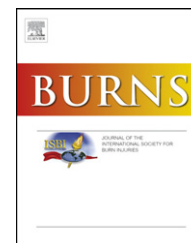


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Scalds as a result of vapour inhalation therapy in children

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ABSTRACT

Objective: To determine the numbers of paediatric scald injuries associated with the practice of inhaling warmed vapour or warm-humidification of rooms for treatment of upper respiratory tract infection (URTI).

Methods: Cases comprised a 6-year consecutive series of scalds in children 0–14 years attending the Royal Children's Hospital (RCH) in Brisbane, Australia. All scalds were sustained either directly from a container of hot water, or by room humidification.

Results: During 2001–2006, 27 children were treated for scald injury associated with breathing humidified air. Aged from 7 months to 14 years, 44% were under 3 years old and the modal age was 1 year. Injuries included steam burns to the hands from commercial vapour-producing devices in children younger than three, and spills from containers of hot water which resulted in larger scalds to multiple body sites in children aged 5–14. No child received an airway scald from hot vapour. Two children required grafts and four had a prolonged hospital stay. Total body surface area (TBSA) scalded, ranged from 1% to 15% and the majority of burns were deep dermal partial thickness.

Conclusions: The common practice of warm-humidification of inspired air as home treatment of URTI's carries an under-recognised risk of serious scalding. An alternative means of providing humidified air is to sit with your child in a closed bathroom whilst running the shower for a short time. If warm humidification is to be used, increased awareness of the risk by both parents and health professionals may reduce the incidence of this serious burn.

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1. Introduction

Scalds are a major cause of paediatric emergency hospital admission due to thermal injury [1–4]. Approximately 50% of new patients treated at the Burns Unit at the Royal Children's Hospital, (RCH) Brisbane have suffered a hot liquid scald (RCH Burns Unit data). Of these, 1.2% are victims of incidents related to spills or vapour burns resulting from inhalation therapy administered by parents.

The practice of inhaling humidified air to treat upper respiratory tract infections, (URTI) is widely accepted and has

long been considered beneficial to health. A Surgical Catalogue from 1926 promoted a variety of copper kettles for room humidification and a range of ceramic bottle-like devices similar to water pipes which were used for personal inhalation [5]. Today, the practice is facilitated by readily available apparatus from department stores and pharmacies, and has been promoted in the medical literature [6].

In this study vapour therapy at home was administered by two methods. The first uses vapour from a bowl of hot water (with or without an added medicament). By this method the vapour is usually inhaled with the child's head over the bowl

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and covered with a towel or other cover to help contain the vapour. The second method is for the vapour to be derived from a commercially available vaporiser. Commercially available vaporisers contain a reservoir where water is heated as it is passed over electrodes immersed in water. Vapour is emitted to the room via a vent which contains a small well for addition of an inhalant.

Injuries are caused from spills from containers of hot water, and from the steam emitted from commercial vaporiser units. To our knowledge, a consecutive series of scalds from direct contact with steam or hot water being used to treat respiratory complaints have not been investigated.

Published case reports, dating from 1969 suggest that this injury mechanism has resulted in presentations consistently over many years. Many of these reports question the usefulness of the treatment as well as the inherent dangers in the devices used for delivery. Reports of presentations tend to cluster over time and these suggest that numbers are not reducing [1,7-10]. Vaporiser injuries in Australia have been reported in injury surveillance system reports from Queensland and Victoria [11,12].

Inhalation therapy undoubtedly helps relieve short-term symptoms of blocked nasal passages, and may alleviate the symptoms of croup. In spite of popular perception, it has no curative effect [13]. In this paper, we report a total population study of injuries resulting from inhalation therapy. The purpose is to determine the number of scald injuries caused by this practice, consider the efficacy of the treatment, and alert medical professionals of this hazard, so that they may question the appropriateness and method of delivery, and review advocacy of this practice in the paediatric population.

2. Methods

The Stuart Pegg Paediatric Burns Centre (SPPBC) is located in the RCH Brisbane, and is the sole tertiary referral unit for the treatment of all burns sustained by children in Queensland, northern New South Wales, and evacuated victims from Papua New Guinea and the western Pacific region. Over 500 children are referred and treated annually at the Burns Centre. Queensland has a population at the mid-survey point (2003) of 3.8 million, of whom 20% were children under the age of 15 years. In this study children aged 0-14 years with scalds were identified in a retrospective audit of a departmental database. This data presents a 6-year consecutive series of scalds resulting specifically from vapour inhalation therapy administered at home. Data were collected by means of a burn proforma for children who presented to the SPPBC over a 6-year period from January 2001 to December 2006. This study documented age, gender, mechanism of injury, body region and percentage of the total body surface area (TBSA) burned, surgical management, length of hospital stay and outcome morbidity.

The terms "vapour" and "steam" used in this report refer to the hot, moist, cloudlike condensate in air that emanates from hot water. Such vapour has a lower temperature than the technical definition of steam, the latter being an invisible gas heated to 100 °C or hotter.

Although the practice of home inhalation therapy is widely accepted and injuries are consistently reported, there were no available data on the extent of use, thus baseline or exposure data for this study are unknown.

3. Results

During the 6-year period to 2006, 27 children were admitted to SPPBC for treatment of a scald injury related to vapour inhalation therapy. (Fig. 1) The children's ages ranged between 7 months and 14 years. The mean age was 5 years, the modal age was 1-year old, and 44% of the children were less than 3 years old. Fifty nine percent were females. These injuries occurred most commonly in winter, and combined with autumn and spring accounted for 92%. Only two scalds occurred in the summer months.

The most common injury scenario is for an older child to spill the container of hot liquid onto thighs, genitalia or abdomen. Younger children were much more likely to reach out and touch the hot contents or the hot part of a commercial vaporiser. Age was significantly related to type of burn ($\chi^2 = 14.75$ (2 d.f.); tail $P < 0.001$) (Table 1) with spills from containers of hot water associated with 5-14 year olds and children younger than three touching hot water or steam.

3.1. Scalds from spills

The majority of scalds (63%) were from containers of boiled water and the children injured in this manner were aged between 5 and 14 years, respectively. Girls were more likely to be injured by spills with the girl-to-boy ratio 1.4:1. The size of containers varied, some being small aroma therapy apparatus, cups, bowls and in one case, a bucket. Eleven scalds (41%) were larger than 4% TBSA (range 4-15%). The size of the container of hot water affects the size of the burn with the child who spilled water from a bucket suffering a 15% burn. Injuries from spills mostly involved multiple body sites and the majority of injury sites (73%) involved the abdomen, genital area and upper thighs. Other body parts injured included the upper torso, arm, abdomen, genitals, thighs and lower leg. Both children who required skin grafts spilled hot water on themselves.

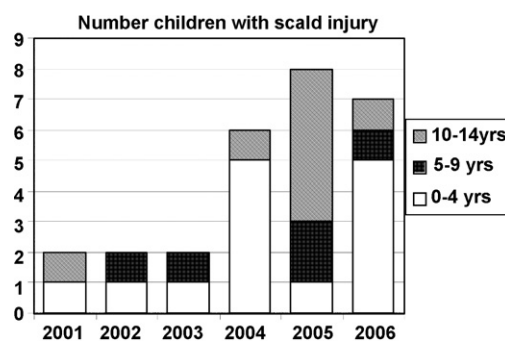


Fig. 1 – Children treated in hospital, for burn due to inhalation vapour therapy, by year and age, 2001-2006 total population survey from the SPPBC, RCH Brisbane.

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