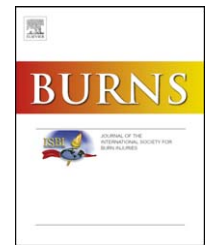


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Assessing the impact of missing data in evaluating the recovery of minor burn patients

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ARTICLE INFO

Article history:

Accepted 4 May 2009

Keywords:

Burns
Minor
Upper limb
Missingness
Outcome
Biostatistics

ABSTRACT

Introduction: Little published evidence is available regarding the recovery of patients with minor burns. Poor attendance at review clinics results in incomplete data which hampers accurate analysis of patient recovery. It is often assumed that non-attendance for review is due to full recovery and the inconvenience associated with clinic attendance. This study aimed to obtain final outcomes for a group of minor burn patients and identify factors contributing to missing data.

Method: A group of patients with minor burn + upper limb involvement, noted to have 81% non-attendance at 6-month review, were contacted to evaluate their recovery and service satisfaction. The stability of responses from 6 months after burn was compared in a subset of participants who did attend review. Demographics of non-responders were compared to responders.

Results: Final outcomes were obtained from 67% of participants. Mean BSBS-B and Quick-DASH scores for this group were 150.2 and 1.55% disability, respectively, indicating a good recovery. Subsequent non-responders were significantly younger ($p = 0.016$), suggestive of a better recovery than responders. Dissatisfaction with the service was not a contributing factor in non-attendance.

Conclusion: Minor burn patients with upper limb involvement recover well and intensive review of these patients is unnecessary.

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1. Introduction

Advances in the management of burns have resulted in decreased mortality rates and better outcomes for patients [1]. Consequently, research in this area has shifted focus to understanding the long-term recovery of patients [2,3]. However, the recovery timeline of all burn patients remains ill-defined in the literature [4].

The Burns Clinical Outcome Research Project (BCORP) at Royal Perth Hospital (RPH) was initiated to review all burn patients periodically at 1, 3, 6 and 12 months during their recovery to collect clinical outcome data. All burn patients were included in this review schedule, even though clinical experience suggests that those with minor burns recover quickly and without complications. Outcome data from over 500 patients has been collected since January 2006.

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doi:10.1016/j.burns.2009.05.004

The purpose of the BCORP was to establish the recovery pattern and final outcome of burn patients, with the aim of providing evidence for treatment strategies and appropriate outcome monitoring. This will facilitate more efficient resource allocation to those patient groups who will derive the greatest benefit, which will contribute to the sustainability of service quality within the Burns Service of Western Australia (WA).

Functional outcome collection at different time points is necessary in order to provide evidence of recovery from minor burn so as to devise effective treatment and follow up strategies. This task is restricted by loss to follow up as an increasing proportion of burn patients fail to return for review as time from injury increases. This trend is most prevalent in minor burn patients and as a result it is difficult to demonstrate that their recovery is uncomplicated and requires as a group minimal ongoing intervention.

The loss of data over time is termed 'missingness' and is a common problem in research and hampers statistical analyses in longitudinal studies [5,6]. As a consequence of missingness, particularly in studies that violate CONSORT principles [7], available data is often discarded or study validity and results are compromised when a small proportion of data is used to infer an entire group's recovery [5,6]. Rendering invalid studies has significant ethical implications with respect to patient burden and implicates investigators in the 'crime' of wasting valuable research resources and funding. According to the literature, missingness bias can be dealt with using intensive follow-up, sample expansion methods (e.g. multiple imputations or last observation carried forward) and, or predictive correction techniques (e.g. Heckman selection method or general estimating equations) [5,6,8,9]. This study will employ the former.

It was assumed that minor burn patients fail to return for review because they have recovered well and find attending hospital review appointments of little benefit. However, evidence supporting such statements is absent in the literature. To test this hypothesis, a group of RPH burn patients were selected for intensive follow-up to obtain a complete dataset of final recovery outcomes.

1.1. Aims

In patients with a minor burn, including the upper limb (MB + UL), this study aimed to:

- investigate the stability of final outcomes from 6 months post-burn;
- obtain final outcomes for those who did not return for their 6-month review;
- identify factors contributing to missingness; and
- in particular, determine if dissatisfaction with the Burns Service of WA contributes to missingness.

2. Methods

2.1. Study design

This is a prospective cohort surveillance study. The patient group ($n = 82$) was selected using retrospective admission data

that indicated they had suffered a burn likely to recover with minimal intervention and few foreseeable complications.

2.2. Inclusion criteria

All adult minor burn patients who presented to RPH between March 2006 and October 2007 were eligible for recruitment into the study. A minor burn was defined, regardless of depth of injury, to include injuries $\leq 10\%$ TBSA. Those with an UL burn, who were managed as outpatients, or had a hospital length of stay of ≤ 3 days were specifically selected for inclusion in this study.

2.3. Exclusion criteria

Patients were excluded if they did not suffer a burn involving the UL, had a TBSA $> 10\%$ or were admitted to RPH burn unit for ≥ 4 days. Patients were not excluded if they had attended review appointments.

2.4. Study participants

Of the group identified for inclusion, 81% were male with a mean age of 32.2 ± 13.4 years. Their average total burn surface area (TBSA) was $3.4 \pm 2.4\%$. Of the 82 patients identified, 16 patients (19.5%) suffered small full thickness burns and 6 (7.3%) required surgical intervention. Thus, the group severity markers and demographics indicate that they represented a typical minor burn sample from the RPH burn population.

2.5. Data collection

2.5.1. Assessment tools

QuickDASH: The disabilities of the arm, shoulder and hand (DASH) are an assessment of disability relating to symptoms, and physical, social and psychological function [10]. The QuickDASH is a shortened version (11 items) which maintains internal consistency with DASH [10,11] and has been validated in the burn population [12]. Each item is self-rating on a 5-point Likert scale. A percentage disability score is calculated from the summation of numeric responses, then subtracting one, and dividing the new total by 25. The survey is not valid if 2 or more items are not answered. A score of zero indicates a lack of perceived pain, neurological symptoms or disability of UL functioning. As the survey indicates a percentage of perceived disability, the maximum score possible is 100. At the RPH, the burn population pre-injury norm measured by QuickDASH is $< 2\%$ disability (unpublished data, $n \approx 400$ inpatient UL burn patients, 2006–2008).

Burn Specific Health Scale-Brief: The Burn Specific Health Scale (BSHS) is a quality of life tool that assesses post-burn sequelae (excluding mortality) [13]. The BSHS-Brief was used in this study. The summation of patient responses provides a score out of 160, using 40 items each rated on a scale ranging from 0 (minimal function) to 4 (optimal function) [14]. A total score of > 150 on this survey was the preset threshold defining a good outcome. In this cohort, it was likely that BSHS-B scores would approach the maximum for the measure and 10-point score reduction was considered a clinically relevant safety net. Following on, without literature to indicate a loss of validity

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