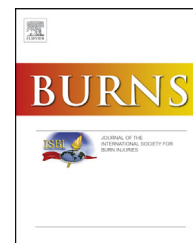


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## Bathroom scald burns in Queensland Children

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### ABSTRACT

**Aim:** To evaluate the current characteristics of bathroom scald injuries in Queensland Children.

**Method:** Data was collected from patients who presented with a bathroom scald injury to the Stuart Pegg Paediatric Burns Centre at the Royal Children's Hospital and Lady Cilento Children's Hospital, Brisbane from January 2013 to December 2014.

**Results:** Bathroom scald burns represented 2.6% of total burns cases with an inpatient rate of 39%. The family home is the location of injury in 84% of cases and in 79% the patient was aged 2 years of age or younger. Total body surface area ranged from 0.5% to 20% with a median of 1.75% (IQR 0.63, 3.38%). In our study 8% of patients underwent grafting and 24% received follow up for scar management. Injuries occurred in rental properties in 47% of tempering valve survey respondents. The rate of installation of tempering valves was 23%.

**Discussion:** Bathroom scald burns continue to be over-represented in inpatient data. Tempering valves were not consistently installed after injury, this intervention would require further legislation to be an effective prevention strategy.

**Conclusion:** This study provides important insights into paediatric bathroom scald injuries and will assist with the development of prevention strategies.

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## 1. Introduction

Scald injuries are the most common paediatric burn [1–3]. Hot water and hot beverages are the two most common causal agents [2]. Bathroom scald injuries account for 5–10% of paediatric burn admissions [3,4]. Burns can lead to significant psychological and physical consequences for the patient and their families [5–7].

Legislation was introduced in Queensland in 1999 requiring all new and replacement hot water systems to be fitted with a temperature control device ensuring that the water is delivered at a maximum temperature of 50°C [8]. In adult skin, transepidermal skin necrosis occurs in 5min at 50°C

but is reduced to 40s at 54°C [9]. The time to injury is less in children [9,10]. This demonstrates that small changes in temperature can correspond to a significant change in injury severity [9,10].

The legislation that governs these safety measures, the Plumbing and Drainage Act of 2002, is currently under review by the Queensland Government [8]. This study is also a timely review of a previous study published by Davies et al. which evaluated bathroom scalds in Queensland Children in 2003 [10].

Bathroom scald injuries are of interest because they occur during a routine daily activity. We chose to focus this study on this particular form of burns injury to evaluate the effect of legislation and also the changes in injury patterns over a ten

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year period. Despite prevention strategies this paper will demonstrate that bathroom scald injuries remain a real danger to the paediatric population.

## 2. Materials and methods

The Pegg Leditschke Paediatric Burns Centre is located in the Lady Cilento Children's Hospital (LCCH) in Brisbane, Australia. It is the major referral centre for inpatient and outpatient care of paediatric burns in Queensland and Northern New South Wales. The Stuart Pegg Paediatric Burns Centre was located at the Royal Children's Hospital, Herston Brisbane prior to relocation to LCCH when the Royal Children's Hospital closed in November 2014. Thus, the study populations between Davies et al. [10] and our study are from the same catchment area.

Ethics approval for this project was obtained from the Queensland Children's Health Services Human Research Ethics Committee (HREC/14/QRCH/59). Children who sustained a bathroom scald injury from January 2013 to December 2014 were identified from the Queensland Paediatric Burns Registry (QPBR). The QPBR is a database, developed at the Centre for Children's Burns and Trauma Research (CCBTR), composed of patient data obtained at the time of presentation using a detailed proforma, collected with written parental or guardian consent.

Data, including: injury demographics, the events surrounding the injury, first aid given, burn depth and burn surface area, duration of treatment, operative management, and referral for scar management was collected from the QPBR. In addition, a phone interview was conducted by the burns centre social worker surveying tempering valve status and other factors regarding the home where the injury occurred.

## 3. Results

A total of 38 children were identified in this study. During the study period 1490 burns were treated, bathroom scalds comprised 2.6% of cases. There were a total of 675 scald injuries during the study period. There was an equal gender distribution. Age ranged from 3 months to 14 years old. The majority of patients ( $n=30$ , 79%) were less than or equal to 2 years old.

### 3.1. Circumstances of burn

The child turned the tap on or off in 14 cases. Another family member or supervisor (described as 'other') turned the tap on or off in 6 cases. The bathroom scald injury was related to kettle use in 2 cases. (5%) Immersion injuries occurred when the child was placed in the bath/shower. This occurred either by the child themselves or by another family member or supervisor but this was not an intentional injury. This classification of injury occurred in 13 cases; attributable to the child in 9 cases, other in 4 cases. The mechanism of injury was unclear in 3 cases (8%).

The family home was the location of injury in 32 (84%) cases with another residence in 5 of the cases (location not stated in 1

case). The activity was bathing in 26 (68%) cases and playing in 12 (32%) cases. All children were supervised by an adult at the time of injury with parents being the main supervisors (30, 79%). However, the actual event was unwitnessed in 17 cases (45%), and witness status was not recorded in 3 cases. There were no reports of proven intentional injury. All patients have a thorough history and examination and those with a suspicion of intentional injury are thoroughly investigated.

### 3.2. First aid

Cold running water was applied at the scene in 32 cases (84%) but in only 13 (34%) cases it was greater than or equal to the 20min recommended [11]. An ambulance attended the scene in the majority of cases (22, 58%). Overall 25 (65.8%) cases received 20min cold running water within 3h of injury.

### 3.3. Burn classification

Total body surface area (TBSA) was recorded for 36 children and ranged from 0.5% to 20% (median 1.75%, IQR 0.63, 3.38). There were 26 superficial partial thickness burns, 10 deep partial thickness burns and one full thickness burn (burn depth not recorded in one case). The burn site is shown in Fig. 1. The most common site of burn was the lower limb in 11 cases (29%).

### 3.4. Burns management

Fifteen cases (39%) were treated as inpatients. Median length of stay was five days (IQR 1.75, 25.00). Days to re-epithelialisation ranged from 4 to 46 (median 11 days). Eight (21%) patients underwent operative management resulting in a total of 20 operations. Three (8%) patients underwent split skin grafting. Nine children (24%) went onto receive long term scar management.

### 3.5. Tempering valves

The tempering valve survey was completed by 17 families. The injury occurred in rental properties on 8 occasions (47%). The majority of homes were made before 1999 (13 cases, 76%). The hot water systems were composed of a variety of systems; 8

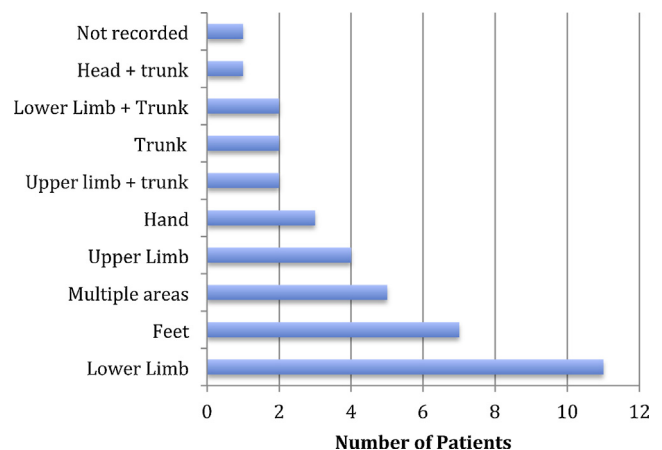


Fig. 1 – Classification of body area burnt.

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