Geriatric intensive care unit (GICU) in Ain shams university hospitals admission characteristics and mortality among elderly patients

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Abstract

Background: Globally, the elderly population is steadily growing because of continual improvement of the standards of living and medical technology. As the population ages the proportion elderly patients entering intensive care unit (ICU) is increasing. A recent large retrospective analysis found a yearly increase of 5.6% in very elderly ICU admission rates.

Aim: to detect the most common causes for GICU admission and mortality rate among elderly patients

Methods: Ninety patients were recruited from GICU of Ain Shams University Hospitals and followed up in a prospective study till death or discharge from GICU from October 2017 till June 2018

Results: Main cause of admission was neurological problem (21.1%) followed by metabolic trouble (18.9%). Out of 90 GICU admissions, 28.8% of the patients died.

Conclusions: The current study showed that advanced age *per se* was not a predictor of mortality but there are other factors which determine prognosis in critically ill elderly patients such as sepsis, high APACHE II score followed by presence of cerebrovascular stroke.

Keywords: ICU admission; elderly; mortality; sepsis

Background

Over the last 150 years, the rapid ageing of the population occurred in developed countries and in those undergoing transition. This does not only indicate a success of the modern way of life, wellbeing, and progress of health sciences, but also creates many medical, psychological, sociological and financial problems [1].

In the elderly we can observe typical geriatric syndromes (sleep problems, delirium, dementia, osteoporosis, heart failure, falls, and weight loss) that reduce the health-related quality of life, activities of daily living, and therefore increases their dependence and need for various supports [2-4].

The elderly also frequently suffer from age-related vulnerability due to reduced compensatory and defence mechanisms that leads to frailty with associated polymorbidity and polypharmacy, undernutrition, poor social status, loneliness, and repetitive hospital admissions. [5-7]

As the proportion of the elderly in the general population grows, the number of elderly patients being admitted to the intensive care unit (ICU) is also increasing [8]. The proportion of elderly patients out of total ICU admissions in various developed countries has been estimated as being between 7 and 25 % and growing [9].

Intensive care units (ICUs) are facing an increasing demand for care from older individuals [10]. Intensive care unit is an expensive and scarce resource. In the face of growing demand, pragmatic decisions regarding appropriate levels of care may become necessary. This study is to detect major causes of admission to GICU and to know the predictors of mortality in elderly patients.

The aim of this study was to detect the most common causes for geriatric ICU admission and predictors of mortality among elderly patients

Methods

Ninety patients were recruited from GICU of Ain Shams University Hospitals and followed up in a prospective study till death or discharge from GICU from October 2017 till June 2018.

Upon admission, the following variables were examined: demographics, clinical history, cause of GICU admission, physiopathology (Acute Physiology and Chronic Health Evaluation (APACHE) II) and Sequential Organ Failure Assessment (SOFA).

In all patients, main blood chemistry examinations (serum creatinine, serum sodium, serum potassium, hematocrit, white blood cell count) were performed upon arrival at the first-aid unit. Fasting serum albumin and total cholesterol values were collected the first morning after the patient's admission into the hospital ward. Blood-gas analysis of arterial blood was performed on all the patients in basal conditions at arrival in the hospital ward. Gathered data were used to fill in the APACHE II form.

In addition, serum bilirubin level, complete blood count and serum creatinine were performed upon admission to fill in the SOFA form.

Ethical Considerations:

The ethical committee approval was taken and the objective of the study was conducted to the legal guardian or the patient. Confidentiality of data was assured and no one has right to read patient's medical information except the main researcher.

Statistical Methods

The collected data were coded, tabulated, and statistically analyzed using IBM SPSS statistics (Statistical Package for Social Sciences) software version 18.0, IBM Corp., Chicago, USA, 2009.
Descriptive statistics were done for quantitative data as minimum& maximum of the range as well as mean±SD (standard deviation) for quantitative normally distributed data, while it was done for qualitative data as number and percentage.
The level of significance was taken at P value < 0.050 is significant, otherwise is non-significant.

