

Pattern and Outcome of Elderly Admissions into the Intensive Care Unit (ICU) of a Low Resource Tertiary Hospital

A M Owojuyigbe¹, A T Adenekan¹, R N Babalola², A O Adetoye¹, S O A Olateju¹,
U O Akonoghrere²

¹Department of Anaesthesia and Intensive Care, Faculty of Clinical Sciences, Obafemi Awolowo University, ²Departments of Surgery and ³Anaesthesia and Intensive Care, Obafemi Awolowo University Teaching Hospitals' Complex, Ile-Ife, Osun State, Nigeria

Correspondence to: Afolabi Muiyiwa Owojuyigbe, E-mail: muyelo2003@yahoo.com

Background: Globally, the population of the elderly is increasing and the greatest increase is occurring in the developing and middle income countries because of falling death rate and high birth rate. The ageing of the population in developing countries may result in increasing requirement for health care facilities including ICU care for the elderly. This study was aimed at assessing the pattern and outcome of elderly patients' admissions into the ICU of our hospital and identifies the determinants of outcome.

Method: This was a retrospective study covering a 5 year period (January 1st 2010 to 31st December 2014) in the ICU of a sub-Saharan tertiary hospital. Data was obtained from the review of ICU admission records over this period. We included as elderly patients aged 65 years and above.

Results: During the period under review, 90 cases were identified but only 62 cases were available for review (68.9%). There were 40 males and 22 females with ages ranging between 65 and 92 years. Surgical admissions accounted for 75.8% of admissions while medical admissions were 24.2%. The overall ICU mortality in the elderly was 58.1%. The major predictors of mortality were: need for endotracheal intubation ($p=0.001$), mechanical ventilation ($p=0.001$), vasopressor ($p=0.001$), electrolyte derangement ($p=0.001$), sepsis on admission ($p=0.001$), shock on admission ($p=0.001$).

Conclusion: Elderly patients admitted into the ICU are a population with an increased risk of mortality. The predictors of high risk of death are sepsis on admission, septic shock, need for vasopressor, endotracheal intubation and or mechanical ventilation and the presence of electrolyte derangement. The outcome of this study calls for a need to pay more attention to this rapidly expanding group of the population.

Keywords: Elderly, Admission, ICU, low resource hospital

DOI: <http://dx.doi.org/10.4314/ecaajs.v21i2.6>

Introduction

Ageing is a universal and progressive physiologic process characterized by declining end-organ reserve, decreased functional capacity, increasing imbalance of homeostatic mechanisms, and an increasing incidence of pathologic processes.⁽¹⁾ An individual with a chronological age of 65 years and above is accepted as elderly.⁽²⁾ Globally the population of the elderly is increasing, and the greatest increase is occurring in the developing and middle income countries because of falling death rate and high birth rate.⁽³⁾ The United Nations has projected that the population of the elderly in Africa will double between 1998 and 2050.⁽⁴⁾ In the nearest future this increase may pose a challenge to the health care system in Africa.

In the US, elderly patients account for 42% to 52% of ICU admissions and almost 60% of ICU days are incurred by the elderly.⁽⁵⁾ Presently elderly people in Africa constitute about 4% of the population while globally elderly people constitute about 8% of the population.⁽⁶⁾ In 2006 those aged 65 years and above constituted about 4.3% of the 140,431,790 million total population of Nigeria⁽⁷⁾. The ageing of the population may result in increasing requirement for healthcare facilities including ICU care for the elderly.

Critically ill elderly patients have increased risk of morbidity and mortality because of the high incidence of co-morbidities associated with ageing which predisposes the elderly patients to progressive organ failure.⁽⁸⁾ A recent systematic review of hospitalized elderly African patients showed that those with stroke, meningitis, septicaemia, renal failure, chronic liver disease, chronic obstructive pulmonary disease, severe asthma, heart failure, high serum creatinine and urea, tachycardia, reduced length of stay from admission to death, and low serum protein had high mortality.⁽⁹⁾ Unadjusted all-cause mortality was also observed to be high among elderly patients in the review.

Several studies in developing countries have examined the clinical pattern of ICU admissions among the elderly and potential determinants of outcome including electrolyte imbalance, presence of co-morbidities, need for mechanical ventilation, sepsis and severity of illness.⁽¹⁰⁻¹²⁾ However, there is paucity of data on this subject in Africa. The aim of this study was to assess the pattern and outcome of elderly admissions into the ICU of our hospital.

Patients and Methods

This was a retrospective study of elderly patients admitted into the Intensive Care Unit (ICU) of a tertiary hospital in Sub-Saharan Africa over a five-year period from 1st January, 2010 to 31st December, 2014. Our Hospital ICU is a 6-bedded multi-disciplinary unit where patients were admitted and co-managed by the Anaesthesiologists, Physicians and Surgeons. Relevant data obtained from the case notes included patients' socio-demographic characteristics, presence of co-morbidities, diagnosis at admission, indication(s) for ICU admission, packed cell volume, need for endotracheal intubation with or without mechanical ventilation, vasopressor use, need for blood transfusion and or haemodialysis, electrolyte derangement, sepsis, shock on admission, length of ICU stay(days), and outcome of ICU admission. Ethical approval for the study was granted by the Ethical and Research Committee of the Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Osun State.

