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A 7-year review of medical admission profile for clinical diseases in an intensive care unit of a low-resource setting

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Abstract

Objective: Various patients needing organ or systemic support and close monitoring are routinely managed in the intensive care unit. This includes patients that emanate from various sources, like the trauma unit, emergency department, inpatient wards, and post-anesthesia care unit. Admissions into the intensive care unit due to medical conditions have not been analyzed in our environment to determine the common indications and the outcome. We aimed to determine the pattern of medical admissions and outcomes in the intensive care unit.

Method: A retrospective study of all patients admitted to the intensive care unit of Nnamdi Azikiwe University Teaching Hospital Nnewi, Anambra State, Nigeria, from January 1, 2014 to December 31, 2020, with medical diagnosis was conducted. Data were retrieved from the intensive care unit admission and discharge registers and analyzed using the Statistical Package for Social Sciences (SPSS) Version 20 (IBM Corp., Chicago, Illinois, USA).

Results: Eighty-nine medical patients were admitted, which accounted for 7.63% of the total intensive care unit admissions of 1167 patients during the period, with a preponderance of males (57.3%). The most common medical condition for intensive care unit admission (31.5%) was a cerebrovascular accident. The mean length of stay was found to be 5.13 ± 3.42 days. Mortality following medical intensive care unit admission was 56.18%, which contributed to about 11.4% of the total ICU mortality.

Conclusion: When compared to all other reasons for admission to a general intensive care unit, medical conditions account for a small percentage. The most frequent illness was a cerebrovascular accident.

Keywords

Intensive care unit, medical admissions, ICU admissions

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Introduction

In order to achieve better outcomes, intensive care units (ICUs) in developed countries have become increasingly specialized (cardiac, neurological, and renal ICUs).[1–3] Unlike in developed countries, the ICUs in low-income settings, where they are available, are still poorly equipped and understaffed, with attendant high mortality rates. Most new ICUs in Sub-Saharan Africa are multipurpose, admitting all age groups and a wide range of pathologies and diagnoses.[4,5]

In low-income settings like Nigeria, intensive care medicine is still evolving, and critical care is a major challenge where those that need ICU care often outstrip available resources. And, unfortunately, most of the critical health care facilities are still in their primordial stages of development.[6,7]

Patients in low-income settings with medical conditions that need special care are admitted to the general ICU for early recognition of the clinical state and prompt intervention. Therefore, a description of admission patterns and clinical outcomes will allow for the identification of the most common indications for medical admissions as well as the efficient use of the limited resources available in developing countries.[6,8] Unfortunately, there are few studies in our environment that have comprehensively analyzed the indications for medical admissions to the ICU. This is often due to the low number of ICU centers and low utilization due to poverty. Hence, this study reviewed the demographic characteristics of medical admissions to the ICU and the outcomes of those admissions. The outcome of this study will probably guide policymakers in planning ways to reduce poor outcomes.

Materials and methods

Study site

The study was conducted at the ICU of the Nnamdi Azikiwe University Teaching Hospital, Nnewi, Anambra State, Nigeria. It is a tertiary institution with a 6-bed ICU and four functional ventilators. It is a referral center for cases from Anambra State, parts of other southeastern states, and other adjoining states. It is a training center for post-graduate studies in anesthesiology and other specialties. Although other specialties have admitting rights, the ICU of the hospital is managed by the anesthesiologist who collaborates with them in patient management. Patients who need ICU admission after assessment by the managing team are admitted to the ICU by the managing team. This is done after confirmation that there is available bed space in the ICU. Unfortunately, mechanical ventilation or other high-skilled interventions are only done in the ICU; hence, those who may need these interventions before having access to the ICU may die before being admitted.

Study design

It is a retrospective study of the medical patients admitted to the general ICU of the hospital from January 1, 2014 to December 31, 2020.

Inclusion criteria

All the medical patients admitted during the study period in the ICU were recruited for the study.

Exclusion criteria

All non-medical cases that were admitted to the ICU and those with incomplete data were excluded.

Sample size determination: All the medical patients managed during the study period were analyzed.

Sample technique

Non-random sampling approach. All the available admission and discharge data during the period were analyzed.

Ethical approval

Approval was obtained from the Chukwuemeka Odumegwu Ojukwu University Teaching Hospital Ethics Committee (date of approval: August 17, 2021; reference number: COOUTH/CMAC/ETH.C/VOL.1/FN:04/0234).

