Predictors of Mortality in a Critical Care Unit in South Western Kenya

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Abstract

Background: Critical care in developing countries has been neglected in the face of high numbers of communicable and infectious diseases like malaria, tuberculosis, HIV and Critical Care Units continue to be limited to large hospitals in urban areas. There is need to know the type of patients admitted to existing units, common diagnoses and outcomes. **Objective**: To determine the demographics, diagnosis and mortality of the patient population admitted to Tenwek Hospital critical care units. **Method**: Retrospective observational review of all patients admitted to critical care unit in Tenwek Hospital. **Results**: Six hundred and forty four patients admitted over a 7 month period were studied. The patients were young (32.8yrs), male and majority were from surgical service. The leading reason for admission was trauma. The overall mortality was 26.1%. Factors that significantly influenced mortality on univariate analysis were patients age (p <0.001), hospital stay (p <0.001), hospital service (p=0.002) and priority level (p<0.001). On multivariate analysis age and pediatric service were still significantly associated with increased mortality. Increased monitoring was protective OR 0.1 (95% CI 0.1-0.2, p=0.01). Of those who died 40.4% had full resuscitation, 36.8% had no resuscitation and 8.2% had withdrawal of care. **Conclusion**: Patients admitted to the critical care units were young, male and mainly from the surgical service with trauma being the commonest diagnosis. Age was an independent predictor of mortality and monitoring was protective.

Keywords: Critical Care, Intensive Care Unit (ICU), High Dependency Unit (HDU)

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Introduction

Critical care in developing countries had for a long time been considered a luxury in the face of high number of communicable and infectious diseases like malaria, tuberculosis, HIV and continues to be limited to large hospitals in urban areas (1-3). Most studies done in Africa have shown that the largest group benefiting from ICU care are post-operative surgical patients (2,4). Knowledge of characteristics and outcomes of critically ill patients admitted to ICUs in developing countries may help with identification of priorities and resources allocation for improvement of this type of care (1). The limited number of beds available compared to those in need creates a necessity of optimizing the criteria for admission. There is a paucity of critical care trained staff (critical care nurses and doctors) which may impact the quality of care. Hospitals also face the challenge of getting appropriate equipment and the appropriate technical personnel to support the use of this equipment (5).

The objective of this study was to describe the demographics of the patient population that was admitted to Tenwek Hospital Critical Care Units (ICU and HDU), determine common diagnoses, the admitting services, indication for admission, patient outcomes and factors that were associated with mortality.

Methods

This was a retrospective observational chart review of all patients admitted to the ICU and HDU

from October 2011 to March 2012. Tenwek Hospital is a three hundred bed faith based rural tertiary and referral facility located in South Western Kenya in Bomet County. It has two critical care units that function equally; a 6 bed Intensive care unit (ICU) and a High Dependency Unit (HDU) that has 7 beds. The services offered include mechanical ventilation, post-operative care as well as ionotropic support using dopamine but no hemodialysis. The ICU is currently staffed by ten nurses who work on shift basis (four during the day and two at night). Each service is responsible for deciding which patients go to the critical care units and will be responsible for providing care for the patient as there is no intensivist (an open ICU).

A questionnaire was used to extract data from the patients' charts. The data extracted included the demographics, reason for admission to ICU which was then categorized to the appropriate priority level based on a four category model ranging from those that will benefit most from ICU (priority 1) to those that are too well or too sick to benefit from the unit (priority 4) (6). Other variables collected were duration of stay and a determination of whether patient died in the unit or was transferred to the general ward. The questionnaires were reviewed by the principal investigator for correctness. Thereafter the data was entered into a database and analyzed using SPSS v17. Demographic data was presented as frequencies respective to the category total and univariate and multivariate analysis were used to establish factors that were associated with mortality. A p value of <0.05 was considered statistically significant.

The study was approved by the Hospitals Research and Ethics committee.

Results

Six hundred and forty four patients were included with the mean age being 32.8yrs and majority were male (Table 1). Most of the patients were admitted for increased monitoring and observation as illustrated in table 2. Twenty two percent (n=143) of patients required ventilator support, 5% (n=33) were on ionotropic support and 5.9% (n=38) were on continuous infusion insulin therapy. The median critical care stay was 2 days (IQR 1-4 days) with range of less than 24 hours to 37days. The mortality rate was 26.6%. The group with the highest mortality was aged more than 60yrs followed by 51-60yrs and 6-10yrs age group (Table 3). Pediatrics and medicine service had the highest mortality (Table 4). Both services also had a high number of patients that required mechanical ventilation.

