

## INTENSIVE CARE UNIT ADMISSIONS IN THE JOS UNIVERSITY TEACHING HOSPITAL

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### ABSTRACT

**Objective:** To determine the pattern of admissions to the intensive care unit (ICU) of the Jos University Teaching Hospital (JUTH), a tertiary level referral hospital.

**Method:** This is a retrospective study of the record of patients admitted between January 1994 and December 2002 to the ICU of the Jos University Teaching Hospital. The information obtained from the admission/discharge record as well as the patients' case notes included demographic data, working diagnosis, type of treatment, length of stay (LOS) in the ICU and outcome.

**Result:** A total of 738 patients were admitted over this period and comprised 403 males (54.6%) and 335 females (45.6%) giving a male: female ratio of 1.2:1. The age ranged from one day to 98 years with a mean of  $28.3 \pm 19.8$  years. Postoperative surgical patients accounted for 48.2% of all admissions, while 15.2% were medical cases. Other indications for admissions included polytrauma (9.5%), Obstetrics and Gynaecological complications (16.1%) and burns (11%). The length of stay (LOS) in the unit ranged from 1 to 56 days, with a mean of  $4.5 \pm 5.1$  days. A total of 241 patients died while on admission giving an overall mortality of 42.8%. Postoperative surgical admissions accounted for 38.6% of deaths followed by burn and polytraumatised patients with 23.2% and 11.6% respectively. The lowest mortality of 8.7% was in the obstetrics and gynaecology patients.

**Conclusion:** The pattern of admission into the unit and the outcome of treatment has not significantly changed after 1-2 decade of an initial report. There is need to increase the number and quality of equipment to cope with the increasing need for ICU care, as well as draw up a policy on the type of cases to be managed in order to improve the out come of care.

**Key words:** Intensive care unit, indication for admission, length of stay, mortality. (Accepted 15 September 2006)

### INTRODUCTION

The earliest attempts at grouping unstable patients started in the 1930s in the form of postoperative recovery room<sup>1</sup>. The concept of intensive care units (ICU) dates back to the epidemic of poliomyelitis in the early 1950s with the use of long-term mechanical ventilation<sup>1, 2</sup>. Because the anaesthetists were responsible for the use of ventilators it is not surprising that the early anaesthetists in Europe were involved with the development of intensive care as a specialty, while in the United States it is the respiratory physicians. Today, ICUs in most hospitals in the developed countries have become separate departments staffed by career intensive care physicians or intensivists from various fields

of medicine<sup>2</sup>. In Nigeria, however, ICUs are still part of anaesthesia department and critical care constitutes a substantial part of the workload and responsibilities of anaesthetists<sup>3</sup>

The ICUs have developed to a highly specialized field with variation in their size and capability. This variation occurs between regions, countries or states and even hospitals. The types of ICU include general, medical, surgical, neurosurgical, cardiothoracic, paediatric, neonatal, coronary care, burns and trauma<sup>1</sup>. The general ICUs are multidisciplinary units, which admit patients with different pathologies from various disciplines of medicine, while elsewhere in the hospital. The intensive care unit of the Jos University Teaching hospital (JUTH) is a general ICU that w others are specific for certain medical specialties. In all, they provide special expertise and facilities for care of patients with life-threatening illness

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which are not available elsewhere in the hospital. The intensive care unit of the Jos University Teaching Hospital was established in 1982 as a 2 bed unit to serve the 500 bed capacity and relocated adjacent to the main theatre. The admission policy was reviewed and the unit's equipment upgraded, particularly the acquisition of ventilators, cardiac monitors, defibrillator, pulse oximeters and the Radiology department has a mobile x-ray unit that is available when the need arises<sup>5</sup>. Since the initial report on the development of the unit (1982-1985), there has been no other evaluation of the unit after the upgrading. The aim of this study is to find out what impact these changes have had on the admission pattern and outcome. This will help to identify factors that influence the quality of care and concentrate on areas in need of improvement that will benefit patients admitted for ICU care.

### PATIENTS AND METHOD

All patients that were admitted into the ICU of the Jos University Teaching Hospital between January 1994 and December 2002 were studied. These patients were managed by the anaesthetist and the admitting Surgeon or Physician. The information obtained from the admission/discharge record as well as the patients' case notes included demographic data, working diagnosis, type of treatment, length of stay (LOS) in the ICU and outcome. The study population was described in rates and proportion.