Results

Mean age in study population was 70.2±8.6 years, male patients constituted 46.7% while female patients constituted 53.3%.
Main cause of admission was neurological diseases (21.1%) including stroke, encephalitis, intracranial hemorrhage and status epilepticus followed by metabolic disorder (18.9%) including electrolyte disturbance, uremic, hepatic encephalopathy and

diabetic ketoacidosis then respiratory problems (COPD exacerbation, Bronchial asthma exacerbation and pneumonia), cardiovascular (hypertensive emergency, pulmonary embolism, decompensated heart failure, acute coronary syndrome and arrhythmia), delirium, hemodynamics (shock, hematemesis, melena) and sepsis.

Table 1: clinical characteristics of the studied cases

Characteristics		Mean±SD	Range
Chalson Comorbidity index		6.1±2.3	2.0–13.0
SOFA score		3.7±2.5	0.0–13.0
APACHE II score		15.4±6.1	3.0–45.0
Serum albumin (gm/dL)		2.9±0.7	1.4–4.3
		N	%
Cause of admission	Respiratory	16	17.8
	Cardiovascular	14	15.6
	Neurological	19	21.1
	Metabolic	17	18.9
	Delerium	11	12.2
	Hemodynamic	9	10.0
	Sepsis	4	4.4

The median APACHE II score for studied patients was 24.0±8.3 and the median SOFA score was 6.1±3.2 with Charlson co morbidity index 6.1±2.3 and ICU mortality in the studied cases was 28.9%.(table 1)
The predictors of mortality in the current study were stroke as a cause of admission, sepsis, mechanical ventilation, high score of SOFA and APACHE II (table 2,3).

Table 2: Comparison between survivors and non survivors among the studied cases:

		Mortality during ICU stay		P-value
		No	Yes	
Age	Mean ± SD	70.25 ± 9.08	70.23 ± 7.47	0.992
	Range	60 – 95	60 – 87	
Sex	Male	30 (46.9%)	12 (46.2%)	0.950
	Female	34 (53.1%)	14 (53.8%)	
Geriatric syndromes	Cognitive impairment	13 (20.3%)	2 (7.7%)	0.145
	Osteoporosis	2 (3.1%)	1 (3.8%)	0.863
	Pressure ulcers	6 (9.4%)	3 (11.5%)	0.756
	History of Malnutrition	7 (10.9%)	8 (30.8%)	0.071
Charlson co-morbidity index	Mean ± SD	6.03 ± 2.19	6.15 ± 2.48	0.817
	Range	2 – 13	3 – 13	

Table 3: Comparison between survivors and non survivors among the studied cases

		Mortality during ICU stay		P-value
		no	yes	
The most common causes of ICU admission	Hypertensive emergency	2 (3.1%)	0 (0.0%)	0.362
	Uremic encephalopathy	2 (3.1%)	0 (0.0%)	0.362
	Hepatic encephalopathy	7 (10.9%)	2 (7.7%)	0.642
	DKA	2 (3.1%)	0 (0.0%)	0.362
	Electrolytes disturbance	3 (4.7%)	1 (3.8%)	0.860
	Stroke	6 (9.4%)	7 (26.9%)	0.032
	Status epilepticus	2 (3.1%)	1 (3.8%)	0.862
	IChg	1 (1.6%)	0 (0.0%)	0.521
	ENCEPHALITIS	1 (1.6%)	0 (0.0%)	0.521
Albumin level	Mean ± SD	2.95 ± 0.70	2.87 ± 0.70	0.649
	Range	1.4 – 4.3	1.5 – 4.1	
Length of ICU stay	Median (IQR)	5 (4 – 8)	7 (4 – 10)	0.201
	Range	0 – 33	1 – 58	
Sepsis		10 (15.6%)	16 (61.5%)	0.000
	No	58 (90.6%)	0 (0.0%)	0.000
Mechanical ventilation	Non invasive	5 (7.8%)	5 (19.2%)	
	Invasive	1 (1.6%)	21 (80.8%)	
SOFA score	Median (IQR)	3 (1 – 4)	5 (3 – 7)	0.002
	Range	0 – 8	0 – 13	
APACHE II score	Mean ± SD	14.05 ± 5.25	18.65 ± 6.86	0.001
	Range	3 – 26	12 – 45	

Table 4: Multi-variate logistic regression

	Mortality during ICU stay					95% C.I. for odds ratio	
	B	S.E.	Wald	P-value	Odds ratio	Lower	Upper
Stroke	1.99	0.84	5.639	0.018	7.328	1.416	37.919
Sepsis	2.18	0.66	11.006	0.001	8.83	2.438	31.979
SOFA score	0.97	0.64	2.299	0.129	2.639	0.753	9.252
APACHE2 score	2.83	1.11	6.538	0.011	16.976	1.937	148.77

the most significant predictors of mortality among the studied cases were sepsis, high APACHE II score followed by presence of cerebrovascular stroke.(table 4).