Table 1: Characteristics of study population

Age	
Mean	32.8yrs (SD 21.3)
Median	29yrs (IQR 18-47)
Age distribution	
0-5yrs	78 (12.2%)
6-10yrs	25 (3.9%)
11-20yrs	82 (12.9%)
21-30yrs	150 (23.5%)
31-40yrs	98 (15.4%)\
41-50yrs	69 (10.8%)
51-60yrs	61 (9.6%)
>60yrs	75 (11.7%)
Gender	
Male	59.8% (n=383)
Female	40.2 % (n=258)
Admitting service	
Orthopaedics	13 (2.0%)
Surgery emergency	213 (33.2%)
Surgery scheduled	56 (8.7%)
Obstetrics	41 (6.4%)
Pediatrics	82 (12.8%)
Medicine	237 (36.9%)
Diagnostic category **	
Trauma	132 (20.6%)
Poisoning	104 (16.3%)
Abdomen	94 (14.7%)
Respiratory	64 (10.0%)
Cardiovascular	59 (9.2%)
Malignancy	47(7.3%)
Endocrine	39 (6.1%)
CNS	41 (6.4%)
Obstetric	36 (5.6%)
Other (renal)	24 (3.8%)

***abdomen (perforated viscous, intestinal obstruction, gastrointestinal), respiratory (pneumonia, pulmonary thromboembolism, bronchiolitis), cardiovascular (rheumatic heart disease, heart failure, hypertension), CNS(meningitis, stroke, meningitis)*

Table 2: Indication for critical care unit admission

Priority level	Definition	Frequency
1	Ventilator, vasopressor and/or insulin drip	187 (29%)
2	Intensive monitoring and potential for immediate intervention	452 (70.2%)
3	Don't resuscitate or intubate	3 (0.5%)
4	Too sick or too well to admit	2 (0.3%)

Table 3: Mortality per age group

Age group (yrs)	Mortality
0-5	23 (29.5%)
6-10	9 (36.0%)
11-20	11 (13.4%)
21-30	22 (14.7%)
31-40	25 (25.5%)
41-50	19 (27.5%)
51-60	25 (41.0%)
>60yrs	34 (45.3%)

p value =0.001

Table 4: Characteristics of different services and mortality

Service	Frequency (%)	Mean Age (Range)	Ventilator Need	Mortality
Orthopaedics	13(2%)	32 (22-60)	0	1 (7.7%)
Surgical emergency	213 (33.2%)	32 (18-51)	14 (6.6%)	53 (25%)
Surgical scheduled	56 (8.7%)	49 (28-58)	4 (7.1%)	8 (14.3%)
Obstetrics	41 (6.4%)	27 (23-36)	5 (12.2%)	5(12.2%)
Pediatrics	82 (12.8%)	4 (2-11)	18 (22.0%)	31 (38.3%)
Medicine	237 (36.9%)	33 (24-46)	70 (29.5%)	73 (30.8%)

Factors that influenced mortality on univariate analysis were: age (p <0.001), hospital stay (p <0.001), service (pediatrics having higher mortality, p=0.002), priority (priority level 1 and 3 had a higher mortality, p<0.001). On multivariate analysis age of more than 60 years was found to be associated with a higher mortality OR 3.7 (95% CI 1.5-9.3, p=0.006). The pediatric service was also associated with higher mortality OR 2.6 (95% CI 1.1-6.0, p=0.026). Increased monitoring was protective OR 0.1 (95% CI 0.1-0.2, p=0.01). As regards end of life care; 40.4% of those who died had full resuscitation and 36.8% had no resuscitation. 8.2% had withdrawal of care.

Discussion

Our study population was young (mean age 32.8yrs) which is comparable to that reported in other African studies but contrasts the older age group (majority above 60yrs) found in critical care units in developed countries (1,2,7-9). Majority were male patients which is consistent with other studies in developing countries (1,7,8). The reason for this is unclear but one may hypothesize that surgical emergencies especially trauma contributed to a significant number of patients and most of these were male patients.

