Paediatric Burns Service Guidelines

Updated September 2014
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Considerable care has been taken to ensure that the information included in these guidelines is accurate. These guidelines are intended as an aid and should not replace clinical judgment. Any loss or damage incurred as a consequence of using these guidelines is not the responsibility of the Women’s and Children’s Hospital or WCHN.
1. Introduction to the burns service at the Women’s and Children’s Hospital

The Paediatric Burns Service is responsible for inpatient and outpatient treatment of children up to 16 years of age. The service provides the majority of paediatric burn care in SA and its catchment population includes metropolitan and country SA, NT and western parts of NSW and Vic. The care requirements of burns patients are considerable and complex. In the case of severe burn injuries an initial period of hospitalisation is followed by extensive follow-up and rehabilitation. Referral criteria are based on the Australia and New Zealand Burn Association’s ‘Transfer Guidelines for Burn Service Referrals (2007)’

Further information on burns injuries and prevention material can be found on our website www.wch.sa.gov.au/services/az/divisions/psurg/burns/index.html

The Paediatric Burns Service is a multidisciplinary team consisting of:

- **Paediatric Surgeon**
  - Mr Anthony Sparnon (Head of Unit)
- **Plastic and Reconstruction Surgeons**
  - Dr Michelle Lodge
  - Mr Bernard Carney
  - Dr Amy Jeeves
- **Paediatric Surgeon**
  - Mr Warwick Teague
- **Burns Advanced Clinical Practice Consultant**
  - Ms Linda Quinn
- **Burns Fellow**
- **Burns Registrar**
- **Burns RMO**
- **Social Worker**
  - Karla Matousek
- **Physiotherapist**
  - Kelly Donnellan
- **Occupational Therapist**
  - Vanessa Timbrell
- **Dietician**

2. Referral criteria to Women’s and Children’s Hospital (WCH) burns service

The Women’s and Children’s Hospital provides an inpatient and outpatient service, including Digital Referral Service for persons aged 0–16 years for:

- Any burn where the referring department/GP/clinic/nurse/or health worker requires management or advice from the paediatric burns service
- Burns greater than 5–7% Total Body Surface Area (TBSA)
- Burns to face, hands, feet, genitalia, perineum, major joints
- Full thickness burns
- Electrical burns
- Chemical burns
- Inhalation injury
- Circumferential burns
- Burn injury inpatients with pre-existing medical disorders
- Burns with associated trauma
- Burn injury with suspicion of non-accidental injury – refer Mandatory Reporting page 20.

This criterion is based on the Australian and New Zealand Burn Association Transfer Guidelines for Burn Service referrals (2012).

**How to refer to the service**

To arrange a transfer of a burns patient

Call: 08 8161 7000
During hours ask for: Burns Registrar
Out of hours ask for: On Call Surgical Registrar

To arrange a burns outpatient clinic appointment

Call: 08 8161 7000
During hours ask for: Burns Advanced CPC
Out of hours ask for: On Call Surgical Registrar

Fax referral to: 08 8161 6246

**Tips for taking digital photos**

- Take on dry plain surface, e.g. with green theatre sheet, or blue sheet.
- Something to measure size by, e.g. tape measure,
- Macro function (flower button) on and lighting may need to be changed, ie heat lamps off, flash off
3. First Aid

DANGER ensure own safety

STOP the burning process

COOL the burn wound

1. For flame burns instruct the person to “Stop, Drop to the ground, Cover face and Roll so fire is smothered” – extinguish flames with a blanket.

2. Remove the heat source: clothing, embers, chemicals, etc.

3. Apply cool running water for 20 minutes\(^1\text{-}^8\) NO ICE

4. Resuscitate if necessary
   - A – AIRWAY (Protecting cervical spine)
   - B – BREATHING (Give Oxygen)
   - C – CIRCULATION (With Haemorrhage control)

5. Remove anything tight: jewellery, non-adherent clothing etc.

6. Minor Burn – continue cool water irrigation for 20 minutes\(^1\text{-}^8\) Cover with non-adherent dressing (e.g. cling wrap).

7. Major Burn – Resuscitation and Emergency management is the priority. If cooling is permitted then cool with water for 20 minutes and then cover with cling wrap (do not apply cling wrap to face or chemical burns). Keep warm with outer blanket and raise the ambient temperature to reduce the risk of hypothermia.\(^9\)

Refer to APPENDIX A: major burn flow chart

Ice should never be used – it causes vasoconstriction leading to further tissue damage and hypothermia.\(^9\)

Gel Pads (such as Hydrogel, Burnaid\(^\text{TM}\)) can be used ONLY as an alternative to running tap water where water is unavailable or not practical.

