

INJURY BULLETIN

Queensland Injury Surveillance Unit

No 89 December 2005

QISU collects and analyses data from emergency department injury presentations on behalf of Queensland Health. Participating hospitals represent three distinct areas of Queensland.

QISU publications and data are available on request for research, prevention and education activities.

HOSPITALS:

Mater Children's, Mater Adult, Princess Alexandra, Redland, Logan, Royal Children's, Mount Isa, Mackay Base, Mackay Mater, Proserpine, Sarina, Clermont, Dysart, Moranbah and Mareeba.

QISU STAFF:

Director - A. Prof. Rob Pitt,
Paediatric Emergency Director,
QISU Director, Mater Children's Hospital
Manager - Debbie Scott
Data Analyst - Richard Hockey
Marketing/Safe Communities Manager - Dawn Spinks
Emergency Paediatrician -
Dr Ruth Barker
Paediatric Emergency Fellow -
Dr Mike Anscombe
Coding /Admin -
Patricia Smith, Linda Horth
Bulletin Layout-Patricia Smith

Contact QISU:

Level 2
Mater Children's Hospital
South Brisbane 4101
Phone 07 38408569
Facsimile 07 38401684
Email mail@qisu.org.au
URL www.qisu.org.au

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Burns and Scalds in Queensland Toddlers

Dr Ruth Barker, Debbie Scott, Richard Hockey, Dawn Spinks, Dr Rob Pitt

Summary

- During the 6 year study period, 2,193 children under the age of 5 years presented to QISU participating emergency departments with a burn injury
- More than 50% of these injuries were due to scalds
- The majority of scalds were caused by hot beverages
- Queensland research shows that a high proportion (18%) of scald injuries due to hot beverages require skin grafting and that 26% result in scarring
- Prevention strategies have been broad ranging but have not resulted in a decrease in burn rates overall
- Simple environmental modifications at home are affordable and may reduce burns in toddlers



temperature and duration of exposure. For scalds, it has been estimated that exposure to water at 54 degrees C would take 10 seconds to cause a full thickness burn, whereas exposure to water at 60 degrees takes between 1 and 3 seconds^(1,2)

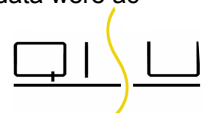
Queensland strategies to prevent burns in toddlers have particularly targeted scald injuries and include public awareness campaigns and alterations to Standards and Building Regulations aimed at reducing hot water temperatures in the home.

Other burns reduction strategies have included promotion of smoke alarms, legislative changes requiring wired in smoke alarms in new and renovated homes, sun awareness campaigns and commercial developments making household appliances safer for toddlers. Despite these strategies, we are unable to detect a decrease in burn rates for Queensland toddlers.

This bulletin will review current data on toddler burns in Queensland and discuss directions for future burns prevention.

Methods

Emergency Department injury presentations to QISU participating hospitals in the seven year period between 1998 and 2004 were searched to identify paediatric patients under 5 years of age who were treated for a burn or scald. QISU collects data from Queensland hospitals that cover 25% of the population with approximately 80% ascertainment. Results in this report then represent about 20% of the Queensland injury burden. Death data were accessed from Queensland



Paediatric Quality Council reports.

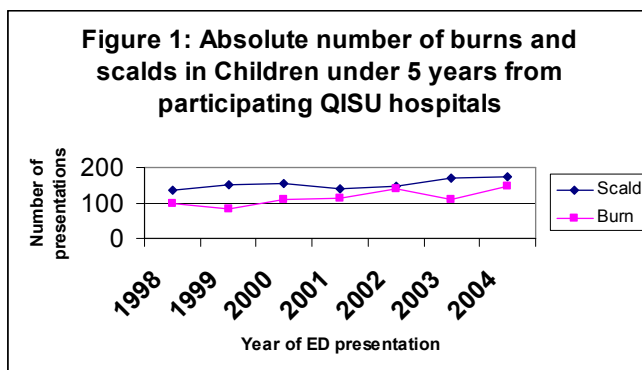
Results

Between 1998 and 2004, 2193 children under the age of 5 years presented to a QISU participating emergency department for treatment of a burn, accounting for 4% of all injury presentations in this age group and 33% of all burn related injury presentations across all ages.

