

# Pattern of admission and outcome of patients admitted into the Intensive Care Unit of University of Nigeria Teaching Hospital Enugu: A 5-year review

FA Onyekwulu, SU Anya

Department of Anaesthesia, University of Nigeria Teaching Hospital, Ituku Ozalla, Enugu State, Nigeria

## Abstract

**Objective:** The objective was to determine the pattern of admission and outcome of patients in the Intensive Care Unit (ICU) of University of Nigeria Teaching Hospital (UNTH), Enugu, Nigeria.

**Materials and Methods:** A retrospective review of all patients admitted into the general ICU at UNTH from 2008 to 2012. Data were collected from the ICU admission and discharge registers, and data analysis was done using Microsoft Excel 2007.

**Results:** A total of 766 patients were admitted during the period, consisting of 501 (65.4%) males and 265 (34.6%) females. Ages ranged from 1-day to 89 years with a mean age of  $38.2 \pm 18.2$  years. The most common cases admitted were neurosurgical patients of which there were 316 (41.2%). Patients admitted as a result of critical incidents in anesthesia formed the lowest number of cases admitted 10 (1.3%). Of the 316 neurosurgical cases, 224 (70.9%) were due to severe traumatic brain injury (TBI). An overall admission of 92.4% (207) was for severe TBI due to motor-vehicular accident (MVA). The average length of stay was <24 h to 72 days with a mean of  $4.9 \pm 3.2$  days. A total of 16.7% (128) patients received invasive mechanical ventilation during their stay in ICU. Only 15% (34 patients) of all the cases of severe TBI patients received invasive mechanical ventilation. Mortality rate was 34.6% in this study.

**Conclusion:** The highest number of admissions into the ICU was for severe TBI following MVA. Developing a viable trauma team and separately equipped neurosurgical ICU with adequately trained and motivated staff will help improve the outcome of patients.

**Key words:** Admission, Intensive Care Unit, outcome

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## Introduction

Intensive Care Unit (ICU) is a special department of a tertiary hospital for patients with the most severe and life-threatening conditions which will often require constant and close intensive monitoring, support from specialist equipment and medications in order to maintain normal physiological functions.<sup>[1]</sup>

Patients' may be admitted into the ICU from the emergency department or from the general ward following deteriorating

clinical condition or as a postoperative case from the operating theatre following major invasive surgeries with high risk of complications.<sup>[1]</sup>

The concept of an "advance support of life" which is the foundation for intensive care was developed in the 1950s.<sup>[2]</sup> In 1953, Bjorn Aage Ibsen established the first ICU in Copenhagen where patients received intermittent positive pressure ventilation.<sup>[3]</sup>

### Address for correspondence:

Dr. FA Onyekwulu,  
Department of Anaesthesia,  
University of Nigeria Teaching Hospital,  
Ituku Ozalla, Enugu State, Nigeria.  
E-mail: faonyekwulu@yahoo.com

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In 1960s, the importance of cardiac arrhythmias as a source of morbidity and mortality in myocardial infarction was recognized, and this led to the routine use of cardiac monitoring in ICUs and the development of coronary care unit.<sup>[4]</sup>

Intensive care medicine is still evolving in developing countries and many tertiary hospitals in Nigeria have developed critical care facilities for the care of the critically ill patients. Critical care is a major challenge in developing countries where health needs often outstrip available resources and, unfortunately, most of the critical health care facilities are still in their primordial stages of development.<sup>[5-7]</sup>

The University of Nigeria Teaching Hospital (UNTH) is the largest tertiary institution in the South-east of Nigeria providing specialist care as well as training of other specialties. Currently, it is the only tertiary health facility with an ICU providing advanced level of intensive care in the entire south-east sub-serving over 17 million people.<sup>[8]</sup>

It is a 700 bedded tertiary hospital and was established in 1976 as an independent hospital with its autonomous management board. During the period under review, the hospital had a 5 bedded general ICU, which offered only level 1 care as described by London department of health.<sup>[9]</sup>

The unit is equipped with modern mechanical ventilators, multi-parameter monitors, and invasive arterial, central venous and pulmonary artery pressure measurement devices, point of care machines for full blood count, serum electrolytes, blood gas analysis, and coagulation profile. Bedside X-ray, echo and thermoregulatory mattress are also available.

This study will provide information about the pattern of admission and outcome in our ICU. This will contribute to the literature on the provision of intensive care facilities in Nigeria.

## Materials and Methods

This is a 5-year retrospective review carried out in the UNTH Enugu Nigeria between 1<sup>st</sup> January 2008 and 31<sup>st</sup> December 2012. Data were collected from ICU admission and discharge registers and included demographic characteristics, diagnosis on admission, reason for admission, duration of admission, medical/surgical specialty requesting admission, nature of interventions, and outcome of patients admitted.

