

The Intensive Care Unit of the University Teaching Hospital, Ilorin, Nigeria: A Ten Year Review (1991 - 2001)

BO Bolaji, IK Kolawole

Department of Anaesthesia, University of Ilorin Teaching Hospital, Ilorin, Nigeria

ABSTRACT

A retrospective study was conducted on all patients admitted to the Intensive Care Unit (ICU) of the University of Ilorin Teaching Hospital (UITH), Ilorin, Nigeria, over a 10 - year period (October 1991 - Sept. 2001). This period marks the first decade of the establishment of our ICU. The purpose of this study is to describe the pattern of admission of patients into the ICU, highlighting the variety of cases, indications for admission, outcome and causes of death, and the problems of medical and administrative management of the unit. No similar study has previously been carried out in this institution.

A total of 295 patients, consisting of 185 males (62.7%) and 110 females (37.3%) were admitted to the ICU during the study period. The commonest indication for ICU admission was for postoperative high care (54.9%), with post-laparotomy patients accounting for 59.9% of these cases. Medical indications for admission accounted for 21.3%, with respiratory failure and asthma being the commonest and each accounting for 11.5%. One hundred and ten patients (37.3%) died during their ICU admission, giving an ICU survival rate of 62.7%. Late presentation of cases and inadequate staffing and equipment were important factors which may have contributed to mortality in these patients.

Improved funding, training of additional staff and acquisition of advanced monitoring and life support equipment would improve the efficiency of our intensive care unit and patient survival.

Introduction

The creation of the Intensive Care Unit (ICU) owes much to the introduction of intermittent positive pressure ventilation (IPPV) for the treatment of respiratory failure.¹ The therapeutic potential of IPPV was demonstrated during the polio epidemic in Copenhagen in 1952 by Lassen², and in 1955 by Bjorneboe et al³ for the treatment of acute exacerbation of chronic obstructive pulmonary disease (COPD). By the 1960's many institutions had developed "respiratory care units" to facilitate the management of patients requiring mechanical ventilation. At the same time, coronary care units were also established for the intensive postoperative care of patients who had undergone cardiac surgery while surgical units managed patients who had undergone major surgical procedures.

Many tertiary hospitals in Nigeria have developed facilities for the care of the critically ill patient. The Intensive Care Unit (ICU) of the University of Ilorin Teaching Hospital (UITH), Ilorin, Nigeria, was initially established in 1991 for the management of surgical patients who required postoperative

high care. Admission criteria included those who had prolonged surgery (4-6 hours), specialized surgery (cardiothoracic and neurosurgery), and complicated surgery associated with one or more of the following complications: major blood loss, massive fluid shifts, cardiac arrest, metabolic disorders and bronchospasm. Other admission criteria were complicated thyroid surgery and patients requiring inotropic support (for example septic shock). The unit was situated within the twin operating theatre complex. The 3-bedded UITH Intensive Care Unit moved to its present permanent site located adjacent to the operating theatre complex in 1994. It serves as a general ICU for all categories of patients.

Materials and Methods

This is a retrospective study in which data on demographic characteristics, diagnoses on admission, duration of admission, nature of intervention and outcome were obtained on all patients admitted into the ICU of the UITH. from 1st October 1991 to 30th September 2001. The data was obtained from the patients' care files and the ICU admissions record book. The causes of death were also noted where applicable.

The total number of yearly hospital admissions during the period of the study was obtained from the Department of Health Records Administration and the Biostatistics Department of this hospital.

Correspondence:

Dr BO Bolaji

E-mail: olubolajidr@yahoo.com

Table 1 : Total annual admissions to the hospital and ICU for the period (October 1991 - September 2001)

Year	Hospital admissions	ICU admissions	ICU annual admissions rate %
1991 (Oct - Dec)	2,950	2	0.07
1992	11,855	14	0.12
1993	6,149	8	0.13
1994	6,051	3	0.05
1995	7,152	8	0.11
1996	7,810	15	0.19
1997	8,922	22	0.25
1998	8,291	32	0.36
1999	7,614	49	0.64
2000	8,230	65	0.79
2001 (Jan - Sept)	7,487	77	1.03
Total	92,374	295	* 0.32
* Cumulative total for 10 years			

Results

The total number of hospital admissions during the ten-year period was 92, 374 patients. Of these, 295 (0.3%) were admitted to the ICU (Table1). The average ICU admission rate was approximately 30 per year. The yearly admission rate into the ICU showed a general increase from 1991 to 2001.