In children under 5 years of age, 1 year olds were most likely to present for treatment of a burn (43%). As with other injury presentations, boys were more likely than girls to present with a burn injury (61%). Just over half of the presentations (51%) were due to scalds (contact with a hot liquid or steam).

The majority of burns in this age group occurred at home (89%), and 47% of all burns occurred in the kitchen. Scalds were more likely than other burns to involve multiple areas (21% compared to 11% for all other burns).

Trend estimates for rates of all burns and for scalds show no evidence of a decline during the 7 year study period. (The Queensland 0-4 year old population remained stable during the study period). (Figure 1)



For the 10 year period 1994 to 2003, 26 children aged under 5 years died as a result of burns or fire. Twenty one (81%) of these children died in house fires, three children died in car fires and one child died following scald injuries. The remaining child died in unknown circumstances. Further results will be presented according to burn type.

Scalds

During the study period, 1115 children under 5 years of age presented with scalds, representing 51% of all burn presentations in this age group.

Age and Gender

The peak age for scald injury is 1 year representing 50% of scald injuries in children under 5 years of age. Boys (59%) were more likely to be scalded than girls.

Agent

Burns due to hot beverages accounted for 600 (54%) of scalds (50% from cups and 4% direct from the kettle). Hot tap water accounted for 31% of scalds and spilled hot food (soup, noodles) accounted for 6%.

Place

Of the 600 scalds caused by hot beverages 63% occurred in the kitchen and 20% occurred in the living

room/dining room. Of the 345 burns that were caused by hot tap water the largest group 38% (132) occurred in the kitchen and 34% occurred in the bathroom.

Overall the kitchen was the most likely place for scalds to occur (57%).

Body Region

Scalds often involved multiple body parts (21%), followed by hands (16%), head (11%) and thorax (2%).

Severity

For scald injuries, 68% had a triage category of urgent or above and 45% of children were admitted to hospital.

Day and Time

The largest group of scalds occurred between 6PM and 8PM (22%). Children were most likely to be scalded on a Sunday (20%) or Saturday (16%).

Hot Object Burns

During the study period 765 (35%) children presented with burns due to contact with hot objects.

Age and Gender

The most common age for children to sustain a hot object burn is 1 year (40%). Boys (62%) are more likely to be burnt than girls.

Agent

Burns from contact with a hot object were most frequently due to a child contacting a hot stove, oven door or barbecue (38%) followed by a hot iron (19%) and a heater (10%). There were 8 children who were burned by contact with a cigarette either by running into a cigarette being held by a smoker or stepping on a butt on the ground. Vehicle exhausts (car, motorcycle) accounted for 6% of these burns and contact with a hot lawn mower resulted in 4% of burns. Ten children (1%) were burnt after contact with hot tools (soldering irons etc).

Place

The kitchen was the most likely place for burns due to contact with a hot object to occur (42%). After the kitchen, burns were more likely to occur in the living/dining room (13%) and then the garden or a park (9%).

BODY REGION

Hands were the most common body part for burns (61%), followed by multiple body parts (11%), head (4%) and foot (3%).

Severity

For toddlers with hot object burns, 48% had a triage category of urgent or above and 27% required admission to hospital.

Day and Time

The most likely time for a child to be burnt due to contact with a hot object was the evening between 7 and 9 PM (26%). As seen in scald injuries, Saturday (19%) and Sunday (18%) were the days associated with the largest numbers of burns.

Chemical Burns

During the study period, 125 children (6%) under 5 years of age had burns caused by chemicals.