The data were recorded on a proforma format sheet designed for the study and data analysis was done using Microsoft Excel 2007.

## Results

A total of 766 patients were admitted into the ICU, there were 501 males and 265 females giving a male to female ratio of 1.9:1.

The ages ranged from 1-day to 89 years with a mean of  $38.24 \pm 18.17$  years and a median age of 56 years. The young and the middle-aged group (20 – 59 years) accounted for 63.4% of all the ICU admissions as shown in Table 1.

The ages of 12 patients were unknown during their stay in admission, and this was due to incomplete documentation as shown in Table 1.

The study showed that neurosurgical cases accounted for 41.2% (316) of all admissions into ICU while the lowest was due to critical incidents arising from anesthesia [Table 2]. Out of the 316 neurosurgical admissions 70.9% (224) was due to severe traumatic brain injury (TBI) while other neurosurgical cases (intracranial tumors, spinal cord injury, and moderate brain injury) accounted for the remaining 29.1%. Patients diagnosed with intracranial tumors were admitted into the ICU postoperatively. Postoperative cases accounted for 49.3% (378) of all admissions [Figure 1].

Patients referred from the specialty of Internal medicine made up 9.4% (72) of the total ICU admissions, while the most common indication for admission was complete heart block (44.4%) as shown in Table 3.

The average length of stay ranged from <24 h to 72 days with a mean of  $4.9 \pm 3.2$  days. A patient with multiple sclerosis co-existing with myasthenia gravis was admitted into the ICU. She was discharged after 72 days on admission only to relapse 2 months later. She was re-admitted into ICU and spent another 70 days.

**Table 1: Age distribution of patients admitted into ICU (January 2008 - December 2012)**

Age group (years)	Frequency	Percentage age distribution
0-9	82	10.9
10-19	49	6.5
20-29	162	21.5
30-39	138	18.3
40-49	84	11.1
50-59	98	13.0
60-69	72	9.5
70-79	53	7.0
80-89	16	2.1
Unknown age	12	
<b>Total</b>	<b>766</b>	<b>100</b>

ICU=Intensive care unit

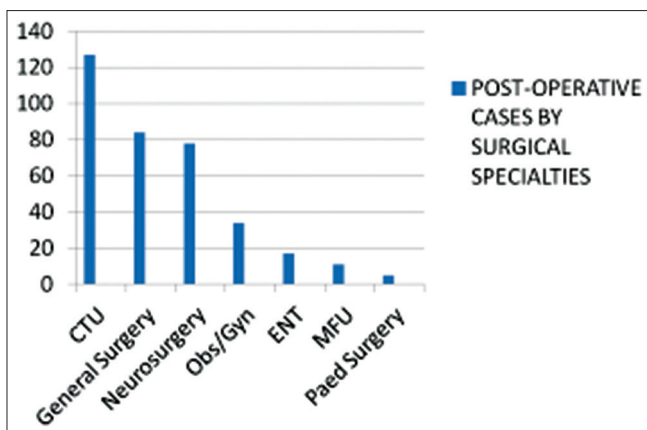


Figure 1: Postoperative cases by surgical specialty

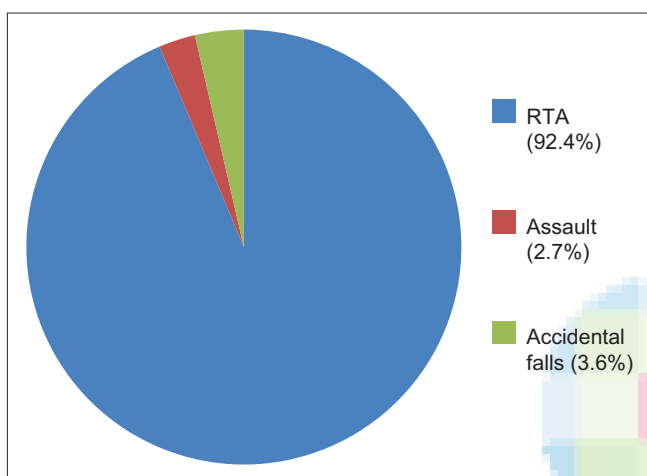


Figure 2: Causes of severe traumatic brain injury

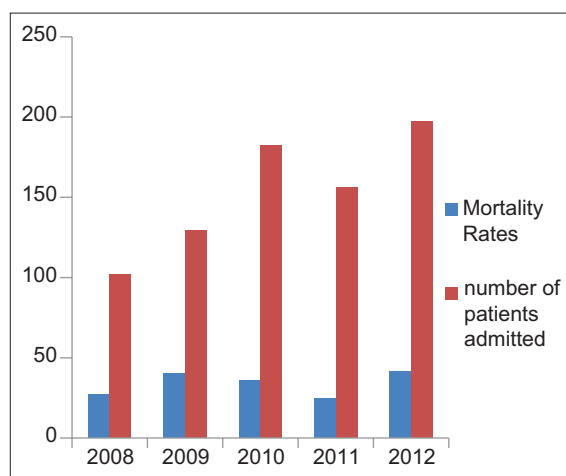


Figure 3: Admission pattern and mortality rate per year

A total of 66 (8.6%) patients admitted spent <24 h in the ICU, out of which 66.7% (44) mortality was recorded. Postoperative cases were 43 patients (65.1%) treated as emergencies, out of which 21 deaths was recorded. In this group (patients that spent <24 h in the ICU) 14 patients

