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Burden of burns in Portugal, 2000–2013: A clinical and economic analysis of 26,447 hospitalisations

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ARTICLE INFO

Article history:

Accepted 13 January 2016

Keywords:

Epidemiology
Burden of disease
Burns
Hospital
Costs
Portugal
Southern Europe

ABSTRACT

Introduction: There is a lack of recent and nation-wide epidemiological studies of burns in Europe, mainly in southern Europe. There are no recent studies describing the clinical and economic burden of burns in this European area. Hence, this research aimed to describe the clinical and economic burden of burn hospitalisations in Portugal.

Methods: A retrospective observational study was performed and the Portuguese hospitalisation database of public hospitals was used; all inpatients, discharged between 2000 and 2013, with a main or secondary diagnosis of burns (ICD-9-CM: 940.xx-949.xx) were taken into account. Furthermore, admissions to hospitals with and without burn centres were compared.

Results: A total of 26,447 burn hospitalisations were registered (mean of 1889 burn admissions/year). The total hospitalisation rate was of 18.9 hospitalisations/100,000 inhabitants/year, and there was a higher incidence of male patients. Burn hospitalisations and hospitalisation rates are significantly decreasing – mostly in 0–14-year-old patients – and children below the age of 5 years represented a fifth of all admissions. Besides the important morbidity, the in-hospital mortality rate was of 4.4%. With a total annual charge of almost 13 million Euros, the average cost per burn admission is increasing, and reached 8032 Euros in 2013. Additionally, more than half of the patients admitted to hospitals without burn centres were not transferred to hospitals with burn centres, not following the European Burns Association transferral criteria.

Conclusions: As the largest southern European nation-wide epidemiological study of burn patients, this research highlights that burn admissions, as well as hospitalisation rates, are decreasing significantly. This was particularly obvious among the youngest patients despite the fact that the numbers still remain very high. Moreover, the in-hospital mortality rate is still excessively high and the burn transferral criteria are not being followed. Thus, it is important to improve preventive measures, reach out to and educate providers about the burn transferral criteria, and develop specific health care strategies for children with these injuries.

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<http://dx.doi.org/10.1016/j.burns.2016.01.017>

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1. Introduction

Burns are one of the most traumatic injuries with significant sequelae that lead to substantial losses in the quality of life of burn patients [1–3]. Besides, burns are responsible for 265,000 deaths every year [4]. However, some studies have shown a burns incidence decrease in several countries since the 1990s and a hospitalisation rate that ranges from 2 to 29 hospitalisations/100,000 inhabitants/year in Europe [5–14]. Still, burns remain between the most expensive non-lethal injuries and represent an important health care concern due to their high associated costs and long hospitalisation periods [13–20].

There are not many epidemiological studies of burns in European countries on a national scale [21–26], and the largest, with 188,597 admissions, was performed in England from 1991 to 2010 [26]. In Portugal the most recent study dates from 2003 and its data relates to the period between 1993 and 1999 [23].

Portugal has five public burn centres (35 beds) and four of them date to before the year 2000 [27]. The burn centre of S. João Hospital opened at the end of April 2006. The Portuguese national ratio of number of beds in burn centres per resident population is 1 bed per 285,390 mainland inhabitants. Nevertheless, not all of the five mentioned burn centres meet the criteria proposed by the American Burns Association or by the European Burns Association, which includes appropriate equipment and specialised staff [28,29].

Currently, burn patients are for the most part admitted to local hospitals to stabilise being transferred to a central hospital emergency room or a burn centre if indicated and only when the transferral criteria fit. The transferral criteria for a burn centre include, according to the European Burns Association, area of the burn by percentage of total body surface area (%TBSA), burn aetiology, anatomical site and depth, inhalation injury, major comorbidities (e.g. trauma) and need of shock resuscitation or rehabilitation support [29].

In southern Europe there are no recent studies describing the clinical and economic burden of burns, which would make it possible to understand the resources needed and the type of procedures adopted by the health care system when faced with these injuries. Thus, the aim of this study was to analyse the clinical characteristics of burn patients who had been admitted to Portuguese hospitals during 2000–2013, as an example of a southern European country, to estimate lengths of stay, mortality rates and economic charges, and to understand the health care flow of burn patients and if the transferral criteria to burn centres were being followed.

2. Patients and methods

A retrospective observational study using a national hospitalisation database from mainland Portuguese public hospitals, provided by the Authority for Health Services of the Portuguese Ministry of Health, was performed. The study took into account all inpatient episodes from 2000 to 2013 with a main or secondary diagnosis of burns, which were coded as 940.xx–949.xx using the International Classification of Diseases – 9th

Revision – Clinical Modification (ICD-9-CM). Each hospitalisation was considered as an independent episode and patients of all ages were included.

The variables reflected upon were age, gender, length of stay (LoS), discharge status, mean charges, type of admission (unplanned admissions – admissions through the emergency department), discharge date, and discharge destination. Other clinical characteristics such as burn aetiology, area of burn by %TBSA, burn anatomical site, self-inflicted injury, inhalation injury and burn depth were also analysed by using the ICD-9-CM codes, as described in Table 1.

For the purpose of burn aetiology analysis, scald was merged with hot liquid/object and taken as burn aetiology – Table 1. In this study there was 18.4% and 22.8% of missing data concerning burn aetiology and area of the burn, respectively. Admissions between hospitals with and without burn centres were compared. Notwithstanding, during the period of time foreseen in this study some hospitals merged and became bigger hospital centres. Therefore, for the purpose of this research, these “new” hospital centres were considered as having a burn centre if any one of the original hospitals had this type of centre.

Charges were calculated from expenditure tables for the Portuguese National Health Service hospital reimbursements, as defined by governmental decree in 2014 (in *Diário da República*), and were performed using the diagnosis-related groups (DRG)-based budget allocation model [30,31]. An

Table 1 – ICD-9-CM codes of the clinical characteristics of burns (burn aetiology, area of the burn and anatomical area, and self-inflicted or inhalation injury).

Clinical characteristics	ICD-9-CM codes
Burn aetiology	
fire/flames	E890.x-E899.x; E958.1; E968.0; E988.1
scald	E958.2; 988.2
electrical	E925.x; E958.4; E988.4
chemical	E958.7; E988.7
hot liquid/object	E924.x; E968.3
Area of the burn, by %TBSA burned	
less than 10% or unspecified	948.0
10–19%	948.1
20–29%	948.2
30–39%	948.3
40–49%	948.4
50–59%	948.5
60–69%	948.6
70–79%	948.7
80–89%	948.8
90–100%	948.9
Anatomical site burned	
face, head and neck	940.x; 941.x
trunk	942.x
upper limb (except wrist and hand)	943.x
wrist(s) and hand(s)	944.x
lower limb (except ankle and foot)	945.0; 945.4–945.6; 945.9
ankle and foot	945.1–945.3
multiple specified sites	946.x
Self-inflicted injury	E955.x; E958.x
Inhalation injury	506.x; 947.0; 947.1; 947.9

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