### RESULTS

There were a total of 117,303 hospital admissions over the period of the study out of which 738 (0.6%) were admitted to the ICU. Four hundred and three of the patients were males while 335 were females giving a male: female ratio of 1.2:1. The age ranged from one day to 98 years with a mean of 28.3±19.8 years. The highest admission was recorded in the third decade (24.0%) followed by the first and fourth with 20.1% and 15.9% respectively as shown in Figure 1. Length of stay (LOS) in the unit ranged from < 1day to 56 days with a mean of 4.5±5.1 days.

The indications for admission included postoperative surgical cases (48.2%), medical cases (15.2%) and polytrauma (9.5%). Other indications were obstetrics and gynaecology (15.3%) and burns (11.1%) as shown in Table 1. Types of postoperative surgical cases admitted were mostly cardiothoracic surgeries, complications following thyroidectomy, laparotomy, neurosurgery and operation for major congenital anomalies. Medical admissions included cardiac arrhythmias, respiratory failure, renal failure, severe diabetic complications, poisoning etc. The trauma cases (excluding burn) were polytraumatised victims of road traffic accidents.

The yearly admission is presented in Figure 2. The year with the highest number of admissions is 2002; while the least is 1994. The number of yearly admission significantly increase in 1998 when the bed occupancy was increased from 4 to 6. The number remained approximately 100 per year except in 1999 (with a rate of 75) when a 2 month workers' strike by hospital workers resulted in a low admission.

Four hundred and ninety seven (67.3%) patients survived, out of which 437(59.2%) were transferred either to the general wards or to other hospitals and 60 (8.1%) were discharged home. A total of 241 (32.7%) died on admission. Figure 2 is a graph showing the yearly admissions and mortality with a steady rise in both. There was no relationship between age and mortality. Postoperative surgical admissions accounted for 42.8% of the deaths, which is the highest, followed by burn injury and polytraumatised patients with 23.2% and 11.6% respectively. Mortality amongst the obstetrics and gynaecology patients of 8.7% was the lowest.

The factors responsible for the mortalities vary among the different groups. Amongst the postoperative group of patients, it includes irreversible shock, respiratory failure, sepsis and multiple organ failure. Irreversible shock and severe brain injury were the major complications responsible for the mortality in polytraumatised patients. While in burn patients, the extent of burn, inhalation injury and sepsis were the major mortality indices. Neurological insult, irreversible shock and sepsis were the main factors responsible for death in obstetrics and gynaecological admissions. Most of the mortalities among medical admissions were cardiovascular patients in whom the main factors responsible for the mortality were cerebrovascular accidents and arrhythmias.

The highest yearly mortality was in 2001 and 2002 with 33 deaths in each year, mainly from admissions of casualties from the Jos civil unrest within that period.