The breakdown of ICU admissions showed a sex distribution of 185 (62.7%) males and 110 (37.3%) females. The age distribution of patients is shown in Table 2. The age ranged from 3 days to 90 years (mean 35.9 years). There were 41 patients (13.9%) in the paediatric age group (less than 14 years of age).

Table 3 shows the indications for admissions and the case mortality. There were 232 (78.7%) surgical and 63 (21.3%) medical cases. The commonest indication for admission was postoperative high care, which accounted for 162 patients (54.9%). This was followed by head injury accounting for 33 patients (11.2%), and burns totaling 26 patients (8.8%). Most of the burns cases

involved victims who had either been trapped in vehicles, or were the victims of kerosene or gas explosions at home during the night, indicating the possibility of inhalational injury. The distribution of

Table 2 : Age distribution of patients admitted into ICU (October 1991 - September 2001) (n = 295)

Age group (years)	Frequency	Frequency as % of age distribution
0 -9	34	11.5
10 -19	36	12.2
20 -29	59	20.0
30 -39	47	15.9
40 -49	36	12.2
50 -59	40	13.6
60 -69	21	7.1
70 -79	18	6.1
80 -89	3	1.1
90 -99	1	0.3
Total	295	100.0

Table 3 : Indications for ICU admission and case mortality (October 1991 - September 2001) (n = 295)

Indication	Number of patients	No of deaths	Case mortality per indication (%)
Postoperative high care	162 (54.9%)	34	21.0
Head injury	33 (11.2%)	21	63.6
Burns	26 (8.8%)	22	84.6
Status asthmaticus	11 (3.7%)	3	27.3
Respiratory failure	11 (3.7%)	7	63.6
Congestive cardiac failure	8 (2.6%)	3	37.5
Polytrauma	6 (2.0%)	1	16.7
Acute renal failure	5 (1.7%)	3	60.0
Meningitis	5 (1.7%)	2	40.0
Cerebro-vascular accident GCS ≤ 8	4 (1.4%)	0	0
Cervical spine injury	4 (1.4%)	1	25.0
Acute pulmonary oedema	3 (1.0%)	1	33.3
Monitoring CVS and RS*	3 (1.0%)	0	0
Severe tetanus	2 (0.7%)	2	100
Severe lobar pneumonia	2 (0.7%)	2	100
Other	10(3.5%)	8	80
Total	295 (100%)	110	37.3 **

* Monitoring of cardiovascular (CVS) and respiratory (RS) systems using multiparameter patient monitor

** Over all ICU mortality rate % for the period.

Table 4. Postoperative admissions to ICU by surgical procedure (n=162)

Cases	No. of Patients	No. of patients as % of total
Exploratory laparotomy	97	59.9
Thoracotomy	25	15.5
Post-thyroidectomy upper airway obstruction	13	8.1
Vascular surgery (prolonged procedure)	4	2.4
Intracranial surgery	3	1.9
Prostatectomy with massive blood transfusion	3	1.9
Gunshot wound exploration	3	1.9
Anorectoplasty (one-stage) in neonates	2	1.2
Excision of huge cystic hygroma in neonates	2	1.2
Closed thoracostomy tube drainage	2	1.2
Pericardial biopsy	2	1.2
Suprapubic cystostomy with haemorrhagic shock/reaction to local anaesthetic	2	1.2
Miscellaneous (tracheostomy, laryngeal papilloma clearance, ORIF*, appendicectomy)	4	2.4
Total	162	100

*ORIF = open reduction and internal fixation

postoperative cases is shown in Table 4. Exploratory laparotomy had the highest number (97 patients (59.9%)), followed by thoracotomy (24 patients (14.9%)).

ICU admissions ranged from 1 day to 181 days (mean 4.8 days + 11.22). A total of 274 patients (92.9%) were admitted for periods ranging from 1 to 10 days, while 21 patients (7.1%) were admitted for more than 10 days. A large percentage of cases (134 (45.5%)) were admitted for 2 days or less. The longest duration of admission (181 days) was for a patient who had severe head injury and was unconscious for 122 days. The patient also had a tracheostomy for the maintenance of a patent airway, which necessitated her continued stay in the ICU.

