

## Campfire burns in children: an Australian experience

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Accepted 16 November 2001

### Abstract

**Objectives:** To document and describe the effects of campfire burns on children. To identify the sources of danger contributing to such injuries, so that a prevention strategy can be devised.

**Design, patients and setting:** Departmental database and case note review of all children with campfire burns seen at the Burns Unit of a tertiary referral children's hospital between January 1999 and June 2001.

**Main outcome measures:** Number and ages of children burned; risk factors contributing to the accidents; injuries sustained; treatment required and long-term sequelae.

**Results:** Thirty-three children, median age 2.5 years, sustained burns, usually to the hands and feet, with eight requiring surgery and the majority requiring some form of scar therapy. Seventy-four percent of the children were burned by hot ashes and coals, usually from the previous night's fire, rather than by open flames.

**Conclusions:** Campfires cause serious injuries to children. In particular, hot ashes and coals from inadequately extinguished campfires pose the greatest danger. Increasing the awareness of this easily preventable problem amongst campers is intended through a public education campaign. © 2002 Published by Elsevier Science Ltd. and ISBI.

**Keywords:** Campfire; Burns; Children; Prevention

### 1. Introduction

There has been an alarming rise in the number of children burned by campfires treated at our centre. The extent of the problem is documented in this paper. Campfire burns are most frequently sustained after a fire is considered extinguished and are largely preventable. The popularity of camping in Australia and the frequency we are seeing children burned by campfires points to the need for greater public awareness of the problem.

### 2. Methods

The Stuart Pegg Paediatric Burns Centre is based at the Royal Children's Hospital in Brisbane. It provides comprehensive inpatient and outpatient care to approximately 250 new children with burns annually. It is the only dedicated centre for the treatment of paediatric burns in the state of

Queensland as well as adjoining regions of neighbouring states, Papua New Guinea and the regional Pacific.

Children who sustained campfire burns during the period January 1999 until June 2001 were identified using our computerised departmental database. Information regarding these patients was extracted from the database and from hospital medical records and included:

- Demographic data and the details regarding the site of the accident and the location of the campfire.
- The events leading up to the accident.
- The areas of the body and percentage of the total body surface area (BSA) burned.
- The acute treatment undertaken, including dressings and surgical intervention.
- Subsequent treatment including scar therapy and contracture releases.

### 3. Results

Thirty-three children with campfire burns were treated during the period of the study. The median age was 2.5 years (range 1.1–12.6) with a slight preponderance of males (18/33; 55%). Fifty-eight percent ( $n = 19$ ) were aged 4 years

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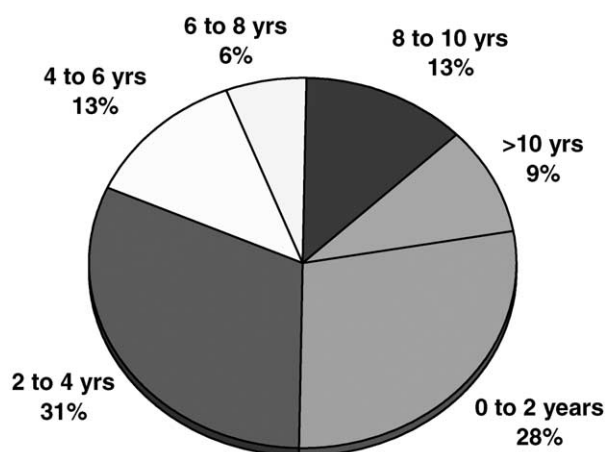


Fig. 1. Age distribution.

or less (see Fig. 1). A dramatic increase in the incidence of injuries was noted in the last 6 months of the study period (Fig. 2). There was a seasonal variation of incidence with peaks during school and summer holidays (Fig. 3).

The majority (61%) of the patients resided outside metropolitan Brisbane. Eighty-two percent of the burns

were sustained away from home, usually at a campsite. Eighty-five percent of the children were injured by fires that had been lit by their carers. Only four children were not under the direct supervision of an adult when the accident occurred. The events which resulted in injuries are listed in Table 1.