Must be removed after 20 minutes; gel pads can lead to hypothermia in children.

Running tap water is still the best means of cooling the burn wound\(^1\text{-}^8\) Refer to APPENDIX E: Hydrogel Protocol

FIRST AID – burn type specific

Scalds
1. Remove all soaked clothing
2. Immediately cool the burn with cool running water.

3. A scald is deepest
   - Where the clothing is thicker
   - Where the liquid is held in the natural creases of the body (e.g. toddlers around their necks and folds of skin in their legs)
   - Where the clothing is compressed in the natural creases of the body

Electrical Burns
1. Turn off mains/ switch off source (power point)

2. Remove patient from electricity source remembering your own safety

3. Spine Protection – This is of particular importance as fractures of the spine may occur following the violent muscular jactitations that occur during the conduction of the electrical current through the body.\(^1\text{1}\)

4. Cervical Spine Protection

5. ECG\(^1\text{2}\)

Refer to page 8–9 including Flow Chart for the Management of Electrical Injury

Chemical Burns
1. Personal Protective Equipment (PPE) for first aid givers: Gown, gloves, mask and eye protection\(^1\text{3}\)

2. Remove all contaminated clothing\(^1\text{1}\)

3. Powdered agents should be brushed from the skin\(^1\text{1}\)

4. Areas of contact should be irrigated with copious amounts of cool water

   *Irrigate to the floor. From the contaminated area to floor directly to avoid run off injury to other areas if possible.

5. Chemical eye injuries require continuous irrigation until ophthalmologic review. Always ensure that the unaffected eye is uppermost when irrigating to avoid contamination.
   - Acid: irrigate* with water for up to 1 hour or until the pain stops
   - Alkali: irrigate* with water for up to 2 hours or until pain stops
Liquefied Petroleum Gas
Due to the low boiling point of Liquefied Petroleum Gas (LPG), it is stored in a pressurized, cooled liquid form, which on exposure to the skin, can result in severe cold burns akin to frostbite due to the rapid drop in temperature.42–45

> The initial wound appears hyperaemic and oedematous, without apparent tissue necrosis.
> The appearance of superficial tissue is quite often an inaccurate indicator of underlying tissue viability, with the injury being more severe than a thermal burn due to the rapid deep penetration of liquids and gases.

First aid at the scene
> Remove the person from danger and minimize the duration of exposure.
> Remove clothing that has been exposed to the agent.
> **Rapid re-warming in a bath of water between 40 and 42˚C for 15–30 minutes** with the aim of minimizing tissue loss and reducing chemical irritation. It is important to achieve this temperature range, as lower temperatures are less beneficial to tissue survival, whilst higher temperatures may produce a burn wound and compound the injury.

> **Please note: the usual recommendations for burns first aid (20 minutes of cool running water) is contraindicated in contact LPG gas burns**

> Active motion whilst rewarming is recommended
> Massage during rewarming should be avoided
> After rewarming, the injured area should be gently covered or draped with clean sterile material.
> Do not break any blisters.

4. Emergency Management
Level 1 Trauma Team Activation Criteria
> **Airway or Inhalation Burns**
> **Partial or Full thickness burns to > 20% TBSA**

Please refer to APPENDIX A – Major Burn flow chart – see page 25

1. **First Aid** – see page 4–5
2. **Primary Survey** – identifying and managing life threatening injuries14,15
   A. **Airway Maintenance with Cervical Spine Control**
   > Ensure airway patent
   > Apply hard collar
   B. **Breathing and ventilation**
   > Expose the chest and assess ventilation13
   > Administer oxygen to all patients with a major burn13,14
   > Be alert for any pre-existing airway obstruction, common in children e.g.:
   - asthma
   - enlarged adenoids
   - tonsils and/or
   - tracheomalacia

   **The upper and lower airway is narrower in children than in adults; swelling of respiratory tract or accumulation of secretions may seriously impair respiratory function.**
   > Assess for signs of inhalation injury13,11,16,17
   - Burns to face, mouth, neck, pharynx
   - Soot in the sputum
   - Tracheal tug, use of accessory muscles
   - Inspiratory stridor
   - Productive cough
   - Respiratory difficulty.