Mortality: A total of 110 patients died during admission, giving an overall ICU mortality rate of 37.3%. Causes of death are shown in Table 3. Burns cases had a high mortality (84.6%). Twenty one (95.4%) of burns patients who died, had over 50% of the body surface area affected (Table 5). In the first half of the period of this study when there were fewer staff and less equipment, 40 patients were admitted to the ICU while the mortality rate was 30%. In the latter half of the study period 255 patients were admitted and mortality rate was 38%. Table 6 shows the number of physician anaesthetists and trained ICU nurses during the study period on an annual basis.

Discussion

The University of Ilorin Teaching Hospital (UIITH) is one of the second generation (post 1975) teaching hospitals in Nigeria. Established in 1980, it is presently a 445 - bedded hospital. The establishment of an intensive care unit for the hospital initially arose from the need to offer postoperative high care services to surgical patients. Thus, a room within the operating theatre complex was designated for this purpose in 1989 to serve as a 2 - bedded ICU. The unit was however, not available for use by non-surgical critically ill patients who should have benefited from intensive care services, until 1994, when it was moved to its present permanent site with a 3 - bed complement.

Since the UIITH has a total bed complement of 445, the intensive care beds account for 0.7% of all beds in the hospital. This figure is low compared with that recommended by the Department of Health and Social Security of the United Kingdom.⁴ It has been recommended that approximately 1 - 2% of the acute admission beds of a general hospital should be allocated to intensive care.⁴ In the United Kingdom, the percentage of intensive care beds is approximately 1-2%⁵, while it is 1.7% in New Zealand⁶ and 6-11% in the USA.⁷ A recent Nigeria study showed that 2% of all beds in a particular tertiary hospital were allocated to intensive care.⁸ The quoted hospital is located in its permanent site. Our hospital is still

Table 5: Percentage burns distribution of patients admitted and mortality (n = 26)

% body surface burns	Number of patients admitted	No of % deaths	No of deaths as % of burns patients
0 - 10	0	0	0
11 - 20	1	1	4.6
21 - 30	2	0	0
31 - 40	0	0	0
41 - 50	0	0	0
51 - 60	8	7	31.8
61 - 70	5	4	18.2
71 - 80	3	3	13.6
81 - 90	3	3	13.6
91 - 100	4	4	18.2
Total	26	22	84.6

located in a temporary site under a lease agreement with the state government and no provision has been made for the erection of a new building.

The administrative management of the UITH ICU initially consisted of an ICU team, comprised the following members:

- The Chairman of the ICU team – consultant pulmonologist,
- Chief residents of the user departments, Medicine, Obstetrics and Gynaecology, Surgery, Paediatrics and Anaesthesia,
- The senior nurse in charge of the ICU.

The duties of the ICU team were to formulate policies for the ICU and oversee the day – to – day administration of the unit. The anaesthesia team manages the day-to-day emergency aspects of care, with input from the primary referring unit. The number of physician anaesthetists and ICU trained nurses shown in Table 6 suggests under-staffing for a 3-bedded ICU. However, the required number of nurses depends on bed occupancy. Ideally, 5-6 nurses are required per bed space.¹ For our ICU, this translates to 15-18 nurses for optimum bed occupancy. Presently, the ICU is overseen by a consultant anaesthetist who co-ordinates the administrative and clinical management of the unit. Admitted patients are managed by their primary physicians except where the anaesthetist's expertise is required, for example in providing mechanical ventilation. Because of inadequate anaesthetic staffing, the primary referring doctor also provides 24 hour cover for their patients, making the ICU function as an open unit. However, patients are admitted after due consultation and review by the ICU duty consultant anaesthetist, or by senior residents in anaesthesia. As can be seen in Table 6, there have been few physician anaesthetists to cope with both ICU elective and emergency operations lists for a tertiary hospital, especially considering the large number of surgical procedures performed annually (1500-2000).

The overall ICU admission rate during the study period was 0.32%. In the first few years, admission into the ICU was low. This was due to the fact that only post-surgical patients were admitted into the unit. When the ICU moved to its permanent site, the facility became available to non-surgical specialties resulting in an increase in admission rate. The admission rate in 1994 was the lowest during the study period because of various industrial crises, precipitating strikes involving a

section of workers in all tertiary hospitals for a total of 6 months. The increase in admission rate in the last 3 years can be attributed to improved facilities in the unit. It was during this period that mechanical ventilation became possible following the acquisition of a ventilator. In addition, the standard of patient monitoring was raised with the acquisition of a multiparameter patient monitor. Other recently acquired useful equipment include an oxygen concentrator, a nebulizer and a volumetric pump.