The data was entered into a predesigned study proforma and was analyzed using the IBM Statistical Package for Social Sciences Version 20 (IBM Corp. Released 2011. IBMSPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.). Categorical variables were expressed as actual numbers and percentages. Characteristics of the patients were compared using chi-square analysis for categorical variables and the *t*-test for continuous variables. Statistical significance was taken at $p < 0.05$.

Results

There were 90 cases identified in the period under review but only 62 (68.9%) case notes were available for review (Table 1). This represented 10% (90/901) of the total ICU admissions during the period under review. There were 40 males and 22 females, the age range was 65 to 92 years with a mean age of 73 years. 75% of these patients had one or more co-morbid conditions, mostly hypertension (seen in 45% of the cases). The majority (75.8%) were surgical admissions while 24.2% were admitted following medical conditions, with cerebro-vascular disease accounting for 60% of the medical admissions. 22% of the patients were admitted following trauma, while 58% were post-surgical admissions (with general abdominal and neurosurgical procedures accounting for 80% of the surgeries). Overall, about 74.2% of the admissions were unplanned (this includes all medical and unplanned surgical admissions). In 65% of the cases, the elderly patients had endotracheal intubation and 53.2% were mechanically ventilated. Length of ICU stay ranged between 1 to 31 days, with 66% of patients staying less than a week on admission.

The majority 36 (58.1%) of the elderly admissions in this review died in the ICU while 26 (41.9%) were discharged. The relationship between the predictors of mortality and the outcome are shown in Table 2.

Table 1. Elderly admissions and total admission during the period under review

| Year | 2010 | 2011 | 2012 | 2013 | 2014 | Total |
|------------------------|------|------|------|------|------|-------|
| No of elderly patients | 14 | 26 | 25 | 20 | 5 | 90 |
| Total no of patients | 91 | 216 | 275 | 172 | 147 | 901 |
| % of elderly | 15.5 | 12.0 | 9.1 | 11.6 | 3.4 | 10 |

Table 2. Relationship between the predictors of mortality and the outcome

| Predictors | YES | | NO | | P value |
|--------------------------|------------|------|------------|------|---------|
| | Discharged | Died | Discharged | Died | |
| Presence of co-morbidity | 20 | 27 | 6 | 9 | 1.00 |
| Trauma | 7 | 7 | 19 | 29 | 0.55 |
| Surgery | 18 | 18 | 8 | 18 | 0.19 |
| Endotracheal Intubation | 10 | 30 | 16 | 6 | 0.001 |
| Mechanical Ventilation | 8 | 25 | 18 | 11 | 0.001 |
| Electrolyte derangement | 3 | 21 | 23 | 15 | 0.001 |
| Sepsis on admission | 1 | 20 | 25 | 16 | 0.001 |
| Shock on admission | 4 | 23 | 22 | 13 | 0.001 |
| Vasopressor | 4 | 22 | 22 | 14 | 0.001 |
| Blood transfusion | 9 | 14 | 17 | 22 | 0.79 |
| Dialysis | 0 | 2 | 26 | 34 | 0.51 |

Table 3. Relationship between electrolyte derangement and outcome

| Predictors | Electrolyte Derangement (%) | | No Electrolyte Derangement (%) | | P values |
|---------------------|-----------------------------|----------|--------------------------------|-----------|----------|
| | Survived | Died | Survived | Died | |
| Hyponatraemia | 1 (1.6) | 0(0.0) | 26 (41.9) | 35 (56.4) | 1.00 |
| Hypokalemia | 2 (3.2) | 13(21.0) | 24(38.7) | 23(37.1) | 0.01 |
| Elevated Creatinine | 2(3.2) | 5(8.1) | 24(38.7) | 31(50.0) | 0.68 |
| Elevated Urea | 2(3.2) | 9(14.5) | 24(38.7) | 27(43.5) | 0.10 |

There was no significant correlation between outcome and age ($p= 0.74$), sex ($p= 0.79$), duration of ICU stay ($p=0.35$), nor the packed cell volume at presentation ($p=0.91$). Also, the number of co-morbidities a patient had did not significantly influence outcome ($p=0.608$). The age at presentation did not significantly influence outcome as patients >80 years did not fare worse than patient between 65-75 years. Planned surgical admissions ($p=0.001$) however had a better outcome than unplanned surgical or medical admissions. Other predictors of mortality included the need for endotracheal intubation ($p=0.001$), mechanical ventilation ($p=0.001$), vasopressor ($p=0.001$), electrolyte derangement ($p=0.001$), sepsis on admission ($p=0.001$) and shock on admission ($p=0.001$).

A total of 61% of patients had no electrolyte derangement, 27% had one derangement while 11% had 2 or more. These derangements were detected in the period of admission in the ICU. The presence and number of electrolyte derangements significantly influenced mortality with outcome worsening with increasing derangements ($p=0.001$). Hypokalemia was noted to be a single contributing factor to mortality in this study ($p=0.01$) as thirteen out of the fifteen patients who had hypokalemia died during the admission as shown in Table 3.