Study procedure

The ICU records (admission and discharge register) were reviewed to identify medical patients who were admitted to the ICU during the study period. Their demographic characteristics, diagnosis on admission, duration of stay, and outcome of the patients admitted were retrieved. The admission parameters like blood pressure, temperature, pulse rate, respiratory rate, and level of consciousness were also extracted from the patients' case notes for analysis. A validated Glasgow Coma Scale[9] was used for prognostication of patients managed in the ICU during the period.

Statistical analysis

The data were entered into an Excel 2016 spreadsheet (Microsoft Corporation, Redmond, WA, USA) and subsequently imported into Statistical Package for the Social Sciences (SPSS) Version 20 (IBM Corp., Chicago, IL, USA). Categorical data were expressed as frequencies and percentages within categories, and continuous variables were given as means (standard deviation). Values of $p < 0.05$ were considered statistically significant.

Table 1. Total ICU admission to number of medical admissions from year 2014 to 2020.

Year	Total ICU admissions	Medical admissions (rate in %)
2014	151	7 (4.64)
2015	147	11 (7.48)
2016	211	10 (4.74)
2017	178	8 (4.49)
2018	167	10 (5.99)
2019	182	30 (16.48)
2020	131	13 (9.92)
Total	**1167**	**89 (7.63)**
Mean	**166.71 ± 24.59 SD**	**12.71 ± 7.86 SD**

Table 2. Age distribution among the ICU medical patients.

Age range (years)	Frequency	Percentage (%)
0–17	6	**6.7**
18–30	16	18.0
31–40	12	13.5
41–50	8	9.0
5–60	19	21.3
61–70	10	11.2
71–80	11	12.4
81–90	6	6.7
91–100	1	1.1
Total	89	100

Results

A total of 1167 patients were admitted to the ICU during the study period, with a bed occupancy rate of 78%, while medical admissions accounted for 89 patients (7.63%). This is shown in Table 1. The ages of the medical patients admitted to the ICU ranged from 18 to 30 years old (18.0%), 31 to 40 years old (13.5%), 41 to 50 years old (9.0%), 51 to 60 years old (21.3%), 61 to 70 years old (11.2%), and 71 to 80 years old (12.4%). This is represented in Table 2. The gender distribution shows a non-statistically significant slightly higher percentage of male patients (57.3%) than female patients (42.7%) (p-value = 0.0275, 95% CI = 0.356–3.549). This is shown in Table 3. Table 4 showed that of the 89 patients admitted during the study period, 83 (93.3%) were adults and 6 (6.7%) were pediatric patients. See Table 4. The diagnosis on admission showed that cerebrovascular accident was the most frequent medical condition (31.5%) while myasthenia gravis and Guillen-Barré were the least (1.1% each). This is represented in Table 5 and Figure 1.

A mortality rate of 50 (56.18%) was noted among the admitted medical cases, while 39 (43.82%) of the admitted patients were discharged, with the mean length of stay of the admitted patients being 5.13 ± 3.42 days. This is represented in Table 6. Table 7 showed that mortality from the medical admission accounted for 50 (11.4%) of the total ICU mortality of 438 (37.5%).

Discussion

The admission of medical patients into the general ICU accounted for 7.63% of the total ICU admissions of 1167 patients, with a mean bed occupancy rate of 78%. This demonstrates a low utilization of ICU services. This figure is similar to the 15% recorded by Oke[7] at Lagos University Teaching Hospital, Nigeria, and the result recorded by Ilori and Kalu[10] in their study at the University of Calabar Teaching Hospital in Cross River State, Nigeria, with a bed occupancy rate of 23%, but not comparable to other findings with a greater number of medical ICU admissions.[4,11–13] This low figure could be due to the medical team's limited use of the ICU due to the high cost and lack of health insurance coverage for admission to the study center, or it could be due to the center's limited number of available beds. It can also be attributed to the fact that patients who had COVID-19, which was prevalent during the study period, were managed in the isolation centers.

Patients aged 51–60 years constituted most of the admissions, with more males in a slightly higher percentage than females (57.3%–42.7%). This age bracket is more vulnerable to chronic medical conditions like hypertension and diabetes. The most common reason for admission in the study was a cerebrovascular accident, which is a common complication of poorly controlled diabetes and hypertension. This might be due to compliance with the antihypertensive drugs, as reported by several authors in the study area.[14,15] The gender distribution is similar to the result of Rajput et al.[16] but opposite to the findings of Tesema et al.[17] who noted female preponderance. Rajput et al., in their study of 241 patients admitted to the ICU during their study period, found that 51% were males while 49% were females, which is similar to our finding of 57.3% (males) and 42.7% (females).