Surgery was the predominant admitting service followed by medicine service. A 5 year retrospective review done at the Kenyatta National Hospital found that only 9% of 4346 patients were medicine service admissions (10). The most common reason for admission was trauma followed by poisoning. This we thought may be determined by fact that we act as a referral institution hence the selection bias in the under 5 age group where poisoning is common. Most of the ICUs in developing countries started as postoperative care units that then developed to managing other cases hence the predominance of post-operative surgical patients (2,8). In contrast however, in Ethiopia most of the admissions were medical followed by surgery patients while in Uganda the most frequent admission diagnoses were sepsis, acute respiratory distress syndrome (ARDS), traumatic head injury and HIV/AIDs (1,7).

The mean duration of critical care stay was comparable to other African studies. An Ethiopian study reported a mean length of stay of 3 days (IQR 1,7days) while in Nigeria the mean was 3.63+/- 0.34days with a range of 1-16days (7,8). The factors associated with prolonged critical care stay were not dissected.

The prioritization model is one way of grouping the critical care admissions. In this study population most of the admissions were priority level 2. None of the sub-Saharan Africa studies used this model to classify their admissions however most of admissions were post-operative cases required intensive monitoring.

The mortality rate in this study population was 26.6% which was slightly lower than that reported in other sub-Saharan countries. This can be explained by the fact that most of the patients were priority level two requiring intensive monitoring. An Ethiopian retrospective review of 370 patients reported a mortality of 50.4%, a Ugandan review 40.1% and a Nigerian study 32.2% (7,8). The Ethiopian study attributed the high mortality to delayed presentation secondary to poor access to health care. Comparison of outcomes in ICU units within sub-Saharan Africa is however challenging as the units largely differ depending on the resources available such monitoring

equipment, ventilators, oxygen supply as well as nurses trained in critical care.

The limitations of this study were mainly that it being retrospective it relied on accuracy of written record and some of the data required was missing. Secondly there is a risk for bias and inability to control for confounders.

Conclusions

This study population which mostly comprised of young males had a mortality of 26.1% with majority of the deaths being in the extreme age groups. Age and service were significant predictors of mortality while increased monitoring was protective.

Competing interests

The authors declare no competing interests and received no funding for this study.

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References

1. Kwizera A, Dünser M, Nakibuuka J. National Intensive Care Unit Bed Capacity and ICU Patient Characteristics in a Low Income Country. BMC Res Notes. 2012;5:475.
2. Oji A. Intensive Care in a Developing Country: A Review of the First 100 Cases. Ann R Coll Surg Engl. 1986;68(3):122-4.
3. Baker T, Lugazia E, Eriksen J, et al. Emergency and Critical Care Services in Tanzania: A Survey of Ten Hospitals. BMC Health Serv Res. 2013;13:140.
4. Towey RM, Ojara S. Practice of Intensive Care in Rural Africa: An Assessment of Data in Northern Uganda. Afr Health Sci. 2008;8(1):61-4.
5. Guidelines for Intensive Care Unit Admission, Discharge and Triage. Task Force of the American College of Critical Care Medicine, Society of Critical Care Medicine. Crit Care Med. 1999;27(3):633-8.
6. Okafor UV. Challenges in Critical Care Services in Sub-Saharan Africa: Perspectives from Nigeria. Indian J Crit Care Med. 2009;13(1):25-7.
7. Smith ZA, Ayele Y, McDonald P. Outcomes of Critical Care Delivery at Jimma University Specialized Hospital, Ethiopia. Anaesth Intensive Care. 2013;41(3):363-8.
8. Uche EO, Ezomike UO, Chukwu JC, et al. Intensive Care Unit Admissions in Federal Medical Center Umuahia South East Nigeria. Niger J Med. 2012;21(1):70-3.
9. Garland A, Olafon K, Ramsley CD, et al. Epidemiology of Critically Ill Patients in Intensive Care Units: A Population Based Observational Study. Crit Care. 2013;17(5):R212.
10. Werunga PK. Medical Cases Admitted to Kenyatta National Hospital ICU and Their Outcome; A Five Year Retrospective Study. Retrieved from http://erepository.uonbi.ac.ke:8080/handle/123456789/6397.