Postoperative cases constituted a large percentage of ICU admissions during the period of study (54.9%). In the study of Kushimo et al⁹ in this environment, 57% of all paediatric ICU admissions were post-anaesthetic cases. Our experience in the adult population has been similar.

Exploratory laparotomy constituted over half (59.9%) of post-operative admissions into our ICU (Table 4). Abnormalities of lung function are particularly severe following upper abdominal surgery.¹⁰ Functional residual capacity (FRC) may fall to as little as 20% of the preoperative value, and vital capacity (VC) and forced expiratory volume in one second (FEV1.0) are reduced by 60% in the immediate postoperative period following upper abdominal surgery.¹⁰ Respiratory support may therefore become necessary especially in those with poor preoperative physical status (ASA greater than 3). In our patients preoperative lung function testing was not available. Bowel perforation in patients with typhoid fever was the most common indication for laparotomy (20 patients (20.6%)). Fifteen of these patients were in ASA IV category while the remaining 5 were in ASA V category. Eight of the patients required mechanical ventilation. Cases of typhoid perforation in our environment usually present late, and often in septic shock. In our experience, many of these patients had significant cardiorespiratory compromise after surgery, requiring ICU admission for support and stabilization. Most of these patients only require admission for fluid resuscitation and oxygen therapy. Some require mechanical ventilation particularly within the first 6-12h of ICU admission. In addition, those who developed septic shock were admitted for inotropic support and fluid therapy.

Head injuries, accounting for 11.2% of ICU admissions in this study, all resulted from road traffic accidents (Ilorin is situated on a major highway and is a strategic link between Northern and Southern Nigeria with heavy vehicular

Table 6: Number of physician anaesthetists and ICU trained nurses on yearly basis

Year	ICU trained nurses	Physician Anaesthetists		
		Junior Resident	Senior Resident	Consultant
1991	3	1	0	0
1992	4	2	0	0
1993	4	2	0	0
1994	4	0	2	0
1995	7	0	2	0
1996	7	0	2	0
1997	7	0	2	0
1998	8	0	0	2
1999	8	2	0	2
2000	8	4	0	2
2001	9	4	0	2

traffic). Our figure is much lower than that recorded by Oyegunle et al⁸ (73.4%) in another city that links major highways in South-Western Nigeria. Trunkey¹¹ states that 50% of all individuals who die following civilian trauma do so within 30 minutes of the event, due to complex and severe injuries. This may explain the low ICU admission of head injuries in our centre, as many of our road traffic accidents have fatal outcomes. Oji¹² and Kushimo⁹ et al also reported lower trauma ICU admission rates, without speculating on the reason for this.

Controlled mechanical ventilation only became available in the last 3 years of the study period. However, lack of an arterial blood gas analyzer in our centre has been a major deficiency.

There were 26 cases of burns admitted to our ICU in this study. Twenty two (84.6%) cases resulted from petrol or kerosene explosions, 3(11.5%) resulted from cooking gas explosion and 1(3.9%) from chemical burns. This contrasts with the pattern seen in the developed world where majority of burn injuries occur in the home and frequently involve children aged 1-5 years who are scalded by hot liquids.¹³ The lowest percentage of body surface area (BSA) burned in patients that were admitted was 20%. There is no dedicated burns unit in our centre. Inhalation injury may occur in as many as 20% of patients admitted into burns centres.¹⁴ All of the 25 (96.1% of burns cases) who had burns as a result of fuel or gas explosions were in enclosed spaces and were diagnosed clinically on admission to have inhalation injuries. These patients may develop pharyngeal and laryngeal oedema, with upper airway obstruction. It is our practice to perform tracheal intubation early in order to prevent upper airway obstruction. Supplemental oxygen is also administered to these patients in our centre.

Medical admissions into the ICU constituted 63 (21.3%) of all admissions during the study period. The two most common indications were status asthmaticus and respiratory failure (3.7% each). Previous studies across the country have shown that medical admissions constituted 14.5-19% of all ICU admissions.^{8,12,15} Respiratory insufficiency was the commonest indication for admission in a previous study from the Lagos University Teaching Hospital (LUTH)¹⁵. The LUTH series showed a higher admission rate for tetanus, comprising 54% of ICU admissions compared to our study (0.7%). Although tetanus has a high prevalence rate in our environment, its low ICU admission rate in this study was due to an initial lack of ventilatory support, and the cases were managed in the general ward.