   **Consider early intubation if any concerns regarding airway or breathing.**

   **Beware circumferential chest burns as they may restrict chest expansion – consider need for escharotomy (see escharotomy page 6)**

C. **Circulation with Haemorrhage control**
> Check the pulse, blood pressure, capillary Blanch test
> Stop bleeding with direct pressure.
> Insert 2 large bore peripheral cannulas (preferably through unburned skin)
> Blood for CBE, EUC/LFTs/BGL, Coags, Group and save for >20%TBSA 13, 14
> Commence formal intravenous resuscitation for burns >10% TBSA (See F: Fluid Resuscitation)

D. **Disability: Neurological Status**
> Establish level of consciousness
   A – Alert
   V – Response to Vocal Stimuli
   P – Response to Painful Stimuli
   U – Unresponsive
> Examine the pupillary response to light. Response should be brisk and equal.

E. **Exposure with Environmental Control**
> Remove all clothing and jewellery
> Keep the patient warm14,18
> Calculate the burn size using the Paediatric Lund and Browder chart
   Refer to APPENDIX D: Paediatric Burns Assessment Form – page 28
> Log roll to visualise posterior surfaces
F. Fluid Resuscitation

With Hartmann’s Solution Calculated using the Parkland Formula\textsuperscript{16,19–27}

\[ 4 \text{ml} \times \text{weight (kg)} \times \% \text{burn TBSA} \]

> First half of the calculated fluid is given in the first eight hours from the time of injury
> Second half is given in the next sixteen hours\textsuperscript{20, 23, 27, 28}
> The time of injury marks the start of fluid resuscitation\textsuperscript{18}
> Adjust fluids as indicated by urine output \textsuperscript{18,19,22,26,28,29}
> Output should be at least:
  - 0.5ml/kg/hr for children <2 years
  - 1 ml/kg/hr for children >2 years

Children also require maintenance fluids with 5% dextrose and 0.45 Normal Saline (4ml/kg/hour for the first 10kg + 2 ml/kg/hour for next 10kg + 1ml/kg thereafter) e.g. 24kg Child

\[
\begin{array}{c}
40 \\
20 \\
4 \\
64 \text{ml/hr}
\end{array}
\]

Analgesia\textsuperscript{14}

Intravenous morphine titrated to effect

0.05–0.1mg/kg
(See analgesia page 16–19 for minor burns and procedural doses)

Tests and Tubes

> Trauma series x rays
> Urinary catheter if receiving fluid resuscitation
> Nasogastric tube for >15% TBSA

Secondary Survey\textsuperscript{13}

> Head to toe examination
  > History:
    - A = Allergies
    - M = Medications
    - P = Past Illnesses
    - L = Last meal
    - E = Events/Environments related to injury

Tetanus status: If the child’s tetanus status cannot be determined all admitted patients require referral to the Immunisation Clinical Practice Consultant.

Continually re-evaluate Primary Survey

Escharotomy

Limbs

When a limb is burned circumferentially the increase in pressure due to the accumulation of oedema under the rigid burned skin may interfere with circulation and cause death of tissue in the distal part of the extremity\textsuperscript{13, 30}

Limb and digital escharotomies may be required if retrieval is delayed. These are usually performed under anaesthetic.

Chest

If deep burns involve the chest and abdomen, chest expansion and diaphragmatic movement may be restricted interfering with breathing. A chest escharotomy may be indicated.

Electrical Burns

Exposure to electrical current may cause life threatening cardiac arrhythmias even at low voltage. These most often occur at the time of electrocution. Delayed arrhythmias are extremely rare even in the “high-risk” situations listed below. In general low voltage (<240V) electrical injuries do not cause significant morbidity or mortality.

High voltage injuries such as those sustained in lightning strikes or contact with overhead (Tension) electrical wires may cause sudden death. Surviving patients often have extensive burns and tissue injury with a risk of compartment syndrome, myoglobinuria and renal failure.

A careful search for associated injuries is required during the secondary survey. Trauma may occur due to burns, severe tetanic muscle contraction or being thrown from the source. Burns are common and may be more severe at the contact site. Oral electrical contact may produce severe mouth burns.