Age and Gender

The most common age of presentation was 1 year (46%). Boys (53%) were slightly more likely than girls to present following chemical burns.

Agent

Dishwasher detergents were responsible for the majority of chemical burns in this age group (61%) followed by bleach and other caustic chemicals (Drano, caustic soda, pool chemicals) (8%) and then paint thinners and strippers (4%).

Place

The most common place for a chemical burn to occur was the kitchen (52%), followed by the garden (10%) and then the bedroom (7%).

Body Region

12.9% of all chemical burns in this age group occurred to the head and face (specifically oesophageal burns following ingestion). The next most common body region involved were the hands (2.4%).

Severity

There were 48% of children in this category who had a triage category of urgent or above and 30% were admitted to hospital.

Day and Time

The most common time of day for chemical burns to take place was 9 AM (12%) followed by 5 PM (11%) and Saturday (21%) was the day associated with the largest number of chemical burns.

Fire and Flames

There were 101 children (5% of all burns to children under five years) who were burnt following contact with smoke or flames.

Age and Gender

Boys accounted for 68% of burns in this group. The largest group of children who had been burned by fire or flames (32%) were 2 years of age, followed by 1 year olds (23%). These children were slightly older (mean 2.44 years) than those who presented to an emergency department for scalds (mean 1.28 years).

Agent

The most common burn from smoke or flames was due to open fires with children either falling into them or walking through the ashes (73%). Ten children were burnt by sparklers or fireworks. Six children (6%) presented after being in house fires. Four children were burned by playing with lighters or matches and three children were burnt when a chemical exploded or caught alight in their immediate vicinity.

Place

Almost one half of these children were burnt in the backyard (47%), followed by camping ground/paddock (14%) and then beach (4%).

Body Region

The most common body part burnt by fire and flames was the feet (81%) and then lower leg (10%).

Severity

There were 35% who had a category of urgent or

above and 43% were admitted to hospital for further treatment.

Day

Almost half of these burns occurred on the weekend (28% Sunday and 20% Saturday).

Sun/ electrical and friction burns

Twenty-four children (1%) presented with sunburn. Ten children (0.5%) suffered electrical burns from power points or electrical cables (often from either sticking objects into the power point or chewing on an electrical cable). Sixteen children (1%) presented with friction burns; six of those were from a child either falling on or catching their hand on moving treadmills.

DISCUSSION

Burn injuries continue to be a common problem for Queensland toddlers despite broad ranging prevention efforts. The majority of burns are due to scalds, with scalds due to hot beverages accounting for more than a quarter of all burns in this age group. Burn injuries to children in this age group are usually the result of a toddler grabbing/ touching or walking over a hot object/ liquid rather than deliberate experimentation with flames/ fire or chemicals. These injuries are preventable through simple environmental modifications.

A percentage of burn injuries are deliberate.⁽³⁾ Estimates vary at different treatment centres. Suspicion may be raised because of the pattern of burn or previous presentations with similar injuries. Assessing the mechanism of injury is important in establishing possible intent. Intent is poorly identified in injury surveillance data. Identification of intentional burn injury is a specialist area requiring clinical, social and psychological assessment.

Scalds

Scalds in children under 5 years of age are very traumatic as they typically cover multiple body areas (usually face and trunk) and are extremely painful. Children frequently require narcotic analgesia and admission for further treatment. Whilst the preventative focus has been aimed at reducing hot water temperatures in domestic water supplies, little attention has been paid to reducing scalds due to hot beverages.