The overall mortality in this study was 37.3%. Previous studies in this country showed overall mortality rates ranging from 30 - 37.6%.^{8,12,16} While the mortality rate in our study compares favourably with others in the country, it is higher than those reported in the developed world, where mortality figures of 18-24% have been quoted.^{17,18}

Conclusion

The Intensive Care Unit of the UITH has expanded from a 2-bedded unit run by the surgical staff, and without equipment and anaesthesia staff, to a 3-bedded modestly equipped general unit with one modern ventilator and a multiparameter

patient monitor. Its manpower complement is made up of 2 consultant anaesthetists, anaesthetic residents, trained and general nurses. However, available staffing and equipment are still inadequate for the ICU workload. These are factors that may have contributed to our high mortality rate. Funding should be made available so that the internationally recommended number of ICU beds (relative to the total number of acute admission beds), is available and can be adequately staffed.

References

- Hinds C.J, Watson D. *Planning, Organization and Management. Intensive Care - A concise textbook 2nd edn.* London: WB Saunders Company Limited 1996; 1 - 8.
- Lassen HCA. *A preliminary report on the 1952 epidemic of poliomyelitis in Copenhagen with special reference to the treatment of acute respiratory insufficiency* Lancet 1953; i: 37 - 41.
- Bjorneboe M, Ibsen B, Astrup P. *Active ventilation in treatment of respiratory acidosis in chronic disease of the lungs.* Lancet 1955; ii: 901 - 903.
- Department of Health and Social Security. *Intensive Therapy Unit. Hospital Building Note (HBN) 27.* 1970.
- Spiby J. *Intensive care in the United Kingdom: report from the King's Fund Panel.* Anaesthesia 1989; 44:428-431.
- Zimmerman JE, Knaus WA, Judson JA, Havwill JH, Frubuhovich RV, Draper EA, Wagner DP. *Patient selection for intensive care: a comparison of New Zealand and United States hospitals.* Critical Care Medicine 1988; 16:318 - 326.
- Osborne M., Evans TW. *Allocation of resource in intensive care: a transatlantic perspective,* Lancet 1994; 343: 778 - 780.
- Oyegunle AO, Oyegunle VA. *The Intensive Care Unit in a young Nigerian Teaching Hospital: The Sagamu (1994 - 1997) Experience - A retrospective study.* African Journal of Anaesthesia and Intensive Care 1997; 3 (2): 41 - 43.
- Kushimo OT, Okeke CI, ffolukes - Crabbe DJO. *Paediatric admission into the Intensive Care Unit of the Lagos University Teaching Hospital.* Nig Qt J. Hosp. Med 1998; 8: 52 - 54.
- Hinds CJ, Watson D. *Respiratory failure.* Intensive Care - A concise textbook 2nd edn. London: WB Saunders Company Limited 1996; 125 - 159.
- Trunkey DD. *Trauma.* Scientific American 1983; 249: 28 - 35.
- Oji A. *Development of an Intensive Care Unit: At Jos University Teaching Hospital (JUTH) from 1982 to 1985.* W. Unit. At University Teaching Hospital (JUTH) from 1982 to 1985. W. Afr. J. Med 1987; 6:91 - 98.
- Muller MJ, Herndon DN. *The challenge of burns.* Lancet 1994; 343: 216 - 220.
- Kinsella. *Smoke inhalational injury: diagnosis and treatment.* British Journal of Intensive Care 1993; 3: 8 -14.
- Oke DA. *Medical admission into the Intensive Care Unit of the Lagos University Teaching Hospital.* The Nigerian Postgraduate Medical Journal 2001; 8 (4): 179 - 182.
- ffolukes - Crabbe DJO. *The Intensive Care Unit of the Lagos University Teaching Hospital - an Anaesthetist's Experience.* Nigerian Medical Journal 1974;7:50 - 55.
- Dragsted L, Qvist J, Madsen M. *Outcome from intensive care II. A 5 - year study of 1308 patients: short - term outcome.* European Journal of Anaesthesiology 1989; 6: 131 - 144.
- Ridley S, Jackson R, Finlay J, Wallace P. *Long term survival after intensive care.* British Medical Journal 1990; 301: 1127 - 1130.