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# Variations in guideline use and practice relating to diagnosis and management of infection in paediatric burns services in England and Wales: A national survey

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ABSTRACT

*Background:* Wound infection causes morbidity and mortality in burns. UK National Burns Care Standards state that guidance should be used to diagnose and treat burn wound infection. However, surveys of senior staff about standard operating procedures or guidance in UK burns services indicate that they are infrequently available (Papini et al., 1995; Lymperopoulos et al., 2015). Staff may have differing views and experiences of guidance use according to their role. This survey investigated the extent to which guidance is available, and current practices used for diagnosis and treatment of burn wound infection, both within and between paediatric burns services.

*Methods:* Staff from paediatric burns services in England and Wales were individually interviewed by two nurses about guidance and practices around antibiotic prophylaxis, diagnosis and management of burn wound infection and toxic shock syndrome, and antibiotic use. In each service staff from three categories were interviewed: lead consultant/burns specialist nurse, junior doctor/senior nurse, ward based nurse. Data were subjected to content analysis and reliably coded by two researchers using a coding frame. Guidance documents were also requested.

*Results:* Thirteen services took part. Staff in fewer than half of services reported that they had guidance for antibiotic prophylaxis, diagnosis, and management of burn wound infection. In nine services at least one staff member reported that they had guidance for antibiotic use. Guidance was available for diagnosis and management of toxic shock syndrome in ten services, and staff in five were consistently aware of it. One service routinely used antibiotic prophylaxis, but had no written guidance for it. In five services where at least one member of staff reported that they had guidance for diagnosing infection, at least one interviewed staff member was unaware of it. Swabbing practice varied between and within services, with 10

*Abbreviations:* NICE, National Institute for Health and Care Excellence; CKS, Clinical Knowledge Summary; COBIS, care of burns in Scotland; SOPs, standard operating procedures; VTCT, Vocational Training Charitable Trust.

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staff across six services cleaning before swabbing, and four staff in three services cleaning after swabbing.

*Conclusions:* Staff from fewer than half of burns services report that they have guidance for diagnosing and managing burn wound infection, and there is variation between and within services relating to staff awareness of available guidance. There are some consistencies in practice; the majority of services do not use antibiotic prophylaxis, and there is consistent prescribing for suspected infection and tests used for infection diagnosis. Swabbing practices are less consistent. This survey indicates a need for evidence-based guidelines to be developed in order to meet national burns care standards, and for staff to be made aware of them and trained in their use. Guidelines do not need to replace clinical judgement and should be developed with the involvement of those who will implement them.



## 1. Introduction

Burn wound infection is a leading cause of morbidity and mortality in burns patients [1], and infection may delay healing [2,3]. Children are at increased risk of wound infection due to immature immune systems [4]. Diagnosis of burn wound infection is difficult, particularly in paediatric patients; clinical signs including pyrexia are poor specific indicators of infection [5], and can be due to unrelated viral infections that children are at increased likelihood of experiencing compared with adults [6], or as a result of the normal inflammatory response to burn [7]. As a result, wound swab, blood microscopy and culture along with laboratory markers of sepsis are needed to establish the presence and nature of an infection [8]. Cultures require over 48h to provide a positive diagnosis. Point-of-care diagnostic devices are not yet available to provide a more timely diagnosis of clinically relevant burn wound infection.

Broad-spectrum antibiotics are typically prescribed where wound infection is suspected, until definitive diagnosis is made, following which antibiotics are stopped or narrower spectrum antibiotics are prescribed. Consequently there is a necessary over-use of broad spectrum antibiotics, due to the necessity that suspected infection is treated early to prevent development of sepsis, with associated risk of mortality [9]. However, over-use of broad spectrum antibiotics is implicated in the increasing problem of antimicrobial resistant bacteria [10]. Prudent use of broad-spectrum antibiotics (antibiotic stewardship) has been identified by the UK Department of Health as key factor in managing the risk of such antimicrobial resistance [11].

Guidelines and protocols in burn care have the potential to facilitate a standardised, evidence-based approach to the detection and treatment of burn wound infection. Meta-analysis has indicated that evidence-based guidelines to inform standardised practice can lead to more equitable care, better patient outcomes and a better process of care for patients [12]. This view is supported by the NHS National Burn Care Standards, which state that all burns services should have in place agreed clinical guidelines covering several aspects of burn care, including management of burn wound infections and toxic shock syndrome [13]. However, the expected content of the guidelines is not stated.

To date there is currently little national-level, evidence-based guidance about diagnosis and treatment of infection in burn care that can be used at a local level. The National Institute for Health and Care Excellence (NICE) has developed a Clinical Knowledge Summary (CKS) indicating steps to be followed for the diagnosis and treatment of suspected burn wound infection in primary care [14]. This CKS indicates that there is no available evidence relating to burn wound injury, and that general guidance should be followed relating antibiotic use for skin infection. The Care of Burns Network in Scotland (COBIS) guidelines indicate steps for the management of infection in paediatric burns, and recommend intensive and frequent bacteriological surveillance of the patient, and early recognition of clinical bacteriological invasion with prompt appropriate antibiotic management [15]. However, detailed, evidence-based recommendations are not made about the frequency with which surveillance should be carried out, and how early recognition of bacterial invasion should be facilitated. The American Burns Association's expert-led and evidence-based consensus statement defines the clinical parameters to diagnose sepsis and wound infection [8]. The authors describe sepsis as 'a change in the burn patient that triggers the concern for infection. It is a presumptive diagnosis where antibiotics are usually started and a search for a cause of infection should be initiated'. The diagnosis is therefore still retrospective and will not help in limiting over-use of antibiotics. Wound infection is also diagnosed in response to numbers of bacteria on biopsy, a procedure that is seldom undertaken in routine clinical practice in the UK.

There is therefore limited available guidance upon which to base local evidence-based guidelines for use in burns services, and the extent to which such guidelines have been developed and are in use is unclear. A survey of 39 burns service directors in the UK in 1995 found that 13 services had a written policy on antibiotic use, and nine used systemic antibiotic prophylaxis [16]. The use of these guidelines may have changed as a result of increasing evidence relating to the use of antibiotic prophylaxis in burns care [17,18] and increasing concerns about the use of broad spectrum antibiotics in relation to antimicrobial resistance. More recently, a survey has been carried out with managers of 26 adult and paediatric burns services in the UK, to ascertain the availability of standard operating procedures (SOPs) relating to the patient care pathway set out in the National Burns Care Standards [6]. This indicated that only 12 units used any SOPs, with a mean of 2.1 SOPs per service. It is notable that neither survey has sought