Cost-Drivers in Acute Treatment of Severe Trauma in Europe: A Systematic Review of Literature

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Abstract

Introduction: Throughout the world, trauma is a leading cause of morbidity and mortality in the young and most active group of society. While specialist trauma centers play a critical role in the survival after severe trauma, the assessment of trauma-related costs, budgeting for adequate trauma capacity, and determining the cost-effectiveness of interventions in critical care are fraught with difficulties. Through a systematic review of the European literature on severe trauma, we aimed to identify the key elements that drive the costs of acute trauma care.

Methods: A PubMed/MEDLINE search for articles relating the costs and economics of trauma was performed for the period January 1995 to July 2007. One hundred and seventy-three European publications were identified. Twelve publications were retrieved for complete review that provided original cost data, a breakdown of costs according to the different elements of trauma care, and focused on severe adult polytrauma. The identified publications presented studies from the UK (3), Germany (6), Italy (2), and Switzerland (1).

Results: In all publications reviewed, length of stay in the intensive care unit (ICU; 60%) and requirements for surgical interventions (≤25%) were the key drivers of hospital costs. The cost of transfusion during the initial rescue therapy can also be substantial, and in fact represented a significant portion of the overall cost of emergency and ICU care. Multiple injuries often require multiple surgical interventions, and prolonged ICU and hospital stay, and across all studies a clear relationship was observed between the severity of polytrauma injuries observed and overall treatment costs. While significant differences existed in the absolute costs of trauma care across countries, the key drivers of costs were remarkably similar.

Conclusions: Irrespective of the idiosyncrasies of the national healthcare systems in Europe, severity of injury, length of stay in ICU, surgical interventions and transfusion requirements represent the key drivers of acute trauma care for severe injury.

Key Words
Trauma · Costs · Europe · Polytrauma · Severe

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Introduction

Traumatic injury is recognized as a pandemic disease, and is a serious and growing global health issue [1, 2]. Worldwide, an estimated 5 million people die each year as a consequence of trauma; a figure predicted to increase to 8.4 million by 2020 [3]. Trauma is primarily a disease of the young, exacting a high toll among an active and productive subgroup of the population. In young men, traumatic injury has been described as “epidemic” [2, 4], and more than 50% of deaths due to
trauma occur under the age of 45 [1, 5]. The costs of traumatic injury can be substantial; in addition to lives lost, there is a long-lasting burden on many survivors of serious injuries in terms of chronic pain, permanent physical and/or mental disability, impaired quality of life, and loss of productive work-years. In the United States (US), the number of lost years secondary to trauma is greater than the sum of lost years caused by malignancy and cardiovascular disease [6].

Expeditious and expert care of the severely injured patient is known to improve mortality, morbidity and functional recovery. Trauma centers and their related services represent a unique and necessary component of modern healthcare systems [7].

Delivery of acute trauma care is expensive. In the US, the Center for Disease Control has estimated that some US$117 billion was spent on medical care attributable to injury in the year 2000 – approximately 10% of the total national healthcare expenditures that year [8]. In Europe, epidemiological studies suggest an annual incidence of severe injury between 30 and 52 per 100,000 population [9, 10], which is lower than the annual incidence of 54 per 100,000 reported for the US [11]. While the total medical cost of injury in Europe has yet to be determined, there is a growing contemporary literature seeking to describe and quantify the healthcare costs devoted to trauma care at a hospital, regional and country level. Trauma systems in Europe demonstrate a sustained country-by-country variation, which in part is explained by the level of economic resources available for trauma care [12].

Both rescue management and rehabilitation of trauma victims consume considerable healthcare resources [13, 14], but assessing the true costs of trauma care, budgeting for adequate trauma capacity and determining the cost-effectiveness of trauma interventions require accurate data on the cost and outcome for trauma victims. An important aspect in all of these health economic activities is to identify the most influential cost-drivers.

This article attempts, through a review of the contemporary health economic and epidemiological literature on severe adult polytrauma in Europe, to identify the main elements which drive the costs of acute trauma care.

**Methods**

A PubMed/MEDLINE search for articles relating the costs and economics of trauma was performed for the period from January 1995 to July 2007. In conjunction with the key words “trauma” and “costs”, the following search terms were applied in the literature search: hospital costs, trauma systems, trauma care, trauma center, trauma economics (severe, acute applied to string), reimbursement, consignment, health care, diagnoses related groups, economic impact, severe trauma epidemiology costs, trauma head injury, trauma brain injury, penetrating trauma, and blunt trauma.

Citations captured using these key word chains were collected into one file and duplicate references removed. The resulting list of title citations (and accompanying abstracts when available) was then first refined by removal of abstracts/titles relating to individual case studies and reports, litigation cases, studies that did not address costs of acute trauma care, and studies exclusively focused on the costs of single fracture-related trauma injury. The remaining abstract and title listings were then broadly divided into citations relating to European and non-European reviews, studies and reports, and non-European publications were excluded from further consideration. To ensure focus on the determinants of the acute costs of severe adult polytrauma, we subsequently applied the following exclusion criteria; (1) studies that did not report original cost data for acute trauma care, (2) studies that did not report the breakdown of costs in acute trauma care, and (3) studies that did not examine adult polytrauma patients.

In the second stage of the review, we assessed the remaining papers in regard to their country of origin, the costing methodology (cost data from a clinical trial, epidemiological cohort study, case–control study, cost-effectiveness study, cost-consequence/minimization study, or meta-analysis), and the cost elements of early management assessed (pre-admission costs, acute care costs or rehabilitation costs, or a combination of these costs). Additionally, papers were assessed according to whether they included data on the type of injury sustained, severity of injury, trauma system/structure, diagnostic tests/interventions, and clinical outcome measures.

**Results**

The key word searches together captured approximately 4,000 titles; more than half of which were repeat/duplicate citations. Applying the initial refinement criteria reduced the listing to 173 European publications of potential interest. Twelve publications were identified for complete review that provided original cost data, a breakdown of costs according to the different elements of trauma care, and focused on severe adult polytrauma (Table 1).

The identified publications presented health economic studies from the UK (3), Germany (6), Italy (2), and Switzerland (1). With the exception of one