High-risk criteria for delayed arrhythmias after electrocution

1. Abnormal ECG on presentation
2. Loss of consciousness at time of electrocution
3. Exposure to high voltage (>240 volts)
4. Past cardiac history
5. Unwitnessed event
6. Increased skin conduction e.g. wet skin, high humidity
7. Tetany at time of electrocution

Laboratory assessment of Creatinine kinase and myoglobinuria should only be considered in those patients who require admission for monitoring.

See Appendix F Electrical Injuries Protocol.
5. Burn Depth Assessment and Management

Gently clean all apparent burn areas; look at the burn

Is the Epidermis attached?
Superficial layers of epidermis will slip free with slight pressure in an epidermal or superficial dermal burn

YES

EPIDERMAL

Run a gloved finger over the burn, is it slippery?

YES

What type of blister is it?

SUPERFICIAL DERMAL
Other signs: Brisk capillary return <2secs, very painful, copious exudate, pale pink, blisters.

MID-DERMAL
Other signs: Some mottling, sluggish capillary refill, darker red base, some anaesthesia, less exudate, blisters.

DEEP DERMAL
Other signs: Sensation to pressure but not pain, absent capillary refill, sometimes has blisters.

FULL THICKNESS
Other signs: No sensation, no capillary refill, may be charred, black, tan, dry with no blisters.

NO

Burn colour

Thin

Thick

Red

White
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## Flow-chart for Assessment and Management of Burns

<table>
<thead>
<tr>
<th>Burn Depth</th>
<th>Epidermal</th>
<th>Superficial Dermal</th>
<th>Mid-Dermal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assess Depth</strong></td>
<td><strong>Appearance</strong> – pink or red erythema with no blisters. Epidermis may not lift off for 12 to 24 hours increasing risk of inaccurate assessment of burn as superficial epidermal. Capillary return – Rapid &lt;2 seconds. Sensation – painful. Pure erythema is not included in estimation of TBSA. Differentiation between erythema and superficial dermal burn may be difficult in the first few hours following the burn injury.</td>
<td><strong>Appearance</strong> – Wet, pale pink or blotchy with blisters. Capillary return – Brisk &lt;2 seconds. Sensation – Very painful as sensory nerves are exposed.</td>
<td><strong>Appearance</strong> – Red, dark pink, white with blisters. Capillary return – Sluggish, varies with depth. Sensation – Adequate. Susceptible to conversion to a deeper thickness wound.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Appearance</strong> – Blotchy red due to extravasation of haemoglobin, or mottled or waxy and white. Will sometimes have blisters. Capillary return – Absent. Sensation – To pressure but not pain. Very prone to conversion to a deeper injury and to infection.</td>
<td><strong>Appearance</strong> – White, charred, black, tan, no blisters. Capillary return – Absent. Sensation – Absent. Epidermis, dermis and epidermal appendages are destroyed, injury may involve fascia, muscle and bone.</td>
<td></td>
</tr>
<tr>
<td>Burn</td>
<td>Epidermal</td>
<td>Superficial Dermal</td>
<td>Mid-Dermal</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>----------------------------------------------------------</td>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Primary Dressing</strong></td>
<td>If there is no epidermal loss, use moisturiser only several times a day</td>
<td>Hydrocolloids Mepilex Mepilex Ag Aquacel Ag Flamazine (SSD, (silver sulfadiazine) Acticoat</td>
<td>Acticoat Mepilex Ag Aquacel Ag Flamazine (SSD, (silver sulfadiazine)</td>
</tr>
<tr>
<td>(Dependant on site of burn, size of burn, exudate, pain, pt ability to manage dressing, cost and contamination)</td>
<td>Sun protection advice: Hats and clothing SPF Factor 30+</td>
<td></td>
<td>Acticoat Mepilex Ag Aquacel Ag Flamazine (SSD, (silver sulfadiazine)</td>
</tr>
<tr>
<td><strong>Follow up</strong></td>
<td>None required</td>
<td>Local follow up +/- Digital Referral Service</td>
<td>Local follow up +/- Digital Referral Service</td>
</tr>
<tr>
<td><strong>Outcome</strong></td>
<td>May require hospitalisation for pain management. Will heal in 3–5 days with no resulting cosmetic blemish.</td>
<td>Will heal in 7–10 days as epidermal appendages remain intact. Minimal or no scarring but a colour defect may remain.</td>
<td>Will heal in 10 to 14 days, except in the very young where the dermis is thin and depth of burn is invariably deeper</td>
</tr>
</tbody>
</table>
## Frequently used burn dressings