Hot Beverages

In our data, 54% of scalds in children under 5 years of age were due to hot beverages. The usual mechanism of injury is a child grabbing a cup/ table cloth or jug cord and pulling the container of hot fluid onto them. Text comments in the QISU database suggest that some children are scalded whilst sitting on the caregivers lap as they are eating/ drinking. Research from the Royal Children's Hospital, Brisbane identified 152 children over a 3 year period who presented with scalds due to hot beverages.⁽⁴⁾ The majority of injuries occurred in the child's own home (71%), usually in the kitchen. In 80% of cases the caregiver was in close proximity and witnessed the injury. In this series, 52% required admission, 18% required a split skin graft and 26% required long-term scar management. Hot tea accounted for 45% of

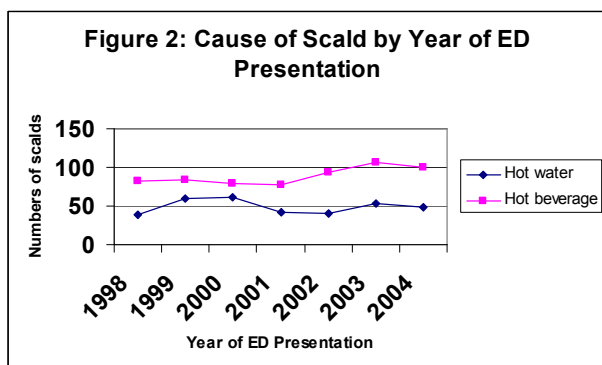
scalds in this series followed by boiled water from a kettle or mug (26%) and coffee (25%). There have been reports in the literature of babies being scalded by milk that has been overheated in the microwave and by the water used to heat the milk bottle. ^(5,6) In our series we identified 15 children under 2 years of age who were burnt in the context of heating milk bottles, but none of these involved a microwave oven

Tap Water Scalds

In our data, 31% of scalds were from hot tap water. These scalds most commonly involved hands (18%) followed by multiple body regions (17%) and then head and face (7%). Surprisingly only 34% of these scalds occurred in the bathroom and 38% in the kitchen. Reported mechanisms included children turning on hot taps, putting hands into buckets of hot water, climbing into or being placed in hot bath water and having the hot tap turned on them (by siblings) whilst sitting in the bath.

Scalds Prevention

Whilst parental supervision is important in scald prevention, the Royal Brisbane study highlights the fact that in most instances, caregivers witness the injury occurring. In some instances children are sitting on the caregivers lap when the injury occurs. Educational campaigns raising awareness and encouraging behavioural and environmental modifications seem to have had little impact in Queensland with little change in numbers of emergency department presentations for scalds in toddlers over the last 7 years. (Figure 2)



Hospital admission data is unreliable for assessing scald campaigns. In comparisons between two Queensland Tertiary Paediatric hospitals, one with an emergency department short stay ward and one without an emergency department short stay ward, 407 of 451 (90.2%) of patients with scalds were admitted from the hospital with the short stay ward whereas only 34 of 353 (9.7%) were admitted from the hospital without the short stay ward. Thus, admission rates may be an unreliable indicator of scald severity because many will be admitted to a short stay unit for pain relief and wound care and potentially counted as a hospital admission in a hospital with a short stay facility. Also, admission practice for scalds vary between metropolitan, provincial and remote locations. The best

evaluation for a scald prevention campaigns uses emergency department presentations where such data exists.

Simple barriers to prevent access by toddlers to kitchen and bathroom areas would prevent some scald injuries. Parental education should emphasise the need to place cups away from the edge of tables, preferably on high surfaces and avoid using tablecloths that the child could grab. Parents should avoid drinking or eating hot food with toddlers on their lap and care should be taken when heating bottled milk. Cooling beverages prior to serving may reduce the severity of burns as there is anecdotal evidence that tea served without milk causes a more severe burn than tea served with milk.