Nearly three-quarters of the children were burned by hot ashes and embers rather than by flames' (see Fig. 4). Nineteen children burned in this way were injured by the remnants of a fire lit originally by their carers, whilst five children were burned by the ashes and embers of fires left by previous users of the campsite. Sixteen children were burned the morning after the fire had been lit and used by their carers. In all these cases, the supervising adults had considered the fire extinguished and did not recognise the hazards posed by hot ashes. Four of the fires had been covered with sand and the rest had been allowed to go out overnight. None had been put out with water.

The hands and feet (see Fig. 5) were the most commonly burned parts of the body (Table 2). The percentage of total BSA burned ranged from <1% to 18% (median 2%). Twelve children required a total of 18 separate hospital admissions. For those admitted, the median stay in hospital was 5.5 days (range 1–42 days). Twenty-one children were

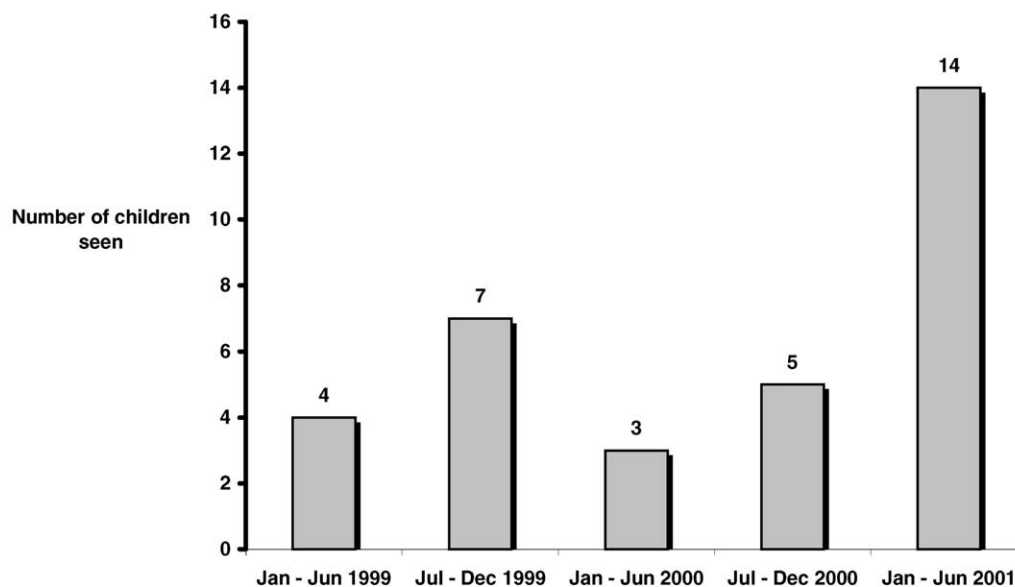


Fig. 2. Six monthly incidence of campfire burns.

Table 1

Causation of injury	Number of children	Percentage
Stepped onto ashes when walking/running	16	49
Tripped or fell when playing around fire	14	42
Hit in face by flying embers whilst sleeping next to fire	1	3
Playing with hot ashes with hands	1	3
Accidentally pushed into fire during parental argument	1	3

