ORIGINAL ARTICLE

Intensive Care Unit admissions and outcome in a university teaching hospital: a 6-year review

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ABSTRACT

Background: Critically ill patients are a significant source of morbidity and mortality in hospitals. In resource-challenged economies like Nigeria, the number of deaths due to conditions requiring critical care is alarming. As in most other tertiary hospitals, critically ill patients are usually admitted into the Intensive Care Unit (ICU) of Nnamdi Azikiwe University Teaching Hospital (NAUTH).

Objectives: We sought to find out the pattern of admissions and the spectrum of disease conditions of patients and also, to assess the outcome of the cases admitted into the Intensive Care Unit (ICU).

Methodology: We undertook a six-year retrospective review of all admissions into the multi-disciplinary six-bed ICU of NAUTH Nnewi, August 2007 to July 2013. Data collected were analyzed using the Statistical Packages for the Social Sciences (SPSS) version 24.0, and presented in relevant charts and tables.

Results: During the period, the total number of hospital admissions was 36,386, out of which there were 933 (3%) ICU admissions but, only 521 (56%) case notes were available for analysis. There were 346 males and 175 females with a male:female ratio of 2:1. Trauma admissions were mostly emergencies 42.7%, with a mean ICU length of stay of 37.6days. Survivors had a statistically significant longer length of stay (LOS) 103.8 days than non-survivors 51.7days ($p = 0.0001$). Mortality rate of trauma patients was 9.7%, and road traffic accidents were responsible for most deaths 32.2%.

Conclusion: Intensive care admissions cover a broad spectrum of diseases and specialties. Trauma, especially, due to road traffic accidents and burns, is a very important cause of morbidity and mortality in ICU. Management strategies should include early admission and active life support measures. There is need to improve trauma and hospital care of these patients in order to improve their outcome.

INTRODUCTION

Nnamdi Azikiwe University Teaching Hospital (NAUTH) is the biggest tertiary hospital in Anambra State. Admission of patients into the Intensive Care Unit (ICU) commenced in August 2007. The ICU has become a standard reference point for the care of critically ill patients in most parts of the world and such critically ill patients include trauma patients with head injuries; some postoperative patients with complications like hypotension, renal compromise; patients with one or more organ failures; burn patients; physiologically unstable patients and potentially unstable patients.

Intensive care provides organ support and close monitoring of the patient's physiological parameters, and so, one of the goals of intensive care is to return the patient to the normal state of health.[1] However, in an attempt to achieve this, there is need to strike a balance between under-treating and over-treating the patient which may end in the prolonged intensive care unit (ICU) stay.[1] Prolonged ICU stay can have adverse effects on the patients such as infections, complication and even mortality besides high cost.[2]

The objectives of this study were to determine the pattern of admissions, the spectrum of disease conditions of the patients and also to assess the outcome of the cases admitted to the ICU.

METHODOLOGY

We conducted a six-year retrospective review of all admissions into the multi-disciplinary six-bed open ward Intensive Care Unit (ICU) at NAUTH, Nnewi, Anambra State, from the inception of the ICU in August 2007 to July 2013. The unit is under the Department of Anaesthesiology and the consultants and residents in the department conduct daily rounds and oversee the unit. Specialists from other departments and units such as surgery, medicine, paediatrics and obstetrics and gynaecology admit and co-manage patients in the ICU.

The following demographic details and other information were retrieved from the patients' records and ICU Register: age, gender, diagnosis/indications necessitating ICU admission, duration of admission, referral or mortality. Patients with incomplete data were excluded from the study.

The primary outcome variable was the total number of patients who were admitted in the ICU and the pattern of admission. Admission duration of 14days and beyond was regarded as prolonged ICU stay.[6] Secondary outcome variables included relationship between interventions / treatment during stay and outcome. Data collected were analyzed using the Statistical Packages for the Social Sciences (SPSS) version 24.0, and presented in relevant charts and tables.

RESULTS

The ICU of NAUTH Nnewi is a 6-bed multi-specialty facility renovated and equipped in 2007. There was one consultant, eight ICU-trained nurses and one technician from 2007 to 2011, but by 2012 the staffing improved with three consultant Anaesthetists and six resident doctors. A consultant Anaesthetist, a senior registrar and a registrar are assigned to cover the ICU each day and the mean nurse to patient ratio was 1:3.

During the period under review, the total number of hospital admissions was 36,386 patients out of which 933 patients (3%) were ICU admissions but, only 521 (56%) patients' records were available for analysis. There were 219 post-operative patients, 93 cases of major trauma with head injury, 53 cases of burns, 14 of tetanus and 12 of cerebrovascular accident admitted during the study period, representing 78% of the total available records among the ICU admissions. There were 346 males and 175 females, giving a male: female ratio of 2:1.