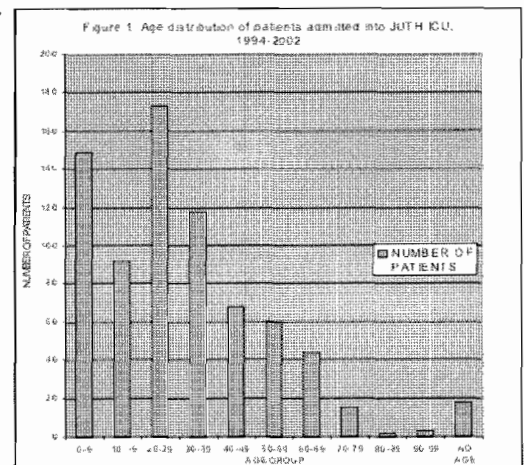
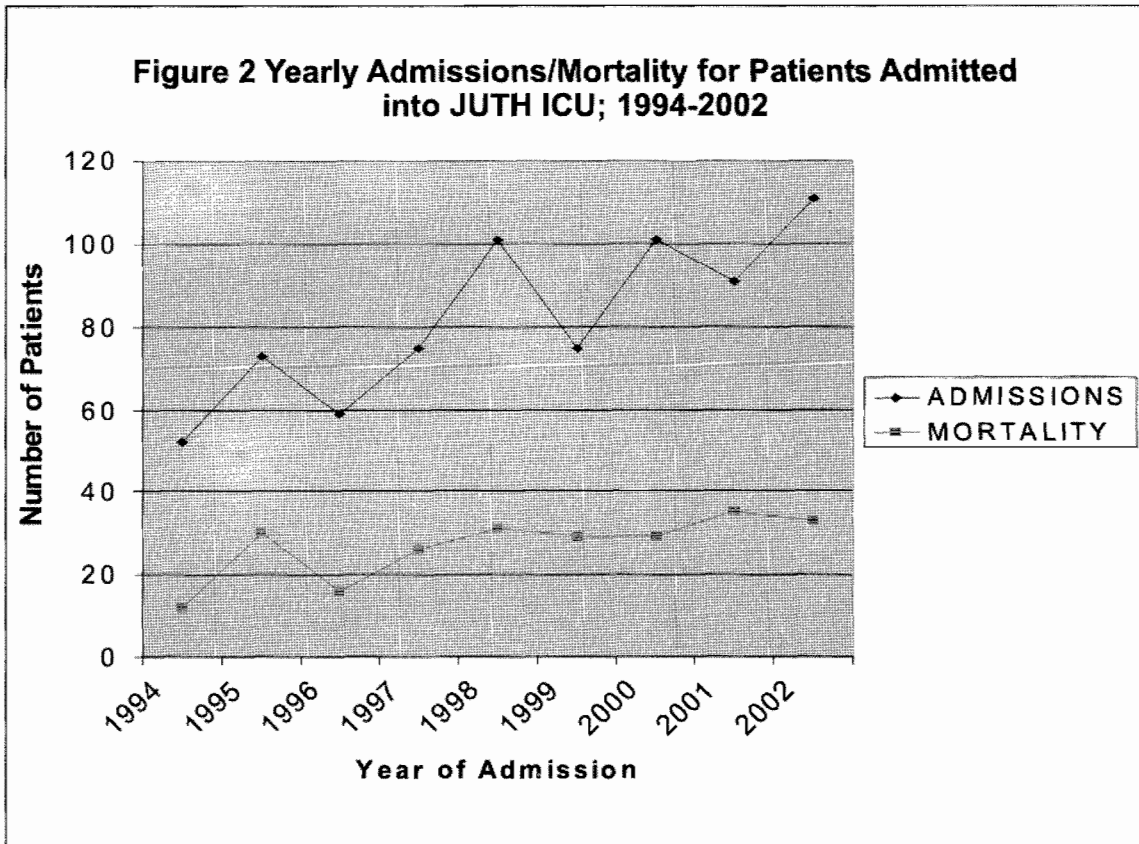


Table 1: Indication for admission/mortality for JUTH ICU; 1994-2002

Indications for admission	Admissions n=738(%)	Mortality n=241 (%)
<b>Postoperative Surgical</b>	<b>356(48.2)</b>	<b>103(42.8)</b>
Cardiothoracic	76(10.3)	19(7.9)
Neurosurgery	44(5.9)	21(8.7)
Thyroidectomy	36(4.9)	4(1.7)
Laparotomy	94(12.7)	33(13.7)
Major congenital anomaly	52(7.1)	17(7.1)
Others	54(7.3)	9(3.7)
<b>Poly trauma</b>	<b>70(9.5)</b>	<b>28(11.6)</b>
<b>Burns</b>	<b>81(11.0)</b>	<b>56(23.2)</b>
<b>Obstetrics and Gynaecology</b>	<b>119(16.1)</b>	<b>21(8.7)</b>
<b>Medical Admissions</b>	<b>112(15.2)</b>	<b>33(13.7)</b>
Cardiovascular	71(9.6)	12(5.0)
Respiratory	10(1.4)	1(0.4)
Others	31(4.2)	20(8.3)



## DISCUSSION

The establishment of ICU has made it possible for clinicians to manage critically ill patients. The type and facilities available has influence on the variety of critical cases that can be handled. Most of the patients that were managed in the JUTH ICU during the period under review were the young. This is not surprising as they are the active and productive segment of the general population. Most of those with burn injuries, trauma as well as obstetric and gynaecology and postoperative patients were young.