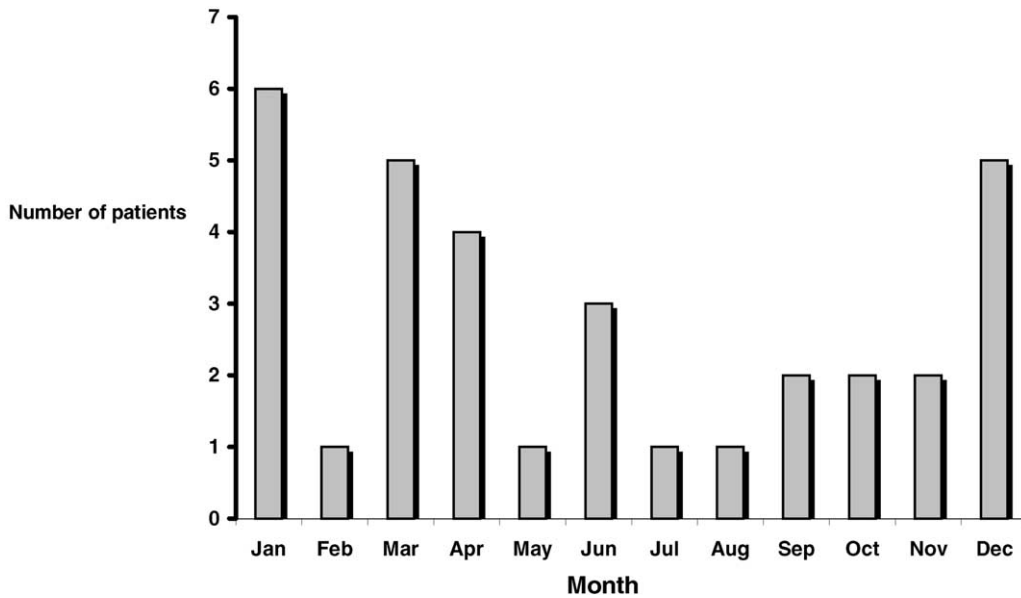


Fig. 3. Monthly incidence.

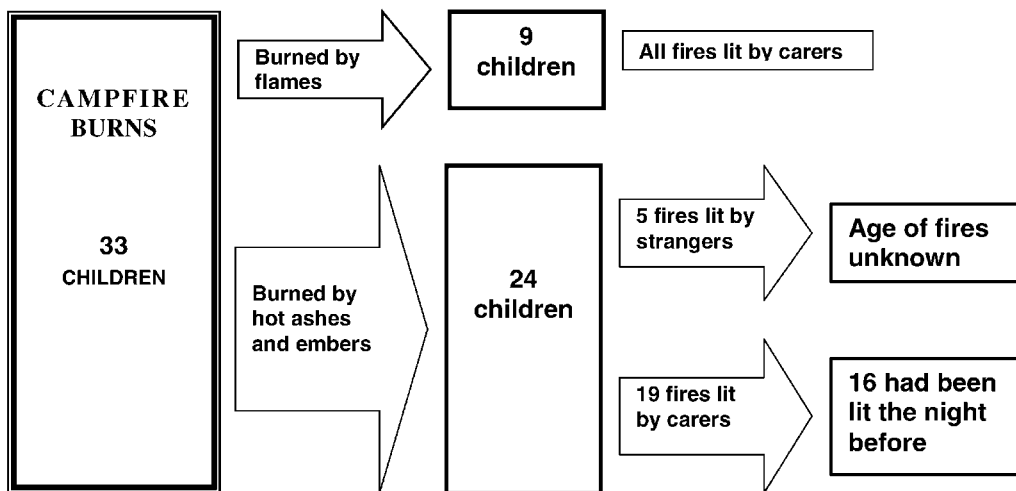


Fig. 4. Aetiology of campfire burns.

managed solely as outpatients, initially for dressing changes and subsequently for review of scars and supervision of scar therapy. After discharge from hospital, inpatients also attended burns outpatient clinics for review. Up to 24 separate

Table 2

Region of body burned	Number of children	Percentage
Feet	20	61
Hands	14	42
Legs	5	15
Arms	4	12
Face and neck	4	12
Trunk	3	9

outpatient attendances (median 5) were required, over periods ranging from 1 week to 12 months.

All burns were initially dressed with daily silver sulphadiazine and 0.2% chlorhexidine cream, progressing on to adhesive dressings when the exudative phase had subsided. The average time dressings were required was 19 days (range 2–42). Early debridement and grafting with autologous split skin was carried out on 12 occasions in eight patients. One child required partial digital amputations. Two children have subsequently required scar revision to release contractures in the hands and fingers.

