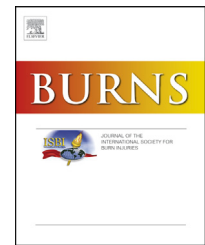


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The management of small area burns and unexpected illness after burn in children under five years of age — A costing study in the English healthcare setting

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ABSTRACT

The objective of this economic study was to evaluate the resource use and cost associated with the management of small area burns, including the additional costs associated with unexpected illness after burn in children of less than five years of age. This study was conducted as a secondary analysis of a multi-centre prospective observational cohort study investigating the physiological response to burns in children. 452 children were included in the economic analysis (median age=1.60 years, 61.3% boys, median total burn surface area [TBSA]=1.00%) with a mean length of stay of 0.69 days. Of these children, 21.5% re-presented to medical care with an unexpected illness within fourteen days of injury.

The cost of managing a burn of less than 10% TBSA in a child less than five years of age was £785. The additional cost associated with the management of illness after burn was £1381. A generalised linear regression model was used to determine the association between an unexpected illness after burn, presenting child characteristics and NHS cost. Our findings may be of value to those planning economic evaluations of novel technologies in burn care.

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Abbreviations: TBSA, total burn surface area; PICU, paediatric intensive care unit; HDU, high dependency unit; TSS, toxic shock syndrome; TSSLI, toxic shock syndrome like illness; ED, emergency department; MIU, minor injury unit.

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1. Introduction

Burns are the third most common injury type sustained by children of less than five years of age in England [1]. In 2015, over 7000 children under the age of five underwent admission to hospital for management of burns [2]. Children of less than five years of age with burns of less than 10% of the total body surface area (TBSA) comprise 70% of the caseload of specialist paediatric burn services in the UK [3,4].

Children of this age, despite having burns of small surface area, can become systemically unwell whilst the burn is healing. Up to 25% of children less than five years of age with burns of less than 10% TBSA have been shown to re-present to medical care facilities with an unexpected illness after burn within fourteen days of injury, and up to 10% benefit from re-admission to hospital [5]. Potential causes include; a systemic inflammatory response to the injury [6,7], community acquired viral illness [8,9], burn wound infection [10,11], systemic bacterial infection [10,12], and toxic shock syndrome [13,14].

Sources of additional economic burden arising from unexpected illness after burn following the initial management of the injury include:

- i. Healthcare resource use including; use of primary care/emergency department/walk in centre services, inpatient

care, outpatient care, theatre time, medications and dressings.

- ii. Family resource use such as; increased time off work (and also lost leisure time), travel to hospital or appointments, use of hotel or temporary accommodation near a hospital and extra childcare.

Although there have been studies previously published on inpatient costs associated with the management of burns in children [15-18], this literature is limited to small patient populations (single-centre studies) or health care systems with insurance based coverage. Furthermore, economic studies for the management of burns originating from outside England may not be generalisable due to fundamental differences in the way healthcare is delivered, financed and reimbursed between continents, countries and the devolved nations of the UK [19]. In addition, no study to date has focussed on the additional costs associated with the management of illness after burn. This information will be useful to those planning cost-effectiveness studies in diagnostic and therapeutic technologies that target infection after burn.

The principal aim of this study was to identify the additional cost associated the unexpected re-presentation of a child of less than five years of age to a GP, local hospital or burns service within fourteen days of sustaining a small area burn (i.e. source i. of the additional economic burden as stated above). Family resource use will not be discussed in this paper.

Table 1 – Unit costs associated with the management of paediatric burns injury patients.

Resource category	Unit cost, £	Source
NHS costs		
First or subsequent presentations to Burn centre	206	Based on observations of wound management within a Burns centre. Micro-costing estimate based on cleaning and debridement of a minor burn [30-32]
Children's burns ward bed-day (includes: hotel, capital, staff and drug costs. Exclusive of surgical procedures)	448	NHS reference costs 2014-2015 [21]; paediatric minor injury, JB32C non-elective excess bed-day cost
Paediatric HDU bed-day	1924	NHS reference costs 2014-2015 [21]; paediatric advanced critical care costs in HDU XB04Z
Paediatric ICU bed-day	2057	NHS reference costs 2014-2015 [21]; weighted average of paediatric advanced critical care costs HRG XB01Z, XB02Z and XB03Z
Other procedure instituting return to theatre	330	NICE medical guidance MTG17 debridement with gauze. Other procedures assumed to use equivalent resource to wound excision. Cost includes procedural costs inclusive of theatre and staff time, excludes bed-days
Outreach appointment ^a	129	Estimated from outreach nurse reporting of workload and mileage for a single week [32]
Outpatient appointment	114	NHS reference costs 2014-15 [21]. Service code 220; paediatric burns care
GP/Walk in centre consultation	44	PSSRU 2015, GP consultation lasting 11.7 min, includes qualification and direct staff costs [32]
ED or MIU contact, irrespective of whether this contact resulted in admission to hospital	55	NHS reference costs 2014-2015 [21]; emergency medicine, category 1 investigation with category 1-2 treatment
Investigation of illness after burn	22.05	Cost of laboratory testing for following tests: CRP, FBC, U&Es blood and swab cultures [31]
Fresh frozen plasma	174	Paediatric MBFFP (225 mL, non-UK sourced), adjusted for price year assuming identical NHS HC&HS indices as previous 2 years [33]
Infection treatments	17.20	Based on a standard Morphine, Flucloxacillin, Penicillin regimen for a 3 year old with average weight [31,34]

^a Outreach service only applicable to Bristol based patients. Estimate assumes average 37.5 h week, 46 weeks of the year, an average 2.5 pts/day and mileage costs based on an average 18 mile/patient round trip.

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