The medical conditions that lead to ICU admission differ depending on the country and environmental factors. In our study, it was noted that neurological conditions, especially cerebrovascular accidents, with a frequency of 31.5%, were the most common diagnosis for admission to the ICU. This is similar to the study at Lagos State, Nigeria, by Poluyi et al.,[11] where 53.8% of the medical admissions were due to neurological conditions. Tesema et al.[17] found that cardiovascular disease was the most common admission diagnosis in Ethiopia, accounting for 36.1% of all admissions. Rajput et al.[16] in their study in Karachi, Pakistan, reported that hepatic disease was the commonest medical condition necessitating ICU admission. This variation in the indication for ICU admission may be related to commonly diagnosed medical complications in the study area. Some common infectious tropical diseases, such as acquired immune deficiency syndrome and tuberculosis, were not recorded in the study because they are managed in specific health facilities.

This study showed a high mortality rate following ICU admission. More than half of the patients admitted died (56.18%), while only 43.82% were discharged. This is comparable to the findings of Tesema et al.,[17] however, studies by Oke[4], and Ilori and Kalu.[10] reported lower figures.

Table 3. Gender distribution from the year 2014 to 2020.

Year	Medical admissions (rate in %)	Sex (%)	
		Males ($n = 51$)	Females ($n = 38$)
2014	7 (100)	6 (85.7)	1 (14.3)
2015	11 (100)	5 (45.5)	6 (54.5)
2016	10 (100)	8 (80.0)	2 (20.0)
2017	8 (100)	5 (62.5)	3 (37.5)
2018	10 (100)	6 (60.0)	4 (40.0)
2019	30 (100)	15 (50.0)	15 (50.0)
2020	13 (100)	6 (46.2)	7 (53.8)
Mean	**12.71**	**7.28**	**5.42**
Standard deviation	**7.86**	**3.54**	**4.72**
p-Value	0.275		
95% CI	0.356–3.549		

Table 4. Distribution of pediatrics and adult patients from year 2014 to 2020.

Year	Medical admissions (rate in %)	Pediatrics patients (%)	Adult patients (%)
2014	7 (100)	1 (14.3)	6 (85.7)
2015	11 (100)	1 (9.1)	10 (90.9)
2016	10 (100)	0	10 (100)
2017	8 (100)	1 (12.5)	7 (87.5)
2018	10 (100)	0	10 (100)
2019	30 (100)	3 (10)	27 (90)
2020	13 (100)	0	13 (100)
Total	**89 (100)**	**6 (6.7)**	**83 (93.3)**
Mean	**12.71**	**1.50**	**11.85**
Standard deviation	**7.86**	**1.0**	**7.05**

Table 5. Medical conditions for ICU admissions (diagnosis).

Year	Medical conditions											Guillain-Barré	Others	Total
	Tetanus	Meningitis	CVA	Seizure disorder	CO Poison	Hypertensive heart disease	COPD	Sepsis	PE	M. Gravis	Nephropathy			
2014	1	1	2	0	0	2	0	1	0	0	0	0	0	**7**
2015	1	0	4	1	2	2	1	0	0	0	0	0	0	**11**
2016	0	0	4	0	2	1	0	1	2	0	0	0	0	**10**
2017	0	0	2	0	0	3	1	1	0	1	0	0	0	**8**
2018	0	1	2	0	0	2	0	2	0	0	1	0	2	**10**
2019	1	2	9	1	1	4	3	5	0	0	2	1	1	**30**
2020	0	1	5	1	0	2	0	0	1	0	2	0	1	**13**
Total	**3**	**5**	**28**	**3**	**5**	**16**	**5**	**10**	**3**	**1**	**5**	**1**	**4**	**89**
Percentage	**3.4**	**5.6**	**31.5**	**3.4**	**5.6**	**18**	**5.6**	**11.2**	**3.4**	**1.1**	**5.6**	**1.1**	**4.5**	**100**

CVA: cerebrovascular accident; CO poison: carbon monoxide poison; COPD: chronic obstructive pulmonary disease; PE: Pulmonary embolism; M. Gravis: myasthenia gravis.

