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Original Article

Cardiovascular profile in critically ill elderly medical patients: Prevalence, mortality and length of stay

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ABSTRACT

Purpose: Data are demonstrating the increase in utilization of critical care by the elderly. Around 11% of ICU patients are ≥80 years-old.
Methods: An observational retrospective study was conducted between 2003 and 2011, including elderly patients (≥80 years old) admitted from medical services to the intensive care unit (ICU) in a tertiary university hospital. The final sample size was N = 202.
Results: Mortality rates were: ICU 34.1%, in-hospital 44% and 1-year cumulative mortality 55.4% (20.4% for hospital survivors). Multivariate analysis showed that APACHE II score: OR 1.10, 95% CI (1.03–1.18), SAPS II score: OR 1.03, 95% CI (1.01–1.06), a score <3 on the Cruz Roja Hospital mental scale: 0.51 OR, 95% CI (0.01–0.57) and ICU admission for cardiovascular disease: OR 5.05, 95% CI (1.98–12.84) were independently associated with mortality ICU. Factors independently associated with 1-year mortality were: dyslipidemia OR 7.25 (1.47–35.60), chronic kidney failure OR 13.23, 95% CI (2.28–76.6), stroke OR 10.44, 95% CI (2.26–48.25) and antihypertensive treatment OR 0.08, 95% CI (0.01–0.48). In multiple linear regression, ICU length of stay was associated with mechanical ventilation B coefficient 6.41, 95% CI (1.18–11.64) and in-hospital length of stay was related to age: B coefficient −2.17, 95% CI (−4.02 to −0.33).
Conclusions: Prevalence of cardiovascular risk factors and cardiovascular disease was high, and basal cardiovascular treatment was underused. Primary diagnosis for cardiovascular disease at ICU admission should be assessed as predictor of ICU mortality. Intensifying cardiovascular basal treatment could decrease 1-year mortality. Cardiovascular profile did not show an effect on in-hospital mortality and length of stay.

1. Introduction

Data are demonstrating the recent increase in utilization of critical care resources by the elderly [1]. Around 11% of patients admitted to the intensive care unit (ICU) are over the age of 80 years-old [2], and potential ICU admissions of this subgroup oscillate between 5.6% and 38.8% [3]. Medical elderly patients are underrepresented in ICU studies, where factors associated with mortality and length of stay duration are not specifically determined [4–7]. Furthermore, patients ≥80 years-old are complex because they commonly present comorbidity and polytreatment. In this context, cardiovascular risk factors, cardiovascular disease and medical cardiovascular treatments are highly prevalent in the elderly population, and its influence in a critical care setting is not well defined [8].

The main objective was to determine the impact of the cardiovascular profile (cardiovascular risk factors, cardiovascular disease and medical cardiovascular treatment) on mortality (ICU, in-hospital and 1-year post-hospital mortality) and length of stay in patients ≥80 years old admitted to the ICU for medical reasons. The secondary objective was to compare basal characteristics and risk factors for mortality and length of stay according to past medical history of cardiovascular disease and primary admission diagnosis to the ICU (cardiovascular vs. non-cardiovascular). This article presents the results of the main objective.

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2. Methods

2.1. Setting, design and patient selection

The study was performed at the La Princesa Hospital, a 554-bed tertiary-care university teaching hospital for adults, located in Madrid, Spain. The hospital provides services in all the medical specialties and in all fields of surgery. The ICU is a 22-bed mixed (medical and surgical) unit that admits more than 800 patients per year, with approximately a rate of 13% aged 80 years or over.

An observational retrospective study was carried out in a population of patients ≥80 years old admitted to the ICU from medical services for medical reasons between January 1, 2003 and December 31, 2011. Patients who were admitted several times during the study period had only their first stay included in the study. The recommendations of the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) [9] declaration for observational studies were used.

The sample selection was performed using non-probability consecutive sampling. The initial sample was 224 patients (Fig. 1). After reviewing the medical records, 22 patients were excluded because they were admitted to the ICU for surgical reasons. The final sample size was N = 202.

2.2. Data collection

A priori independent variables were selected based on clinical criteria and previous studies as possible prognostic or confounding factors. For each patient included in the study, hospital charts were reviewed, and the following collected data were recorded: age and sex, ICU admission source, cardiovascular risk factors, heart failure, aortic aneurysm, chronic renal failure, ischemic heart disease, stroke, atrial fibrillation, chronic respiratory disease, body mass index (BMI), weight (kg) / height (m^2), obesity (BMI ≥ 30 kg/m^2), neoplasia and basal treatment (antihypertensive, insulin, statins, oral antidiabetics, anticoagulants, antiplatelets and bronchodilators).