Discussion

This study has shown that the outcome of elderly admissions into the ICU is very poor with a mortality rate of 52%. This is comparable but higher than what was reported by Belayachi et al who reported 44.7% among the elderly patients in Morocco and Wade et al who reported a mortality rate of 42.8% in a medical ICU in Senegal^(13,14). The high mortality reported on the African Continent compared to findings in Europe may be due to inadequate manpower and equipment¹⁵.

Our ICU is a 6-bedded facility with limited equipment – 4 multi-parameter monitors and 4 ventilators; set up for the management of patients of all age groups. It is also covered by Consultant Anaesthesiologists who also participate in theatre procedures in addition to managing patients in the ICU. Intensive care nurses are usually about 3-4 per shift. These factors affect the delivery of high-quality intensive care to patients, particularly high-risk elderly patients with co-morbid conditions and declining organ function. The ICU essentially offers organ support and co-manages patients with other physicians and surgeons.

A high percentage (74.2%) of unplanned admissions may also explain the high mortality in this study. This is similar to the findings of some current studies that reported high mortality among the elderly patients in ICUs admitting predominantly medical and unplanned surgical cases.^(16, 17)

With the projected ageing of the population coupled with poor financing of health care and lack of medical specialists in the newly evolving field of geriatric medicine, the African continent may find it more challenging to cope with provision of intensive care therapy for the elderly population. The elderly patients in our study account for about 10% of all ICU admissions which is in contrast to 42-52% reported by **Pisani** in the USA⁽⁵⁾. The low utilization of ICU recorded in this study may be due to the fewer people surviving up to the elderly age range in our region; the limited bed spaces for admission, the cost of ICU care; and the reluctance of elderly patients' relatives to fund ICU care, as there is no insurance coverage for ICU care in our facility.

In this study, elderly patients admitted into our ICU were mostly males but there was no correlation between gender and outcome in our study. Our finding is similar to other studies.^(18, 19) However, Fowler et al reported higher mortality in elderly women.⁽²⁰⁾

The need for mechanical ventilation was found to be associated with increased mortality in this study. Several studies have also described poor results in elderly patients who were subjected to mechanical ventilation.⁽²¹⁻²³⁾ Farfel et al in a study conducted in Brazil concluded that age worsened outcomes in the elderly submitted to invasive mechanical ventilation while age was not related to mortality in the elderly not submitted to invasive mechanical ventilation.⁽²⁴⁾

In this study, 88% of the elderly patients identified with electrolytes derangement died during the course of their ICU stay. Hypokalemia was a single contributing factor to mortality in this study. Contrary to our findings, studies have associated severe hypo and hypernatremia with significant high mortality and morbidity in the geriatric population.^(25,26) Refae and Rasheedy also identified low serum sodium and bicarbonate at admission as independent predictors of mortality in critically ill elderly patients.⁽¹¹⁾ 65% of the non survivors in their study had hyponatremia.

Severe sepsis and septic shock are common in the elderly patients^(27, 28). In the US, elderly people constitute two-third of patients presenting with sepsis⁽²⁷⁾. In this study sepsis and septic shock were associated with increased mortality which is in keeping with previous studies in which elderly patients were observed to have increased mortality when compared to their young counterparts.⁽²⁷⁻²⁹⁾ Vosylius *et al* in a study carried out in Lithuania rated infection among the three independent factors with the highest risk of death.⁽¹²⁾ The other two are severity of illness and impaired level of consciousness. Predisposing factors to sepsis in elderly include pre-existing comorbidities, drugs, malnutrition, endocrine disorders e.g hypoadrenalism and hypothyroidism⁽¹²⁾.

Also, in this study, the use of vasopressors was found to be associated with increased mortality. This is probably related to the fact that patients requiring vasopressors are poor risk patients⁽¹³⁾. About 84% of the elderly patients who had vasopressors were observed to have died during admission in the ICU. This is similar to the outcome of

several other studies^(10, 30, 31). Orsini *et al* categorised the need for vasopressor as one of the independent risk factors associated with adverse outcome in elderly patients admitted into the ICU⁽¹⁰⁾. The other independent risk factors identified from the study by Orsini *et al* included advanced age, severity of illness, need for mechanical ventilation and cardiopulmonary resuscitation.⁽¹⁰⁾

A possible limitation to this study is the fact that routine ICU scoring systems like the APACHE score were not used, as the required indices were not found in the case notes of most of the patients and, a significant proportion of the patients were transferred to ICU following initial admission on other wards.

Conclusion

In conclusion, this study suggests that the elderly patients admitted into our ICU are a population at risk of high morbidity and mortality. The predictors of high risk of death identified in this study include sepsis on admission, septic shock, need for vasopressor, endotracheal intubation and or mechanical ventilation and the presence of electrolyte derangement. The outcome of this study calls for a need to pay more attention to this rapidly expanding group of the population.

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