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Mortality and treatment cost estimates for 1075 consecutive patients treated by a regional adult burn service over a five year period: The Liverpool experience

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ABSTRACT

Objective: To assess the clinical outcomes and treatment costs of a regional adult burn service in northwest England.

Methods: We retrospectively reviewed data on a five year cohort of 1075 patients treated by the Mersey Regional Burn Service between 2006 and 2010 to obtain age-stratified mortality estimates based on the lethal area 50 (LA50) measure. Treatment cost estimates were made for a one year cohort of 262 patients treated between April 2011 and April 2012.

Results: 44 (4.1%) of the five year cohort died; 36 had suffered flame burns. Our LA50 was 71.08 for the 15–44 age group, 56.64 for the 45–64 age group, and 28.82 for the 65 and over age group. Mean treatment costs associated with patients allocated to different burn-specific healthcare resource groups ranged from £2527.77 to £31,870.95. Detailed cost estimates for three patients ranged from £12,553.23 to £66,029.33.

Conclusion: The LA50 estimates for the Mersey Regional Burn Service compare favourably with previous reports in the literature. Our treatment costs were substantially lower compared to those reported previously in the United Kingdom. This study demonstrates that high quality and cost effective care can be delivered by a service that treats relatively few major burns (>70% TBSA).

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1. Introduction

Acute burns are both common and relatively expensive to treat. In 2007, the United Kingdom (UK) National Health Service (NHS) treated over 21,000 patients with acute burns [1]. Of these patients, just over two per cent died. The cost of treating burns may be substantial, and has been quantified in numerous studies in the UK and beyond [2–5].

Improved survival rates following major acute burns have been attributed in part to the increased use of early

tangential wound excision and grafting, improved antimicrobial therapies, and the use of specialised critical care facilities and nutritional support protocols [6]. However, there is growing consensus that trained multidisciplinary teams within major burn centres provide the best outcomes for a given injury [6,7]. Similar findings have been published with respect to the management of all major traumatic injuries and the delivery of all specialist care [8–11]. In the UK, this has occurred in parallel to a new emphasis on improving outcomes for all patients treated within the NHS

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[12]. Following the recommendations of the 2001 National Burn Care Review, the UK burn care community established a national network of specialist burn facilities, units and centres to optimise treatment and improve outcomes for patients who sustain an acute burn [7].

The Mersey Burn Service is based in the northwest of England, within the St Helens and Knowsley Teaching Hospitals NHS Trust. The Service provides adult burn services to a population of 4.5 million people within the Mersey region, North Wales and the Isle of Man. We fulfil the UK commissioning criteria to operate as a burn centre but our throughput of very large burns (>70% total body surface area or TBSA) is low.

To ensure robust clinical governance, all regional burn centres within the UK are expected to both audit the outcomes they attain and monitor the cost effectiveness of their therapeutic interventions [11]. In April 2004, the Mersey Burns Service began to collect data prospectively on all patients admitted with an acute burn. The data were collated and submitted to the British Isles Burn Injury Database (BIBID) [13].

This study was conducted as part of a locally approved audit project, and includes data on the clinical outcomes and cost effectiveness of the treatments that we undertook. We set out to analyse local trends in the number of acute admissions, and to compare our clinical outcomes and costs to contemporaneous reports in the peer reviewed literature [2–5,14–17]. To facilitate direct comparisons, we undertook our outcome analysis using the methodology previously used in papers from UK regional burn centres at Chelmsford, Birmingham and Belfast [14–17]. We also provide a detailed breakdown of treatment cost estimates for three individual burn patients to permit comparison with similar estimates published by the Welsh burn centre at Swansea [2].

2. Methods

2.1. Inclusion criteria

For the survival analysis we included all patients admitted to the Mersey Burn Service with an acute cutaneous burn. We included those patients with predominant inhalation or electrical injuries who had an associated minor cutaneous burn. Data collection covered a five year period from 1 January 2006 to 31 December 2010.

Similarly, for the cost analysis undertaken, we included all patients admitted to the Mersey Burn Service with an acute cutaneous burn. Data collection covered all patients treated within the last complete financial year, from 6 April 2011 to 5 April 2012 inclusive.

2.2. Definitions of data items, outcome measures and costs

The data collected included age, percentage total body surface area (% TBSA) burned, gender, cause of injury, presence or absence of inhalation injury, length of stay or duration of survival in days, length of stay in the intensive therapy unit (ITU) and our principle outcome measure, whether the patient survived or died.

Mortality is a clear end point and therefore provides a reliable and objective outcome measure [18]. In calculating mortality rates in this study we included any patient who died of all causes following admission with an acute burn. We included those patients in whom resuscitation was deemed futile and was therefore not undertaken, those in whom resuscitation was discontinued, and those whose cause of death was not directly associated with their cutaneous burn. For example, we included patients who died primarily of an inhalational injury leading to pneumonia and respiratory failure, and those who died primarily of an electrical injury leading to arrhythmias and cardiac failure. This was to keep our analyses in line with those published previously in the peer-reviewed literature, and to make our mortality data directly comparable with that from other burn centres [19–23].

Comparisons between our mortality rates and those at other UK burn centres were undertaken using mortality estimates based on the lethal area 50 (LA50). The LA50 is defined as the percentage of total body surface area burned at which fifty per cent mortality is expected in a given age group of patients. We therefore feel it to be a valid and reliable tool for inter-centre outcome comparisons [24].

The UK NHS has developed and implemented an “internal market” system to allow hospital trusts to be paid appropriately for the treatments that they carry out. Patients are assigned a healthcare resource group (HRG) code that determines how much money the hospital will be paid, and should be based on the costs of providing that treatment. The HRG code assigned and payment made for a particular burn patient depends on the depth and extent of the burn, whether surgical intervention is required on one or more occasions, the patient’s pre-existing comorbidities, and any complications [25]. In this paper we present mean costs per patient stratified by the HRG to which the patient was assigned by our clinical coding team. This is to help the reader interpret the data and to compare the average costs we incurred to those of similar patients treated at their own centre.

We worked closely with the finance department at our NHS hospital trust to accurately estimate the actual cost of treating individual patients. Inpatient cost estimates included, where applicable: the number of days in an intensive therapy, high dependency or ward bed; the number and duration of any operating theatre sessions; medical, nursing, and therapy staff allocations; medications; and haematological, biochemical, microbiological and radiological investigations. Outpatient cost estimates were based on the number of burn outpatient and dressing clinic attendances following the patient’s discharge home. The costs of intensive therapy unit stay were included in our analysis to ensure true cost estimates, although these are funded through a different annual fixed tariff for our NHS Trust and are not included within its HRG payment system.

We first report the overall costs incurred by the service over the full financial year, stratified by HRG code. The costs incurred are then presented individually for three patients with a varying severity of burn, to provide a better understanding of the issues involved and the difficulties in assigning appropriate codes that reflect the true cost of treatment.

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