The JUTH ICU uses the queuing theory<sup>6</sup> with the policy of first come first served. Where the need arises a patient who can be managed in a general ward can be transferred to create space for a critical patient in need of ICU care. The trauma and non-trauma surgical patients accounted for nearly 70% (68.7%) of the total admissions with Obstetrics/Gynaecology and Medical cases accounting for 16. % and 15.2 % respectively. The percentage of medical admission is comparable to other reports from the country<sup>3,7</sup>. However, in the report from Sagamu<sup>3</sup> the surgical patients were mainly patients with trauma and burns which accounted for about 84% of the admissions. There were however, no admissions from Obstetrics/Gynaecology, because they don't routinely admit post-surgical patients due to lack of facilities to monitor. The high rate of admitted trauma patients is due to the location of the facility as they receive a lot of road traffic accident victims. The reason given for the road traffic accidents are similar to our own setting and this has not changed despite all the efforts by agencies responsible to reduce the incidence. In this study the most common indication for ICU admission are post operative surgical cases and they are cardiothoracic cases and post exploratory laparotomy patients. The high rates of post surgical admission is comparable to the report from Finland<sup>8</sup> where postoperative admissions accounted for 61% of their ICU admissions. On the other hand a report from a centre in Saudi Arabia showed a higher rate of medical admission<sup>9</sup>. This centre has a separate coronary care unit and a cardiac surgical unit. Therefore patients that were managed in the two units were not included in their study. When compared to the study from Sagamu, the higher rate of postoperative admission we recorded may be due to the fact that our unit has mechanical ventilators, a reason given for the non admission of postoperative cases in their unit. Generally the types of cases that weremanaged over this period in our centre are comparable to the previous study from the same centre<sup>4</sup> except for burn cases that were not reported. The inclusion of burn injuries is due to the

change in the admission policy which is now more liberal as a result of the expansion of the facility, as well as the increase in the prevalence of burn injury from petroleum product explosion<sup>5</sup>. When it was a 2 bed unit it was designated as a respiratory therapy unit<sup>4</sup>. Majority of the post operative surgical cases at that time were admitted to allow for the management of the respiratory complications and cardiovascular instability. In addition to the availability of facilities, the high staff- patient ratio is another factor that must have influenced the choice of admitting patients into the unit for better monitoring. Some of the patients that were admitted did not require ICU care. This group of patients had a short LOS before being transferred or discharged home. A liberal admission may be a source of abuse as a clinician may insist on admitting a particular patient who may not need ICU care. This group of patients can either be managed in the general ward or if need be, in a high dependency unit (HDU). In some cases, the very bad ones may not need ICU care as this will not improve or change the outcome, a situation that can be likened to the use of the ICU as a comfortable dying chamber. Thus the unit may be filled to capacity with unnecessary admissions and this might deny space to others who will benefit from such facility. This can be reduced by having a standard policy that is appropriate for that unit<sup>1</sup>. In addition to the admission policy the introduction of an intermediate unit (HDU or step down unit-SDU) can fill in the gap<sup>1,9-11</sup>. The medical admissions in this report were mainly cardiovascular cases (>60%) unlike the report from Lagos<sup>7</sup> where majority of the medical admissions were neurological disorders (mainly tetanus patients). The type of cases admitted may be influenced by the types of cases that present to the unit as well as facilities available for care. In our report the availability of a digital ECG machine (with a central monitor) which can provide a continuous tracing may explain the high number of cardiovascular cases (especially those with arrhythmias) that were admitted. The unit is the only one with facilities for continuous ECG monitoring which when needed might necessitate admission of patients who require it for investigation. ICU admissions for monitoring and /or treatment that can only be provided by such unit are an acceptable practice<sup>10</sup>. The other major reason for medical admission is respiratory illness, while other cases included renal, neurological conditions and complications of diabetes mellitus among others. The rate of obstetric admissions of 13 per year in our review is comparable to a rate of 10 per year from the United Arab Emirate<sup>11</sup>. The high rate may be due to the lack of an intermediate unit such as HDU in both centres that can handle this type of cases.