All children were seen by an occupational therapist, with 18 requiring splinting. Twenty children (61%) required therapy to prevent hypertrophic scarring. This usually took the

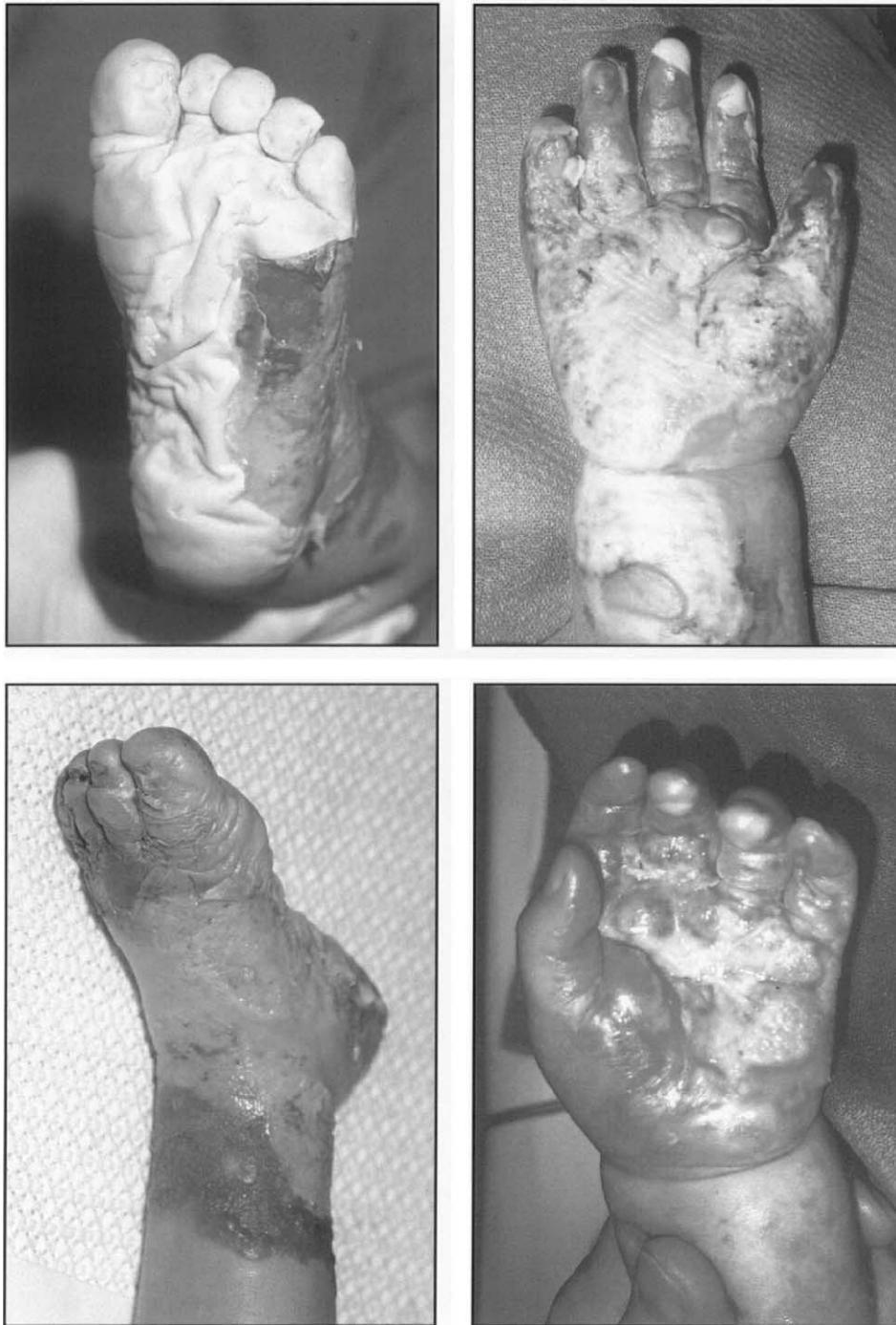


Fig. 5. Deep partial, and full thickness burns due to campfire injuries.

form of silicone padding with pressure bandages or garments. The duration such treatment was required ranged from 1 to 11 months, with nine children still undergoing therapy at the time of writing of this article. Physiotherapy assessment was carried out for all children and treatment undertaken if indicated. Three children and their families required review by the child psychiatric team for behavioural problems directly related to the emotional impact of the burn and the subsequent treatment.