Table 2: Pattern of admission according to specialty

Specialty	Total number of admission	Percentage	Ranking
Neurosurgery	316	41.2	1
CTU	156	20.4	2
Gen.Surgery	128	16.7	3
Internal medicine	72	9.4	4
Obs/Gyn	47	6.1	5
ENT	24	3.1	6
MFU	13	1.7	7
Anaesthesia	10	1.3	8
Polytrauma	18	2.3	9

Total number of admission -766, MFU=Maxillofacial unit; CTU=Cardiothoracic unit; ENT=Ear, Nose and Throat (otolaryngology)

Table 3: Indication for admission into ICU from internal medicine

Listing	Diagnosis	Frequency	Percentage	Rank
1	Complete heart block	32	44.4	1
2	CVA	9	12.5	2
3	Hepatic encephalopathy	5	6.9	3
4	Guillain-barres syndrome	4	5.6	4
5	Status epilepticus	4	5.6	5
6	Acute MI	3	4.2	6
7	CCF due to HTN	3	4.2	7
8	Tetanus	2	2.8	8
9	Rabies	2	2.8	9
10	Sickle cell crises	2	2.8	10
11	Acute asthmatic attack	2	2.8	11
12	Congenital heart disease	2	2.8	12
13	Diabetic Ketoacidosis	1	1.4	13
14	Multiple sclerosis + M.Gravis	1	1.4	14

ICU=Intensive care unit; CVA=Cerebrovascular accident; MI=Myocardial infarction; HTN=Hypertension; CCF= Congestive cardiac failure

Table 4: Analysis of outcome

Outcome	No. (%)
Transferred to the ward	489 (63.8)
Died	265 (34.6)
Discharged home	10 (1.3)
Referred to Europe (London)	1 (0.1)
Left against medical advice	1 (0.1)

received mechanical ventilation with 85.7% (12) mortality; five of the fatal cases were postoperative cases.

A total of 128 (16.7%) patients admitted into ICU received invasive mechanical ventilation during their stay, while 82 (64%) of these patients died on admission. Majority of the deaths recorded in this group were nonpostoperative patients (48) as compared to postoperatively ventilated patients (34).

The overall ICU mortality rate was 34.6% [Table 4], 67.5% (179 patients) were males while 32.5% (86 patients) were females. Severe TBI accounted for 45.7% (121 patients) of

ICU mortality, postoperative cases accounted for 40.7% (108 patients) while medical admissions accounted for 13.6%. Patients referred from the specialty of internal medicine [Table 3] recorded 50% mortality (36 deaths out of 72 patients).

During the period of study, 15% (34) of all severe TBI patient received invasive mechanical ventilation, and 6.3% (14) of these patients were poly-traumatized.

A total of 1.3% (4) of all neurosurgical cases admitted into ICU was purely due to high spinal cord injury with respiratory failure. The spinal cord injury was due to fracture of the 3<sup>rd</sup> and 4<sup>th</sup> cervical spine resulting in respiratory failure due to phrenic nerve injury.

There were two cases of rabies with 100% mortality and four cases of Guillain–Barres syndrome with documented 75% (3) mortality.

Severe TBI was most commonly due to motor-vehicular accident (MVA) as shown in Figure 2.

The highest number of admissions into the ICU during the period of study was in 2012 with 197 patients, and the lowest mortality rate of 24.4% was observed in 2011 [Figure 3].

## Discussion

Intensive Care Unit requires a vast use of up to date equipment and highly skilled staff. The outcome of patients admitted into the ICU will also depend on the level of training and experience acquired by staff. In developing countries where financial resources are limited training and re-training of staff may not be adequate. Intensive care also demands a tremendous amount of time and effort on behalf of the medical and nursing staff to treat and improve survival of the critically ill patients.<sup>[10]</sup>

Postoperative cases across the various surgical specialties accounted for 49.3% of all admission into the ICU followed by neurosurgery 41.2%. This result is similar to previous studies done by Isamade *et al.*<sup>[11]</sup> and by Bolaji and Kolawale.<sup>[12]</sup> In centers with functional high dependency unit (HDU), the number of postoperative cases managed in the ICU would be greatly reduced as some of these cases could have been treated in the HDU.