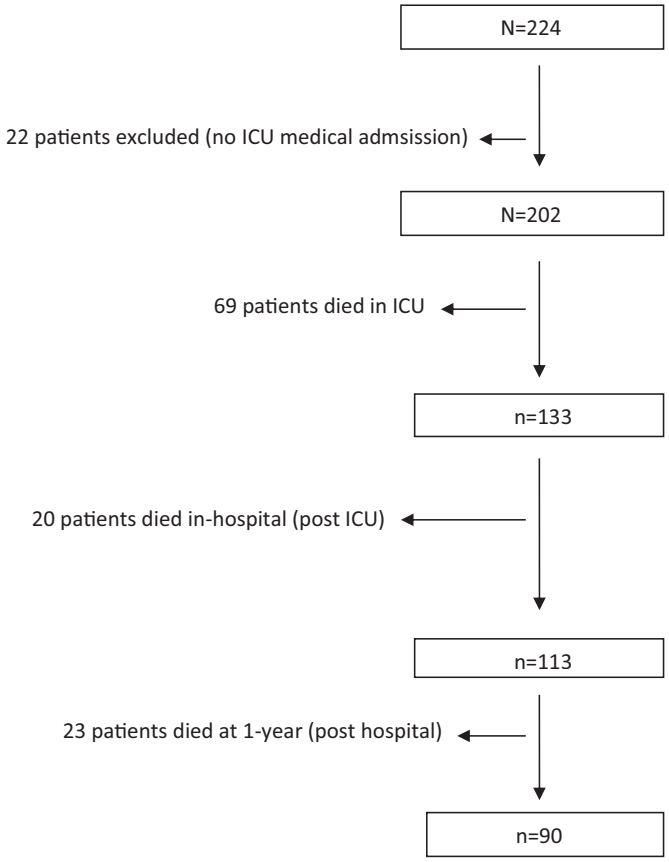

Fig. 1. Flow diagram.

The data recorded in ICU were: APACHE II score (Acute Physiology and Chronic Health Evaluation II) [10], SAPS II score (Simplified Acute Physiology Score II) [11], Glasgow coma scale, treatment and complications (inotropes/vasopressors, continuous renal replacement, mechanical ventilation, sepsis [12]—pneumonia, urinary tract infection, bacteremia and others) and analytical data (glomerular filtration rate by *Modification of Diet in Renal Disease* 7–MDRD 7–formula). Renal failure was defined as glomerular filtration rate <60 ml/min/1.73 m^2 by MDRD 7 [13] formula at ICU admission.

2.3. Geriatric assessment: comorbidity, mental status and functional status

The modified Charlson comorbidity index [14,15] was used to determine the associated diseases. Components and scoring of modified Charlson comorbidity are: cerebrovascular disease (1 point), diabetes mellitus (1 point), chronic flow airway obstruction (1 point), heart failure/ischemic chronic heart disease (1 point), dementia (1 point), peripheral artery disease (1 point), chronic renal failure (2 points) and neoplasia (2 points). A score of 0 or 1 point indicates the absence of comorbidity, of 2 or 3 points was low comorbidity and >3 points was high comorbidity [15].

Mental disability and functional disability were measured by the Cruz Roja Hospital mental and functional scales (Appendix 1) respectively. These scales have been validated and include ordinal values from 0 to 5, where 0 indicates the absence of mental disability or functional disability, and 5 indicates severe dementia or total dependence for daily activities [16]. Scoring variables were missing in 49 (24.2%) patients for mental status and in 41 (20.2%) patients for functional status.

2.4. Cardiovascular disease definitions, mortality and length of stay

Definition of medical history of cardiovascular disease was based on the criteria of the established atherosclerotic heart and vascular disease [17–19]: ischemic heart disease, cerebrovascular disease (stroke-ischemic or hemorrhagic non-traumatic- and transient ischemic attack), heart failure, chronic kidney failure, peripheral arterial disease and aortic aneurysm.

Cardiovascular disease as primary medical diagnosis admission to the ICU, was defined according to Major Diagnostic Categories (MDCs)–from the International Classification of Diseases (ICD) 9–using the clinical criteria of acute cardiovascular disease: acute myocardial infarction angina (MDC 5: 122, 123), cerebrovascular stroke (ischemic or hemorrhagic, MDC 1: 14, 810), heart failure (MDC 5: 127), kidney failure (MDC 11: 316) and arrhythmia (MDC 5: 138, 139).

The dependent variables were: ICU mortality, in-hospital mortality (ICU and ward), post-hospital mortality (1-year), ICU length of stay (days) and hospital length of stay (days). These data were collected from in-hospital and outpatient primary care databases (Nostradamus program, Madrid community health system).

2.5. Statistical analysis

Mean and standard deviation or median and interquartile (IQ) range were calculated, depending on the distribution of continuous variable. The absolute percentage and relative frequencies were used for categorical variables.

In univariate analysis, the χ^2 test was performed for dichotomous variables. If the independent variable was polytomous, the Kruskal–Wallis test was used. When the dependent variable was quantitative, Student's t test and Mann Whitney U test were performed, according to the parametric or non-parametric distribution. To determine