Discussion

As the geriatric population in Europe and the United States increases because of several factors (e.g., preventive medicine, better management of chronic diseases and acute illnesses, smoking cessation), more older people will become critically ill and potentially require critical care resources for management of life-threatening diseases. [11]

As a result, the future demand for ICU beds and critical care services already exceeds or may soon exceed the capabilities of the healthcare system in many countries. For this reason, this study was conducted to know the most common causes for GICU admission.

Ninety patients were recruited from Geriatric intensive care units (GICU) of Ain Shams University Hospitals. Mean age in study population was 70.2±8.6 years, male patients constituted 46.7% while female patients constituted 53.3%. The median APACHE II score for studied patients was 24.0±8.3 and the median SOFA score was 6.1±3.2 with charlson co morbidity index 6.1±2.3.

Main cause of admission was neurological problem (21.1%) followed by metabolic trouble (18.9%) in contrast to [12] who found that the most common causes of ICU admission in elderly were cardiovascular troubles as heart failure (25.9–40.3 %), cardiac arrhythmia (24.6–43.5 %), and valvular heart disease (7.5–15.8 %) followed by diabetes complications (7.5–2.4 %) then alcohol abuse (4.1–0.6 %) and chronic obstructive pulmonary disease (COPD) (24.4–17.4 %).

In addition, mortality rate was 28.9% in the current study. This is not far from the mortality rate reported in previous literatures for elderly patients. Specifically Francine et al, 2009,[13] who had found that Mortality in the ICU in this population was 28.1% and a Spanish study on eighty-six multidisciplinary ICUs in Spain, including coronary patients during a 6-month period between 1992 and 1993 was reported a hospital mortality rate of 30.8% in patients aged 75 and older

[14]

Another prospective study on ninety-seven patients aged 65 years and older who required intensive care recruited during a 3-month period was reported a rate of 39% [15]. A fourth reported that the oldest elderly (≥85) had a 90 day mortality rate of 36% after ICU discharge, and a fifth study done on 63 patients 75 years of age or older and 237 patients younger than 75 years of age enrolled from medical and coronary ICUs found an in-hospital mortality rate of 38.1% in a cohort of patients aged 75 and older. [16]

The current study showed that advanced age per se was not a predictor of mortality but there are other factors which determine prognosis in critically ill elderly patients such as sepsis, high APACHE II score followed by presence of cerebrovascular stroke. So, proactive medical care should be maximized to prevent neurological disorders using primary and secondary prevention measures

The current study was found that sepsis is the most significant predictor of mortality in GICU. This finding agrees with Didier et al who found that the fatality rate was 35% at 28 days after the onset of sepsis; in hospital mortality was 43%. Also Didier et al found that one of the best independent prognostic factors was the APACHE II score at the onset of sepsis. [17].

Similarily, Saad et al was found that higher mortality rate was observed in patients with high APACHE II score. So, the APACHE II scoring system was found useful in classifying patients according to the disease severity and strong predictor of mortality. [18]

In addition, the present study was found that cerebrovascular stroke was significant predictor for mortality in ICU. Similarily Fanshawe et al , 2002 found that the ICU, in hospital and three month mortality rate in stroke patients were 36%, 47% and 52% respectively . [19]

Some limitations of this study must be addressed. The study population of this research consisted of older patients admitted to a medical GICU of a university teaching hospital and may not be generalized to patients hospitalized at other institutions. Also, it is a single-site study with a small sample. Medical care that occurs after the patient is transferred to another hospital unit could affect the outcome of the patients.

Further studies should be conducted among both medical ICU (including stroke unit and coronary care unit) and surgical ICU patients to confirm our results.

Conclusion:
The current study showed that advanced age *per se* was not a predictor of mortality but there are other factors which determine prognosis in critically ill elderly patients such as sepsis, high APACHE II score followed by presence of cerebrovascular stroke.

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