<table>
<thead>
<tr>
<th>Dressing</th>
<th>Type of Burn</th>
<th>Suitable Use</th>
<th>Dressing Change</th>
</tr>
</thead>
</table>
| Acticoat Fixed with Hypafix    | Partial/Full thickness              | > All areas of the body, except in the perineum  
> Colonised but not infected burns  
> Non-infected burns          | 3–7 days                                                                          |
| Mepilex Ag (Hypafix to secure edges) | Partial/Full thickness              | > All areas of the body, except in the perineum  
> Colonised but not infected burns  
> Non-infected burns          | 4–7 days                                                                          |
| Aquacel-Ag                     | Superficial/ Partial thickness      | > All areas of the body except over joints or in the perineum.  
> Colonised but not infected burns.  
> Non-infected burns          | Until dressing separates from wound. **Do not take dressing off unless infected.** |
| Hydrocolloids:                 | Superficial/Partial Thickness       | > Flat surfaces  
> Not suitable for infected burns          | Up to 7 days or sooner if there is excessive exudate or loss of dressing. |
| Duoderm Comfeel (Hypafix to secure edges) | Superficial/Partial Thickness       | > Flat surfaces  
> Not suitable for infected burns          | Up to 7 days or sooner if there is excessive exudate or loss of dressing. |
| Flamazine (SSD, silver sulfadiazine) | Full thickness/infected/ contaminated burns | > ALL areas of the body except the face. | Change daily  
**Admission may be necessary DO NOT USE in children <12 MONTHS OF AGE** |
| Hypafix                        |                                     | > Dressing fixation  
> Scar management  
> To secure other dressings | At least once a week or as necessary. |
| White soft paraffin (Vaseline) | Face, buttocks, genitalia            | > Only areas that cannot be covered with dressings: face, buttocks, genitalia | At least three times a day or as necessary. **Admission is usually indicated.** |
| Topical antibiotic ointment e.g. mupirocin (Bactroban) | Face, perineum, or any other area that may be infected | > All areas of the body | Twice a day or prescribed for infected burns. |
Speciality areas

Facial burns
All facial burns require eyes to be stained with Fluorescein 2% drops to detect any corneal damage, unless mechanism of injury excludes possibility. Rinse thoroughly with normal saline to prevent corneal irritation.

Consider admission for face care
Leave face open and apply white soft paraffin after cleaning – refer to Nursing and Midwifery standard
Chloramphenicol ointment applied to eyes and ears. Consider adding Bactroban if clinical signs of infection.

Do not use Flamazine (SSD, silver sulfadiazine) as it can cause corneal ulceration.

Perineal burns

> Carry a severe risk of infection from gut flora.
> After bowel actions, perineal area should be cleaned with a soapy solution.
> May require catheterisation.

Treatment:
> Soft paraffin or topical antibiotic ointment like mupirocin (Bactroban) or Silver sulphadiazine impregnated onto gauze should be applied over perineal area and changed after every void and bowel action. This may be placed inside a nappy.
> Bathed daily in 4% chlorhexidine skin wash.

Consider admission

6. Complications

Fever/Infection
This is a common reaction to the hypermetabolic state of a child following a burn injury. Other causes however must be excluded by:

> Examination (of child and wound)
> Nasopharyngeal aspirate
> Wound swabs
> As indicated by clinical picture
> Consider Toxic Shock – refer to page 14–15

Immunisation and tetanus status needs to be reviewed and updated.

For outpatient treatment parents should be instructed to return the child to a medical officer/health facility if the following symptoms occur:

> Fever
> Vomiting/Diarrhea
> Excessive pain
> Any evidence of purulent discharge
> Offensive smell
> Redness, swelling or tenderness
> Rash
> Patient is unwell

Antibiotics are used ONLY if positive wound culture or clinical infection is detected and NOT routinely used as prophylaxis.

Burn Itch
This is a common reaction to healing burn wounds. Non-sedating antihistamines provide a safe option for children: Cetirizine should be tried as a first option.

**Oral cetirizine**
Infants 6 months – 2 years 0.125mg/kg/dose* TWICE daily prn
Age 2–5 years 1.25–2.5 mg/dose TWICE daily prn
Age 5–12 years 5mg/dose ONCE or TWICE daily prn
>12 years 10mg/dose ONCE or TWICE daily prn

**Trimeprazine** 0.25 mg/kg/dose PO 6-8 hrly prn up to 1mg/kg at night for sleeping. Caution is always required if trimeprazine is administered in conjunction with other sedating medications. It is preferable to start with a low dose and increase slowly in the absence of oversedation.

