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Pathways after inpatient admission in very advanced age: A Portuguese nationwide study

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ABSTRACT

Introduction: Oldest old patients often have complex and multiple medical conditions, which are associated with higher rates of use of healthcare services, and a higher risk of experiencing adverse outcomes, such as mortality. This study investigated (a) the in-hospital mortality rate and predictors in patients aged 80+; (b) the destination patients have after hospital discharge.

Methods: Nationwide study. All inpatient admissions by individuals aged 80 years and older between 2011 and 2014 in Portugal were considered. Exploratory descriptive analyses of data regarding in-hospital mortality and destination after discharge were performed; multivariate logistic regression analyses were conducted to identify predictors of in-hospital mortality.

Results: A total of 614,807 episodes of hospital admissions were analysed. A mortality rate of 15.4% was observed. In the majority of episodes, patients returned home (78.6%). Increased age, male gender, increased length of stay, unplanned attendance, medical DRG type, increased severity of illness and mortality risk, and comorbidities were significant predictors of in-hospital mortality.

Discussion: This study strengthens the importance of implementing health policies specifically to the oldest old, namely with the promotion of the use of primary care services. That would expectably concur to a better management of the most common medical conditions in this population, and a decrease in hospital unplanned attendances.

1. Introduction

The oldest old (i.e. those aged 80+) are one of the fastest growing age segments in most European populations. The rise in the very elderly population is expected to concur to an increased prevalence of chronic conditions and, subsequently, to a greater burden on healthcare services (Denton & Spencer, 2010). Older patients are known to use more hospital services and having longer lengths of stay (LOS) than younger ones (Aminzadeh & Dalziel, 2002; Somme, Maillet, & Gisselbrecht, 2003). Also the management of older patients is more complex, and healthcare services are not always qualified to meet the specific needs of these patients (Hwang & Morrison, 2007).

Hospitalization in old age can concur to loss of independence, even in patients functionally independent at admission (Isaia, Maero, & Gatti, 2009). This is particularly true in cases of prolonged hospital stays, with the need for long-term care at discharge (Palmer, 1995), resulting in high rates of mortality in this population during the year following discharge (Walter, Brand, & Counsell, 2001). Nevertheless, few authors have explored the factors that contribute to mortality in the elderly during hospitalization periods (Hwang, Hsu, & Tjung, 2013; Silva, Jerussalmy, & Farfel, 2009). Concurrently, the effect of increased age in mortality is not clear in the available literature: although advanced age is commonly reported as one of the key factors for hospital mortality (e.g. Andersen, Flaatten, & Klepstad, 2015; Bo, Massaia, & Raspo, 2003; Hwang et al., 2013), other studies verified that increasing age is associated with a reduction in hospital deaths (e.g. Witham & Hockley, 2016), or show no differences in the characteristics and outcomes of the old (75–79 yrs), very old (80–84 yrs) and oldest-old (≥85 yrs) patients in intensive care units (ICU) (Somme et al., 2003).

Several factors are reported to contribute to in-hospital mortality among older patients. Among those, functional dependency previous to admission, medical diagnoses, illness acuity, cognitive impairment, comorbidity scores, and male gender are commonly reported (e.g. Bo et al., 2003; Campbell, Seymour, & Primrose, 2004; Elliott, Worrall-

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Carter, & Page, 2012; Hwang et al., 2013; Peigne, Somme, & Guérot, 2016; Pocock, Ives, & Pring, 2016). Nonetheless, information about the predictors of mortality among the oldest old is still limited and often dissimilar, though the indicators of health and functioning known to predict mortality in younger old age seem to maintain their importance in nonagenarians, and functioning is the most important target for interventions at very old age (Tiainen, Luukkaala, & Hervonen, 2013).

This study's main goals are (i) to analyse the destination after discharge and in-hospital mortality rate in inpatient admissions by Portuguese oldest old patients; (ii) to analyse the most frequent diagnoses and comorbidities in patients who died; and (iii) to identify risk factors associated with in-hospital mortality in these patients. It is expected that this study can add to the body of knowledge concerning the in-hospital mortality among an increasingly important segment of hospital patients.

2. Methods

We obtained the data from the national hospitalization's database, provided by the Central Administration of the Health System of the Portuguese Ministry of Health (ACSS), which includes patient-level data for inpatient admissions in all public acute care hospitals in the Portuguese National Health Service (NHS). All discharges by patients aged 80 years and older between January 1, 2011, and December 31, 2014 were considered, excluding the episodes not coded as valid in statistic terms, considering the pooler APR-31. The database includes several variables such as: gender, date of birth, principal and secondary diagnoses (coded in ICD-9-CM), LoS, All Patient Refined DRGs (APR-DRGs) classification (APR-31), that incorporates severity of illness and risk of mortality subclasses into the DRGs, DRG type (surgical vs medical), admission type (planned vs unplanned attendance), and destination after discharge (home; another institution with hospitalization; domiciliary care; discharge against medical opinion; subsequent specialized attendance; deceased; palliative care; post-hospital care; long-term hospital care). Destination after discharge variable was categorized as follows: home; deceased; OH/PC (which includes another institution with hospitalization or palliative care); and MC (which includes all the remaining responses). Comorbidities were identified using ICD-9-CM codes associated to secondary diagnoses and Charslon/Deyo comorbidity methods (Quan, Sundararajan, & Halfon, 2005). The data are anonymous and available from the ACSS for scientific research purposes.