More than 80% of the indications for obstetric admissions in our series were preeclampsia/eclampsia and they accounted for most of the mortality in this group of patients. The mortality is more than thrice that reported elsewhere<sup>11-13</sup>. This may be due to the fact that most of our patients had preeclampsia/eclampsia which is a more severe condition than patients who had blood loss of >1000ml which constituted about 28% of the admissions in the report from United Arab Emirate<sup>11</sup>, a condition that did not merit ICU care in our centre except if there were additional reasons. The mean ICU stay was 4.5±5.1 days even though it ranged from <1 day to 56 days. This mean is comparable to the mean of 3.3 to 7.3 days of a large multi centre study in the USA<sup>14</sup>. Only two patients in our study stayed more than a month and both were post operative cardiothoracic patients who needed close monitoring for a longer period. Generally the patients had short stay, some were admitted for observation e.g. for ECG monitoring. Some other patients were transferred (after a short period) when some clinical improvement was noted to avoid accumulation of bills. Death within a short period of admission also contributed to a short LOS especially in patients whose clinical status was very poor right from admission. It is known that ICU care is more expensive than routine hospital care<sup>15</sup> and in our setting medical service is on cash and carry bases hence there is usually pressure both from patients' relatives as well as nursing staff for transfer once there seem to be some improvement. The cash and carry policy where the patients fund their treatment may be detrimental, since most patients may not cope with the cost of ICU care<sup>5</sup>. This factor has been found to increase mortality<sup>16</sup>. On the other hand, it has been observed that the non availability of beds in the general ward, family reasons (pressure from the affluent) or system related factors also contribute to delay in discharge<sup>17</sup> which ultimately increase the LOS. In our setting fear of readmission due to inadequate follow up care and close monitoring on the general ward is an additional factor in prolonged LOS. It has been suggested that admitting these type of patients to a HDU or SDU before finally moving them to a general ward can help in reducing the LOS in the more expensive ICU<sup>9,10,14</sup>. In our Centre there is a unit that serves that purpose but it is restricted to only trauma patients. There is therefore the need to establish a similar unit to cater for other specialties. In trauma patients, it has been observed that the increase in the LOS is associated with age, co-morbidities and injury severity. In such cases the use of a guideline for admission<sup>18</sup> where the criteria for admissions are clearly stated can help in the

selections of cases that will actually benefit from ICU care. In addition to the admission guideline the use of scoring systems like the Acute Physiology and Chronic Health Evaluation (APACHE), Simplified Acute Physiology Score (SAPS) and the Mortality Probability Model (MPM)<sup>19</sup> which are prognosticating tools, can be used in monitoring patients. The data base for these scoring systems has proven useful for comparing groups of patients for reasons of quality assurance. Their use in individual patients is still contentious but they have potential use as a means of patient triage for admission and as an aid to making discharge decision or withdrawal of life support<sup>19</sup>. Generally patients with prolonged LOS consume the bulk resources and they form a small proportion of the ICU patients<sup>9</sup>. For this reason the LOS has been used as a measure of resource utilization in the ICU<sup>9,14,20,21</sup>. In our setting factors like non availability of bed in the general ward (especially if the patient was not admitted from the ward) the severity of the condition and the fear of readmission due to inadequate monitoring and follow up care in the ward contribute to long LOS in the ICU. The overall ICU mortality of 32.7% in this study compares with 34.6% from a previous report from the same centre<sup>4</sup>, the rate of 37.6% reported by ffoulkes-Crabbe<sup>22</sup> and the rate of 35.7% by Oyegunle and Oyegunle<sup>3</sup>, but much higher than the rate of 20.4% reported from Saudi Arabia<sup>9</sup>. The high mortality is perhaps due to the severity of the condition of patients and lack of specialized equipment and trained intensivists in our centre compared to that in Saudi Arabia. Patients with very severe illnesses have been noted to have a shorter LOS because they die early<sup>9</sup>. Non trauma and trauma (including burns) surgical cases were responsible for more than 75% of the ICU mortality in our report. The yearly rise in mortality is less than the rise in yearly admission. However, with time the increase in the yearly admission will overwhelm the available resources resulting in a steep rise in mortality if there is no concomitant plan and provision to cope with the rise in admissions. Intensive Care has a role in providing specialized care (that may not be provided in a general ward) for patients with potentially recoverable severe illnesses. This care can only be feasible where adequate facilities (both in manpower and equipment) are provided. There is therefore the need to invest in this aspect of health care in our country. Where such facilities exist, the need for patient selection is necessary so that only those that will benefit from such facilities need to be admitted. Limiting the length of stay (LOS) in the ICU to what is necessary will reduce the cost to patient and wastage of resources by the hospital.



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