Developed continents such as North America, Oceania, Asia, and Europe have a low ICU mortality rate of 9.3%, 10.3%, 13.7%, and 18.7%,[18] respectively, while South America and the Middle East recorded 21.7% and 26.2% respectively.[19] This high mortality rate in this study compared with studies in more developed countries may be due to well-trained staff and better equipment in such areas than in low-resource settings. In addition, late presentation of cases may contribute to high mortality, and ICU services are essential to care in developed countries.[18] Most patients in the low-income setting present to the hospital too late, when they have developed irreversible complications. The majority of patients in low-income settings arrive at the hospital after developing irreversible complications. Most often,

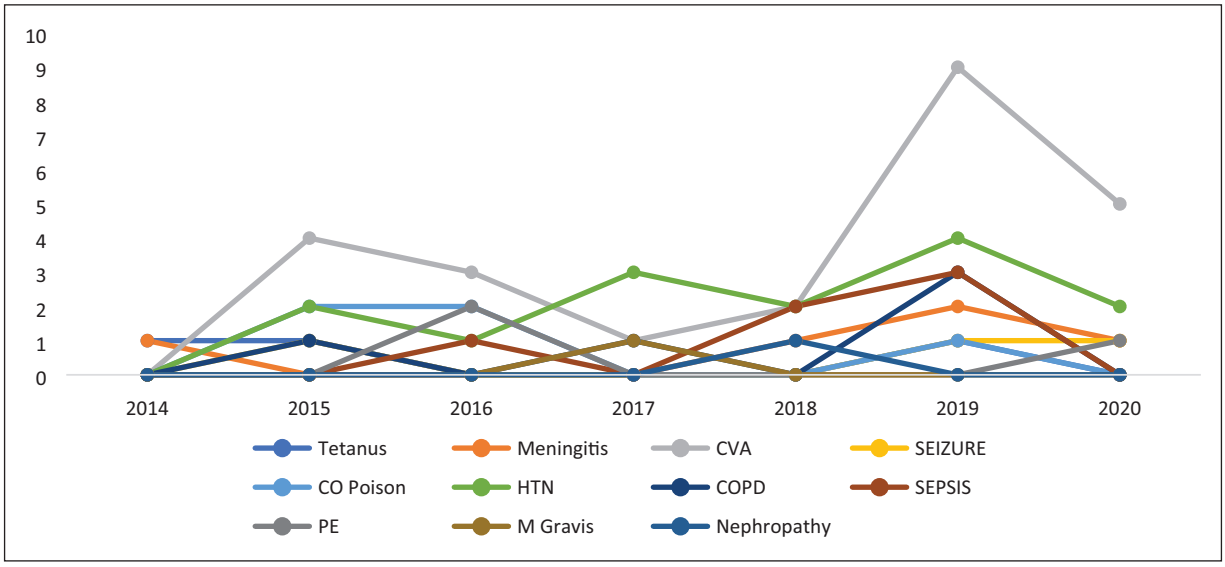

Figure 1. Medical conditions for ICU admissions (diagnosis).

Table 6. Medical ICU admission outcome from year 2014 to 2020.

Year	Medical admissions (rate in %)	Medical discharge (%)	Death (%)	Average duration of stay
2014	7 (100)	3 (42.86)	4 (57.14)	7.50 ± 4.5
2015	11 (100)	4 (36.36)	7 (63.64)	9.96 ± 7.28
2016	10 (100)	5 (50.00)	5 (50.00)	4.12 ± 3.62
2017	8 (100)	4 (50.00)	4 (50.00)	5.45 ± 3.21
2018	10 (100)	5 (50.00)	5 (50.00)	5.08 ± 3.37
2019	30 (100)	13 (43.33)	17 (56.67)	5.81 ± 3.90
2020	13 (100)	5 (38.46)	8 (61.54)	3.0 ± 2.0
Total	**89 (100)**	**39 (43.82)**	**50 (56.18)**	
Mean	**12.71**	**5.57**	**7.14**	**5.13**
Standard deviation	**7.86**	**3.35**	**4.81**	**3.42**

Table 7. Comparing medical admission outcomes (discharge and death) to the total ICU Admission outcome from the year 2014 to 2020.