Table 1. Demographic variables

Diagnosis	Number of Cases		Male Duration of ICU stay(days)	Female Duration of ICU stay (days)
	Male	Female		
Multiple Injuries	198	92	24	35
Burns	17	18	7	4
Heart Diseases / Cerebrovascular Accident	5	Nil	7	Nil
Head Injury	12	3	90	71
Malignancies/Tumour	5	9	24	43
Eclampsia	Nil	22	Nil	7
Renal Failure	5	3	117	87
Bacterial	Nil	16	4	10
Exploratory Laparotomy	36	21	1	4
Trauma	34	Nil	6	Nil
Chest Injury	1	Nil	73	25
Spine Disease	23	Nil	27	Nil

Trauma admissions were mostly emergencies (42.7%) with a mean ICU length of stay of 37.6 days. The duration of hospital stay and proportion of patients with prolonged hospital stay is shown in Table 2.

Only 3.8% (20) of these patients had endotracheal intubation while 2.8% (15) received artificial ventilation.

Table 2. Duration of Hospital Stay

Specialty	Cases		Age Range (years/days)		Duration ICU Stay (days)	
	Male	Female	Male	Female	Male	Female
General surgery	3	68	14 – 60	9 – 45	7 -54	15 -60
Cardiothoracic	69	1	12 -79	12	10 - 122	30 -76
ENT	Nil	12	-	18– 65	-	29 - 45
EUA	Nil	1	-	3– 35	-	6 - 12
Medicine	32	-	25-104	-	10-29	-
Neurosurgery	122	30	25 -91	4 – 70	42-140	5 - 32
Orthopaedics	15	6	20 -80	8 - 80	2-68	10-100
Paediatrics	29	9	8-84	5 -13	25-100	10 -33
O&G	Nil	35	-	13 - 63	-	10 - 117
Oncology	Nil	1	-	21-80	-	80
Plastic surgery	43	23	40-87	6 - 80	10-67	10 -76
Resp. medicine	Nil	1	-	38 – 61	-	10 -120
Urology	6	1	23-70	36 – 45	30-46	20-42

ENT: Ear, Nose and Throat; EUA: Examination under Anaesthesia; O&G: Obstetrics and Gynaecology

About 4.8% (25) of patients received sedation, and diazepam was the most common agent (65%) used for sedation. A combination of paracetamol and pentazocine was used for

analgesia in 18% (94), whereas 16.7% (87) had only non-steroidal anti-inflammatory drugs (NSAID), 14.8% (77) only pentazocine, 9.4% (49) combination of pentazocine and NSAID, and 18%(94) had no analgesia. Survivors had a statistically significant longer length of stay (LOS) 103.8days compared to non-survivors 51days ($p = 0.0001$). The mortality rate for trauma patients 9.7% (51) was significantly higher than that for all ICU admissions 8.5% (43). Road traffic accidents were responsible for most deaths 32.2% (168) followed by burns 10.2% (53).

Table 3. Outcomes from ICU admissions

Outcome	Cases		Age Range (*years*)		Duration of Stay (*days*)	
	Male	Female	Male	Female	Male	Female
Dead	132	63	25-86	55 -86	25-50	10 -76
Discharged	63	32	30-87	20 -65	10-140	10 -36
Female SW	2	80	17-58	40 -82	3-9	10 -120
Male SW	104	2	30-91	18 -68	10-100	30 -40
Paed Ward	5	5	19-64	6 -16	10-52	10-15
Referred to other Hospital	14	5	10-104	24 -55	10-27	3 -18
Transferred to Ward	5	Nil	30-75	-	4-47	-

SW - Surgical Wards

Table 4. Condition of patient at discharge

Condition at Discharge	Cases		Age (years)		ICU Stay (days)	
	Male	Female	Male	Female	Male	Female
Ambulating	154	97	58-91	2-82	42-111	10 -120
Morgue	127	63	3-104	6-86	25-140	10-76
Ref. UNTH	1	Nil	30	-	122	-
Still Unwell	34	21	5-79	4-68	10-67	10 -117

UNTH - University of Nigeria Teaching Hospital

DISCUSSION

Our review revealed that 219 (42%) post-operative patients were admitted into the ICU which is the highest percentage of the proportion amongst the admitted patients. Most of these patients had obstetric and gynaecological surgeries, while, some had neurosurgical procedures done. This is similar to the findings by Oji in which 50%of the ICU admissions in Jos were post-operative patients.[8] Similarly, Kushimo, *et al*, found that 57% of the paediatric ICU admissions in Lagos University Teaching Hospital (LUTH), Nigeria were also, for post-operative problems largely from cardiothoracic operations.[9] At the University of Port Harcourt Teaching Hospital (UPTH), Nigeria Ebirim, *et al*, documented that 42.7%

of the ICU trauma admissions were for post-operative patients.[10] Thus, we conclude that ICU admission rate for post-operative conditions in Nnewi was probably similar to those of other centres around the country.