#### 4. Discussion

Camping is a popular activity. Campers spend nearly one million nights per year in Queensland national parks alone [1]. Burn injuries due to campfires, bonfires or barbecues have previously been reported in the overseas literature [2–8] but surprisingly for a country with a love of the outdoors like ours, we believe this to be the first Australian study on the subject.

This series is the largest yet reported on children who have been injured specifically by campfires—we have deliberately excluded children who had been burned by bushfires or burn-offs. Despite a comparatively short study period, a large number of cases were identified with more than a doubling in the number of children burned by campfires in the final 6-month period, compared to each of the preceding 2 years. Although campfire burns still represent only a small proportion of the total number of children we see, the increase in incidence is concerning.

There are many factors seen as contributing to campfire accidents [2,3,6]. Toddlers are the most frequent victims of burn injuries of all types [9], and campfire burns are no exception [4,6,7], with the majority of children in this series under 5 years of age. Small children are poor at recognising hazards in their environment and have difficulty extricating themselves from injurious situations. Most of the children in this study were burned away from home, giving credence to the view that children are especially vulnerable to dangers when in unfamiliar territory [10]. Despite supervision by an adult in all but four of our children, injuries still occurred. The relaxed atmosphere associated with camping, exacerbated perhaps by alcohol consumption [8] may lower the degree of vigilance in carers.

A very significant finding from our study was that it was far more likely for a child to be injured by hot ashes and embers than by active flames. Fires allowed to go out by themselves or which are covered with sand, can smoulder, retaining heat in the ashes, embers and coals. In this situation, the dangers posed by the ashes may not be appreciated, or if the fire has been covered with sand, there may be no surface evidence of a previous fire. Unsuspecting children then walk or fall into the old fire sustaining burns, often many hours after the flames have died [2,4,7]. Not surprisingly, the feet and hands are the most common part of the body burned [3,4,6], as children first stumble, then fall onto their outstretched hands.

Although the BSA burned by campfires is usually small, the potential for morbidity is significant. Along with the pain and discomfort, is the prospect of impaired function of the burned area. Burns to the feet and hands in small children, as occurred frequently in our patients, are always of concern, given the rapid physical growth these children are experiencing. Apart from the cosmetic deformities, hypertrophic scarring can lead to contractures, adversely affecting function and requiring surgical reconstruction [6,7]. Most of our children have required some form of scar minimisation therapy, and two have already required contracture releases. The psychological effects of the burn injury and the subsequent treatment can be substantial, with three of our children sufficiently distressed to require psychiatric review.

Although most of our children were treated as outpatients, those who were admitted often required long periods of time in hospital. Both inpatients and outpatients required several visits to the Burns Unit for dressings and/or review. With the majority of patients in this series originating from out-

side Brisbane, their families must have suffered considerable social dislocation and inconvenience. The economic costs, both to the health service and to the families of the children, as a result of these injuries would be substantial.

## 5. Conclusions

Hot ashes and coals from inadequately extinguished campfires pose a significant hazard to small children. The injuries received result in substantial morbidity. The vast majority of such accidents can be prevented if campers take care in putting out their fires effectively. The experience of our patients proves that covering a campfire with sand or allowing it to go out is inadequate. Research by our unit and discussions with local fire authorities have revealed that there are no guidelines available to campers in our part of Australia on the most effective method of safely putting out a campfire. In association with fire authorities we are undertaking a public awareness campaign on campfire safety. Dousing with water would appear to be the most effective way to put out a campfire.

## Acknowledgements

We are grateful to Dr. Deborah M Bailey, Associate Professor J. Fred Leditschke, Professor Stuart P. Pegg and Dr. Rosslyn M Walker for allowing us to include their patients in this study, and to the entire Burns Unit team for their skills and dedication in the care of the children.

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