Changes made to the Australian Standards for all new hot water installations in 1997 means that a tempering valve or a thermostat mixing valve is required to reduce the temperature of the hot water delivered at the bathroom to 50 degrees (45 degrees in child care and care facilities). ⁽⁷⁾ However, this temperature reduction is not required for other hot water outlets in the house and the standard is not retrospective. Instant hot water systems are factory preset to deliver water at 50 degrees throughout the house. Our data shows that more tap water scalds occur in the kitchen (38%) than the bathroom (34%) so regulators that only reduce water temperatures in bathrooms will not be effective in reducing scalds. A public awareness campaign coincided with the introduction of these new standards, "Hot Water Burns like Fire". There is evidence to suggest that despite this campaign, domestic hot water temperatures in Queensland remain higher than 50 degrees. Research from other countries has also shown that home owners and plumbers often thwart attempts to reduce the temperature of hot water. ^(8,9,10)

Industry has in part responded to preventative efforts through design of tempering valves and electronically controlled selection of water temperatures at different sites in the house. Tap design has only partly addressed the issue of young children turning on hot water taps. In particular, the use of flick taps in the bath or kitchen sink makes exposure to high flow hot water possible with a bump of the tap. A scald in this situation would still be minimised/prevented if the water temperature were less than 50 degrees. In our series scalds due to hot tap water occurred more frequently in the kitchen suggesting that Standards Australia should consider regulating hot water temperatures throughout the house to 50 degrees.

Severity of scalds can be further reduced by prompt first aid measures which require removal of the child's clothing and irrigation of the burn with cold water. Researchers in Sydney have identified language and cultural difficulties in getting this message through to a multicultural community and reinforce the need to develop programmes that include parents from non-English speaking backgrounds. ⁽¹¹⁾

Hot Objects

Burns due to contact with hot objects accounted for 35% of burns in the under five age group in our series and many of these occurred on cooking surfaces (kitchen stoves, ovens and barbeques). Children frequently sustained burns to hands as they reached up to touch hot surfaces but 3% of children sustained burns to their feet after being placed/

climbed up onto the bench top and walking over elements that were hot.

Stove, bench and oven guards or barriers would reduce some of these injuries; however, child gates excluding the toddler from the kitchen area would serve to reduce other kitchen injuries (pulling kettle cords, accessing detergents and chemicals from kitchen cupboards etc).

Another common mechanism in this category is contact with the iron, again through reaching up or pulling on the cord.⁽¹²⁾ Parents should be encouraged to place the iron in a secure place (not the ironing board) to cool down, away from the edge and with the cord out of reach. A small percentage of toddlers are burnt following contact with hot tools (soldering irons) or motorised equipment (motorbike exhausts).⁽¹³⁾ Ensuring safe play areas for toddlers both inside and outside the house may minimise these injuries.

Chemical

The majority of chemical burns in our series were oesophageal burns due to ingestion of caustic agents (usually dishwasher detergent) accessed from the kitchen cupboard. This topic has been dealt with in a recent QISU bulletin (87).

Dishwasher detergents are hazardous to toddlers because of their accessibility within the home. They are highly caustic and until recently, child resistant packaging has not been required for all forms of dishwasher detergent (powdered forms were excluded from the scheduling). Recently QISU, working together with Kidsafe and Office of Fair Trading, Queensland Poisons Information Centre and Queensland Health, put a case before the Therapeutic Goods Administration National Drugs and Poisons Schedule Committee. A decision has been given recommending standard child resistant packaging for all forms of caustic dishwasher detergents with a pH of greater than 11.5, and development of a safe upper limit for caustic domestic cleaning agents.

Fire/Flames

Only a small percentage of children presented following smoke inhalation after exposure to a house fire. Amendments to the Building Code stipulate the installation of hardwired smoke alarms in new and renovated homes in Queensland built after 1997.⁽¹⁴⁾ Now, new Queensland regulations will require the installation of smoke alarms (battery operated or hard wired) in all Queensland homes by July, 2007.⁽¹⁵⁾ Queensland Fire and Rescue Services estimate "that 78% of all home fire deaths have occurred in homes without smoke alarms".⁽¹⁵⁾ Information regarding choosing a smoke alarm is available on the Queensland Fire and Rescue website.⁽¹⁶⁾ Smoke alarms require regular testing and if battery operated, fitted with a functioning battery.⁽¹⁷⁾