Medical admissions accounted for 9.4% [Table 3] of all ICU admissions. Previous studies across the country have shown that medical admissions constituted around 4.3 – 21.3%.<sup>[6,7,11-13]</sup> Complete heart block (44.4%) was the most common indication for medical admission into the ICU. The patients later had a permanent pacemaker inserted. This was different from earlier studies were

respiratory insufficiency and tetanus were observed to be the highest indication for admission.<sup>[7,12]</sup>

Neurosurgical specialty was observed to be the highest surgical specialty utilizing the ICU bed spaces. This was different from the study done by Mato *et al.* where the Obstetrics department was the highest specialty utilizing the ICU bed space.<sup>[14]</sup> MVA is the most common cause of severe TBI in this study, and this agrees with a study done in Britain where high-velocity injury involving rapid acceleration and deceleration was noted to be the most common cause of severe TBI.<sup>[15]</sup> In a study by Adenekan and Faponle<sup>[16]</sup> road traffic crashes were responsible for most deaths in major trauma admissions to the ICU.

The high prevalence of severe TBI in this study is due to the high level of reckless driving and poor maintenance of the highway. The availability of a neurosurgical unit and the location of the hospital along the expressway (UNTH is situated along Enugu-Port-Harcourt expressway, the major road connecting Northern Nigeria and the South-East and South-South Nigeria with heavy traffic load) provides close proximity to victims of road traffic accident along the highway. Management strategy should include increased public enlightenment campaign, enforcement of safety rules and improved pre and in-hospital care of trauma victims.<sup>[16]</sup>

The length of stay in ICU ranged from  $\leq 24$  h to 72 days with a mean of  $4.9 \pm 3.2$  days. The longest duration of stay (72 days) was for a patient who had multiple sclerosis with co-existing myasthenia gravis. Admission of patients with poor prognosis and/or prolonged use of the ICU facility results in other patients with a better prognosis being denied care; many of these die, as a result.<sup>[10]</sup> Resources are also used up, and this adds further stress on the health care system in a developing country.

In this review, 8.6% of patients admitted into the ICU spent  $< 24$  h with 66.7% mortality in this group. On the contrary, a study done in Saudi Arabia showed that this group of patients formed 27.8% of all ICU admissions, with an ICU mortality rate of 26.3%.<sup>[17]</sup> This difference was largely due to better targeting of ICU admission protocols to patients most likely to benefit, making “do not resuscitate” decisions early during their hospital stay and functional HDUs. It was also observed that the clinical events that occurred, the quality of care provided prior to stay in ICU and the length of stay in ICU are all factors that inter-relates in determining the outcome of patients.<sup>[15,18]</sup>

The percentage of ventilated patients observed in this study is far less compared to the study by Wunsch *et al.*<sup>[19]</sup> where more than 50% of all patients admitted into the ICU received mechanical ventilation in the first 24 h.<sup>[19]</sup> Only 15% of patients with severe TBI received invasive

ventilatory support which is an integral part of the management of patients with severe head injury. This was largely due to shortage of mechanical ventilators in the center during the study period. Furthermore, the absence of a clear-cut protocol on whom and when to institute mechanical ventilation could have contributed to these wide differences observed.

A mortality rate of 34.6% (226 patients) was observed, and 67.5% were males and 32.5% were females. The mortality rate and sex distribution observed in this series is similar to previous studies.<sup>[10-12]</sup>

A lower mortality rate was observed by Mato *et al.* (24.3%) but in their study over 42% of admissions into the ICU were nonjustifiable as most patients were admitted into ICU for lack of bed space in the general wards and for better comfort.<sup>[14]</sup> In this study, the yearly mortality rate along with the number of admissions during the period under study showed the lowest mortality rate to be in 2011. The findings of differences on admissions, of course, translate into differences in outcomes.

Severe TBI accounted for the highest number of mortality in this study and this is accounted by the fact that most of the severe TBI patients receive very poor prehospital trauma care, ineffective ambulance system for transportation of patients to the hospital and the time lag between illness and intervention. This additional stress further exacerbates an already established primary brain injury and therefore worsened their prognosis.

In this series, 6.2% (14) of severe TBI patients were poly-traumatized. This differs significantly from other studies where it was observed that severe TBI patients (58%) had polytrauma.<sup>[20]</sup> This wide margin of difference was due to better evaluation and documentation of patients with trauma in the setting of a prospective study in Israel.

## Conclusion

Neurosurgical cases had the highest number of admissions into the ICU with severe TBI constituting a greater number of all neurosurgical cases and mortality. Developing a viable trauma team and separately equipped neurosurgical ICU with adequately trained staff will help improve the outcome of patients. Furthermore, the development and strict implementation of protocols for use in the management of ICU patients along with improved documentation will foster better prognosis for ICU patients in resource-poor settings.

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