2.1. Analysis

First, exploratory descriptive analyses were performed in order to have an overview of inpatient admissions by oldest old patients. Categorical variables were presented as counts (frequency), and continuous variables with skewed distribution were expressed as median (inter-quartile range). Each variable was tested for differences between survivors and non-survivors by univariate statistical methodology (contingency tables with chi-square test for categorical variables, Mann-Whitney *U* test for continuous variables). All variables significant by univariate analysis (those with $p < 0.2$) were included in the multivariate logistic regression analysis. The dependent variable was mortality, and the model determined the odds of increased mortality given the independent variables. The same analyses were conducted in order to test the variables that predicted discharge home. The analyses were performed using IBM SPSS Statistics for Windows v24 (Armonk, NY: IBM Corp.).

3. Results

Over the 4-year period, there were 614,807 inpatient admissions by persons aged 80 and older (82.4% by octogenarians, 17.2% by nonagenarians, 0.4% by centenarians) in Portuguese public acute care hospitals. The number of admissions increased from 139,172 in 2011 to 164,057 in 2014, which corresponds to a 15.2% increase. Most patients were female (58.0%); 34.2% had no Charlson comorbidity coded, 43.5% had mild comorbidity, 15.3% had moderate comorbidity, and 7.0% had severe comorbidity. The majority of admissions were unplanned (85.8%) and most commonly were for non-surgical reasons (78.7%) (Table 1).

Table 1
Descriptive data for study sample (N = 614,807).

Variable	n (%)
Age group, n(%)	
80–89 yrs	506796 (82.4)
90–99 yrs	105741 (17.2)
100+ yrs	2270 (0.4)
Sex, n(%)	
Male	258199 (42.0)
Female	356604 (58.0)
Admission type, n(%)	
Planned attendance	87589 (14.2)
Unplanned attendance	527218 (85.8)
DRG type, n(%)	
Surgical	130986 (21.3)
Medical	483821 (78.7)
CCI categories, n(%)	
None (CCI 0)	210224 (34.2)
Mild (CCI 1–2)	267173 (43.5)
Moderate (CCI 3–4)	94226 (15.3)
Severe (CCI ≥5)	43184 (7.0)
Median LoS (days)	7.00
Severity of illness, n(%)	
Minor	154605 (25.1)
Moderate	283632 (46.1)
Major	148560 (24.2)
Extreme	28010 (4.6)
Risk of mortality, n(%)	
Minor	163384 (26.6)
Moderate	296881(48.3)
Major	136066 (22.1)
Extreme	18476 (3.0)
Major Diagnostic Category n (% yes)	
Pre- Major Diagnostic Categories	560 (0.1)
DDs of the Nervous System	59834 (9.8)
DDs of the Eye	6482 (1.1)
DDs of the Ear, Nose, Mouth and Throat	4682 (0.8)
DDs of the Respiratory System	147867 (24.1)
DDs of the Circulatory System	102498 (16.7)
DDs of the Digestive System	55103(9.0)
DDs of the Hepatobiliary System and Pancreas	29844 (4.9)
DDs of the Musculoskeletal System and Connective Tissue	59853 (9.7)
DDs of the Skin, Subcutaneous Tissue and Breast	12952 (2.1)
DDs of the Endocrine, Nutritional and Metabolic System	15623 (2.5)
DDs of the Kidney and Urinary Tract	60571 (9.9)
DDs of the Male Reproductive System	5451 (0.9)
DDs of the Female Reproductive System	4288 (0.7)
DDs of the Blood and Blood Forming Organs and Immunological Disorders	6902 (1.1)
Myeloproliferative DDs (Poorly Differentiated Neoplasms)	11561 (1.9)
Infectious and Parasitic DDs (Systemic or unspecified sites)	15333 (2.5)
Mental DDs	3913 (0.6)
Alcohol/Drug Use or Induced Mental Disorders	111 (0.0)
Injuries, Poison and Toxic Effect of Drugs	2518 (0.4)
Burns	537 (0.1)
Factors Influencing Health Status and Other Contacts with Health Services	6007 (1.0)
Multiple Significant Trauma	126 (0.0)
Human Immunodeficiency Virus Infection	715 (0.1)

DRG – Diagnosis Related Groups; CCI – Charlson Comorbidity Index; DDs – Diseases and disorders.