A large number of fire/ flame burns in our series occurred when toddlers walked through or fell into fires. Research by the Royal Children's Hospital Brisbane showed that most toddlers were burnt after walking through campfires that had been thought to be extin-

guished the night before.⁽¹⁸⁾ Fires extinguished with sand can smoulder and sustain sufficient heat to cause a full thickness burn up to eight hours later, whereas those extinguished with water lose heat within minutes.⁽¹⁹⁾

Electrical

Electrical burns were uncommon in our series but are potentially a devastating injury. The usual mechanism for a toddler to receive an electrical injury is through inserting objects into power points. This is preventable through installation of plug in safety caps for power points. Electrical safety switches are mandatory on new houses built after 1992 and all homes sold in Queensland must have a safety switch installed within 3 months of transfer.⁽²⁰⁾ They function as a rapid circuit breaker in the event of a short circuit and reduce the exposure to electrical current to a fraction of a second. Safety switches should be tested (using the test button on the unit) every 3 months to ensure that they are functional.



Sunburn

Sunburn was an uncommon reason for presentation in toddlers, and tended not to be severe. These children presented following exposure on beaches or boats, with parents believing the child was 'in the shade' or had sunscreen on to protect them. Sun awareness has increased in Australia over the last 24 years with the effective "Slip, Slop, Slap" campaign (1981). Market forces have responded dramatically with many sun protection products designed for toddlers (sunsuits, swim hats, water resistant sunscreen). Child care facilities and schools have strict policies on provision

of shade in play areas and use of hats and sunscreens. Many Queensland councils have installed shade protection over play areas. Queenslanders are increasingly aware of avoiding sun exposure between 10 am and 2 pm.

Friction burns

A small percentage of toddlers in our series presented with friction burns. Most of these injuries were sustained at home following contact with treadmills or bike wheels on exercise bikes. Parents should keep toddlers clear of rooms containing such equipment.

Summary

Burns remain a common cause of injury for Queensland toddlers. Burns reduction strategies have had little measurable impact so far. A review of community based interventions to prevent burn and scald injuries in children found that there was a limited number of studies allowing conclusions to be drawn about the effectiveness of prevention programmes.⁽²¹⁾ Further measures such as a legislated reduction of hot water temperature in all areas of the house to below 50 degrees, and retrospective legislation requiring safety switches and smoke detectors in all houses may go further to reduce burn injuries and deaths.

Ongoing parental/ care giver education is required to avert many common toddler burns, particularly associated with accessing hot beverages and cooking equipment. Simple, cheap environmental measures can reduce toddler burns.

Tips for parents with toddlers

- Reduce the hot water temperature to less than 50 degrees at all outlets in the house (cost depends on hot water system)
- Install child safety gates to **Keep Kids Clear of the Kitchen** (\$75)
- Keep hot beverages out of toddlers reach (free)
- Install and regularly test smoke detectors (\$10 to 25 per unit)
- Have a fire escape plan for your household (free)
- Install and test electrical safety switches every 3 months (cost depends on electrical supply)
- Install power point safety caps in all accessible areas (\$5)
- Ensure a safe secured play area both inside and outside the house (cost depends on situation)
- When camping, extinguish the fire completely with water (free)
- “Slip, Slop, Slap”, remember the shirt, sunscreen and hat (<\$20)

Your toddler avoiding a painful burn with the possibility of long term scarring.....priceless!

Links

Queensland Fire and Rescue Service: <http://www.fire.qld.gov.au/>

Building Codes/ Dept Local Government: <http://www.lgp.qld.gov.au/?id=30>

Kidsafe: http://www.kidsafesw.org/homesafety/burns_scalds_prevention.htm

Safe Housing: <http://www.housing.qld.gov.au/>

Queensland Safe Communities Support Centre: <http://www.safecommunitiesqld.org>

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