The proportion of trauma patients with head injury admitted into ICU was second to post-operative patients, and they were admitted as emergencies. This is similar to the pattern of admission at UPTH.[10] Most of the trauma resulted from road traffic accidents involving motorcycles. Mortality amongst the patients with head injury admitted to ICU was and similar to that reported by Adamu, *et al,* in northern Nigeria.[10] Brain injuries were the implicated cause of death as earlier published by Ebirim and Ojum.[9]

Fire outbreaks, related to inappropriate storage of petroleum products, fuel tanker explosions and adulterated kerosene explosion, accounted for most of the burns cases admitted during the period studied. Burns cases accounted for only 10% of all admissions to the ICU but, the mortality from them was significant. A similar study in Port Harcourt showed a higher mortality rate amongst the burns patients but, there was no ICU admission for burns patients at LUTH, and Jos University Teaching Hospital, Nigeria from previous studies.[8,9]

Noteworthy is, a four-year retrospective study by Oyegunle and his co-workers at Ogun State University Teaching Hospital, Nigeria (OSUTH), which showed that 6.8% of all the ICU admissions were for burns and mortality rate for the affected patients was 35.7%.[11] The mortality rate associated with burns injuries might have resulted from the level of facilities and expertise available at the ICU. A dedicated care unit strictly for burns patients may improve the outcome of these patients. In so doing, better and improved level of management will be made available; thereby, reducing the mortality rate associated with burns patients.

Our review showed that 3.8% had endotracheal intubation, especially among head injured patients and 2.8% had artificial ventilation. Endotracheal intubation has the potential for complications like laryngeal trauma, mucus plugging and infections. This was acknowledged by Koh, *et al,* in their own study.[12] Pulmonary hypertension may arise following manipulation of the endotracheal tube, tracheal suctioning and artificial ventilation. This may lead to positive intra-pulmonary pressure which increases pulmonary vascular resistance and may impede pulmonary blood flow with attendant poor oxygen saturation.[13] There was 33% mortality amongst cardiothoracic patients that had endotracheal intubation according to Okafor at Enugu, Nigeria.[14] The increased mortality rate might be related to the duration of endotracheal intubation and its complication in already compromised chest regions following the primary diagnosis.

Sedation was achieved mainly with diazepam in our review (65%) and muscle paralysis with atracurium. Recommended agents are midazolam for sedation of the acutely agitated patient, while lorazepam is recommended for longer infusions, propofol is preferred when rapid awakening is desired.[15,16,17] Though, diazepam has active metabolites prolonging its action, it was readily available and cheaper, and that may have informed its common usage for sedation.

A major drawback seen in this review is that the level of sedation was not assessed. The use of a combination of paracetamol and pentazocine constituted 18% drug-choice for analgesia in our review, non-steroidal anti-inflammatory drugs 16.7%, 14.8% had only pentazocine, 9.4% had combination of pentazocine and NSAID, and 18% had no analgesia. Sedation and analgesia are very important aspects of care in ICU. Pentazocine has some sedating property but on a molecular level, it has both agonist and antagonist properties at the receptor level.

There is also concern about NSAID usage as they inhibit cyclo-oxygenase which may lead to acute gastritis and stress ulcers. They also

exhibit anti-platelet activities leading to increased bleeding and may affect renal functions.[18] Even though, opioids with agonistic properties like fentanyl, morphine are preferred, the choice in our review might be likely due to availability as pentazocine and NSAIDs are more readily available.[19]

Survivors had a statistically significant longer mean length of stay (LOS) 103.8 days than non-survivors 51.7 days, as shown in Tables 2 and 3. This is similar to the findings by Williams, *et al,* which their study revealed that increasing LOS in ICU was not associated with an increased risk of in-hospital mortality after adjusting for other covariates, but was associated with an increased risk of long-term mortality after hospital discharge.[19] According to Osinaike and co-workers in their series at UCH Ibadan, the most significant predictor of outcome was endotracheal intubation and overall mortality was 15%.[20]. However, in our study 10.2% (53) of the patients were discharged still unwell as shown in Table 4 but, they received further care at the wards.

There is lack of adequate man-power from our review, one consultant, one senior registrar and one registrar for twenty-four hour coverage may obviously lead to fatigue with its attendant adverse effects. Nurse-patient ratio averaged 1:3. It is necessary that patients in ICU should have a 1:1 nursing care. When this is not possible due to staff shortage, complications arising from patients' care may contribute to their mortality.[21] Other studies have shown that ICU staffing can have significant impact on management outcomes.

CONCLUSION

Intensive care admissions in NAUTH cover a broad spectrum of disease conditions and specialties, and trauma especially, due to road traffic accidents is a very important cause of morbidity and mortality in ICU. Management strategies should include increased public enlightenment campaigns, enforcement of road safety rules in order to reduce the incidence of RTAs. There is need to improve trauma and hospital care of ICU patients in order to improve outcome of ICU patients.

RECOMMENDATION

Efforts should be made to build a separate care unit to be dedicated to burns patients. Public enlightenment campaign should also be made on the dangers of inappropriate access and storage of petroleum products.

Finally, employment of adequate number of physician anaesthetists and intensivists and allied staff, along with the provision of modern ICU facilities will invariably improve the dismal outcome of ICU admissions.

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