Year	Total ICU admissions *n* (%)	Total ICU discharge *n* (rate in %)	Medical discharge *n* (%)	Total ICU death *n* (rate in %)	Medical death *n* (%)
2014	151 (100)	85 (56.3)	3 (3.5)	66 (43.7)	4 (6.1)
2015	147 (100)	85 (57.8)	4 (4.7)	62 (42.2)	7 (11.3)
2016	211 (100)	137 (65.0)	5 (3.6)	74 (35.0)	5 (6.8)
2017	178 (100)	119 (66.9)	4 (3.4)	59 (33.1)	4 (6.8)
2018	167 (100)	114 (68.3)	5 (4.4)	53 (31.7)	5 (9.4)
2019	182 (100)	114 (62.6)	13 (11.4)	68 (37.4)	17 (25.0)
2020	131 (100)	75 (57.3)	5 (6.7)	56 (42.7)	8 (14.3)
Total	**1167 (100)**	**729 (62.5)**	**39 (5.3)**	**438 (37.5)**	**50 (11.4)**
Mean	**166.71**	**104.14**	**5.57**	**62.57**	**7.14**
Standard deviation	**24.59**	**21.0**	**3.35**	**7.14**	**4.81**

they look for herbal remedies to treat their illnesses before looking for proper medical care. In high-income countries, ICUs are equipped for specialties and subspecialties, viz., medical ICU, neurosurgical/surgical ICU, pediatric ICU, etc. This stratification helps with better care as health care providers manage cases with which they are more familiar due to specialization. The above assertion was supported by some researchers who submitted that the mortality rate is lower when diseases are managed in a special ICU than in a general ICU.[16,20]

The average length of stay of 5.13 ± 3.42 days is comparable to the findings of Bolaji and Kolawole,[12] but lower than the findings of Koirala et al.[13] This similarity to Bolaji and Kolawole could be explained by the fact that the research was carried out in a hospital in Nigeria with comparable demographics and medical facilities, whereas Koirala's study was carried out in Nepal, India.In Koirala's study, the mortality rate was 26%, while in our case it was 56.18%. Patients in their study presented early and were managed in a specialized ICU; hence, the lower mortality rate and longer stay.

Comparing the mortality following medical admission into the ICU to the mortality in the overall ICU admission shows that it accounted for 11.4% of the 37.5% total ICU mortality. This is lower than that reported by some researchers.[10,11] This variance might be due to the low use of ICU services in the study area, as some cases that may need ICU services may not reach the hospital before they die or may not have the needed financial capacity for ICU services. Health insurance for critically ill patients is not readily available in most low-income countries like Nigeria; hence, most patients who may need ICU services may not have it due to poor financial capacity.[21] Alawode and Adewole[21] in their study "Assessment of the design and implementation challenges of the National Health Insurance Scheme in Nigeria: a qualitative study among sub-national level actors", found that abject poverty, a low level of awareness, superstitious beliefs, and other factors negatively affect the implementation of health insurance services in Nigeria. They recommend that subnational governments create legal frameworks establishing compulsory health insurance schemes at the subnational level.[21]

Limitations of the study

Although the research reached its aims, there are some unavoidable limitations. The main limitation is the retrospective nature of the study; hence, factors that affect poor outcomes and length of hospital stays were not analyzed. Also, some of the clinical information, like the degree of clinical impairment, organ dysfunction, and waiting time before admission, was not recorded in the patients' case file. Another limitation is the non-use of the Acute Physiology and Chronic Health Evaluation (APACHE)[22] score and the Simplified Acute Physiology Score 3 (SAPS 3),[23] which are important tools in predicting length of stay and mortality of patients admitted to the ICU, in this study due to the retrospective nature of the study. Lastly, our inability to calculate the sample size in this study, although we reviewed all the available case notes during the study period is another limitation we noted.

Conclusion

In our environment, the use of ICUs is low by medical specialty, with cerebrovascular accidents being the most common medical illness and Guillain-Barré syndrome being the least. Also, there was a high mortality rate among the managed cases. We therefore recommend that universal health insurance policies cover critically ill patients so they can access ICU services when they need them. Also, a special ICU should be set up for medical patients and other subspecialties, with proper equipping and training of staff to ensure better outcomes.

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Author contributions

CEN, JN, and BCO contributed to protocol/project development, data collection, data analysis, and manuscript writing and editing. CAN, IOO, CUU, and ANO contributed to study design, data collection, and manuscript writing and editing. CJO OSU, and LAN contributed to data collection and manuscript editing.

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Informed consent

Informed consent is not applicable due to the nature of the study (retrospective study).

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Supplemental material

Supplemental material for this article is available online.

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