PAST AND PRESENT. Journal of Nepal Medical Association [Internet]. Journal of Nepal Medical Association (JNMA); 2003 Sep 1;42(149):306–11. Available from: http://dx.doi.org/10.31729/jnma.654
9. Murthy S, Leligdowicz A, Adhikari NKJ. Intensive Care Unit Capacity in Low-Income Countries: A Systematic Review. Azevedo LCP, editor. PLOS ONE [Internet]. Public Library of Science (PLoS); 2015 Jan 24;10(1):e0116949. Available from: http://dx.doi.org/10.1371/journal.pone.0116949
10. Shrestha RR, Vaidya PR, Bajracharya GR (2011) A survey of adult intensive care units in Kathmandu Valley. Postgrad Med J NAMS 11(2): 1-7.
11. Dünser MW, Baelani I, Ganbold L. A review and analysis of intensive care medicine in the least developed countries*. Critical Care Medicine [Internet]. Ovid Technologies (Wolters Kluwer Health); 2006 Apr;34(4):1234–42. Available from: http://dx.doi.org/10.1097/01.ccm.0000208360.70835.87
12. Sharma NR. Outcome of intubated post-surgical cases in intensive care unit in Tribhuvan university teaching hospital, Nepal. Journal of Institute of Medicine [Internet]. Nepal Journals Online (JOL); 2007 Jan 5;27(3). Available from: http://dx.doi.org/10.3126/joim.v27i3.413
13. Koirala S, Ghimire A, Sharma A, Bhattarai B. ICU admission and outcomes in a community-based tertiary care hospital: an audit of one year. Health Renaissance [Internet]. Nepal Journals Online (JOL); 1970 Jan 1;9(2):83–7. Available from: http://dx.doi.org/10.3126/hren.v9i2.4978
14. Hamal AB. Patients Presenting in Intensive Care Unit of Nepal Police Hospital: An Overview. Journal of Anesthesia and Intensive Care Medicine [Internet]. Juniper Publishers; 2019 Aug 2;9(2). Available from: http://dx.doi.org/10.19080/jaicm.2019.09.555758
15. Acharya SP, Bhattarai A, Bhattarai B. An Audit of An Intensive Care Unit of A Tertiary Care Hospital. Journal of Nepal Medical Association [Internet]. Journal of Nepal Medical Association (JNMA); 2018 Aug 31;56(212):759–62. Available from: http://dx.doi.org/10.31729/jnma.3703
16. Murray CJL, Lopez AD. Measuring the Global Burden of Disease. New England Journal of Medicine [Internet]. Massachusetts Medical Society; 2013 Aug;369(5):448–57. Available from: http://dx.doi.org/10.1056/nejmra1201534

17. Neupane HC, Gauli B, Adhikari S, Shrestha N. Contextualizing Critical Care Medicine in the Face of Covid-19 Pandemic. J Nepal Med Assoc [Internet]. 2020Jun.30 ;58(226).
18. Pant MN, Jha SK, Shrestha S. Cases of Left Against Medical Advice from the Emergency Department of a Tertiary Care Hospital in Kathmandu: A Descriptive Cross-Sectional Study. JNMA J Nepal Med Assoc. 2020 Dec;58(232):992–7. doi: http://dx.doi.org/10.31729/jnma.5411 Epub 2020 Dec 31. PMCID: PMC8028538.
19. Shrestha T, Pradhananga S, Batajoo KH, Bajracharya M. Factors Affecting Discharges against Medical Advice in an Emergency Department of a Tertiary Care Center. JKISTMC 2020;2(2)4: 31- 35.
20. Ong AW, Omert LA, Vido D, Goodman BM, Protetch J, Rodriguez A, et al. Characteristics and outcomes of trauma patients with ICU lengths of stay 30 days and greater: a seven-year retrospective study. Crit Care 2009 135 [Internet]. 2009 Sep 24 [cited 2021 Sep 28];13(5):1–9. Available from: https://ccforum.biomedcentral.com/articles/10.1186/cc8054
21. Kisat MT, Latif A, Zogg CK, Haut ER, Zafar SN, Hashmi ZG, Oyetunji TA, Cornwell III EE, Zafar H, Haider AH. Survival outcomes after prolonged intensive care unit length of stay among trauma patients: The evidence for never giving up. Surgery. 2016 Sep 1;160(3):771-80. https://pubmed.ncbi.nlm.nih.gov/27267552/