**Ranitidine** (the H2 agonist), given regularly has some effect on burn itch: Ranitidine 15mg/ml
1–6 months 1mg/kg twice daily
6 months–3 years 2–4mg/kg twice daily
3–12 years 2–4mg/kg (max. 150mg) twice daily
Toxic Shock

Toxic shock is a clinical diagnosis syndrome consisting of clinical symptoms:
- Pyrexia > 39°C
- Rash
- Shock
- Diarrhoea, vomiting or both
- Irritability
- Lymphopaenia

Caused by bacterial superantigens which are produced by staphylococcus aureus and streptococcus pyogenes.

Superantigens bind directly to T cells stimulating them to produce massive amounts of inflammatory cytokines e.g. TNF, IL-1, IL-6

Causes capillary leakage, hypotension and can lead to shock and death

Enhances patient susceptibility to gram negative infections

Children < 2 are particularly susceptible because of low levels of anti-toxic shock antibodies. Up to 90% adults have antibodies against TSST and maternal antibodies can confer protection up to 9 months of age

Usually manifests 2–4 days after the burn injury

Often occurs in small burns (<10% TBSA) so be aware of outpatient presenting to ED, clinic or phone call from concerned parent

Burn often appears “clean”

Patient often deteriorates rapidly

Once shock develops mortality can be as high as 50%

Differential diagnosis includes burn sepsis, Kawasaki disease, toxic epidermal necrolysis, or any other infection.

Treatment

Aggressive management of hypovolaemic shock with fluid resuscitation and haemodynamic monitoring in Intensive Care / High Dependency

Inspection of wounds, debridement of necrotic material, change of dressings

Blood, wound and other cultures for microscopy and sensitivity

Antibiotics:
- Fluclouxacinil 50mg/kg up to 2g IV, 6 hourly PLUS Clindamycin 15mg/kg up to 600mg IV 8/24 OR
- Vancomycin 30mg/kg IV 12 hourly PLUS Clindamycin 15mg/kg up to 600mg IV 8/24

Passive immunisation of antibodies to staphylococcal and streptococcal superantigens e.g. fresh frozen plasma, IV immunoglobulin.

Refer to APPENDIX C: Toxic Shock Protocol

7. Infection Control

All patients

All burns patients admitted require a set of MRSA (Multiple Resistant Staphylococcus Aureus) screening swabs on admission and weekly throughout their admission (Day case patients are excluded) Swabs should be taken from the nose, axilla and groin and unhealed wound/s

- If any multi-resistant organisms (MROs) are detected weekly swabs are no longer necessary
- Patients with MROs should be managed as per the WCHN Procedure: “Management of patients colonised or infected with multi-resistant organisms (MROs)”
- Patients with MROs may be admitted to positive pressure rooms (e.g. Room 5 in PICU) after risk assessment by Infection Prevention and Control.

Staff and visitors to perform hand hygiene either by washing their hands with soap and water or via the use of alcohol hand rub (ABHR) on entering and exiting the room.

Staff to wear gown and gloves for dressing changes, including face care.

Gloves must be changed and hands washed when gloves become contaminated with the patients' secretions or excretions before contact with another site.

Hand Hygiene to be conducted according to WCHN procedure: Hand Hygiene and Hand Care

Visitors with infectious diseases (including colds) should not visit the patient

Minor Burns <10%TBSA

In addition to the above

Nursed in a side room only if open areas i.e. facial burns.

Major Burns 10–40%

In addition to the above

Nursed in a side room

Limit the number of staff and visitors entering the room, including non-essential staff

Staff to wear gown/apron and gloves, for all direct patient care.

Ensure that all unnecessary equipment and furniture are removed from the room, avoid over cluttering the room to facilitate appropriate cleaning
Major Burns >40% TBSA
In addition to the above

> Should be nursed in a single room to ensure physical separation from other patients.
> Doors should be closed when dressings are taken down and remain closed while any burn wounds are exposed.
> A sign should be placed on the patient’s door indicating that the patient is on protective/transmission precautions.
> Staff to wear gown/apron and gloves on entering the room.
> Staff to wear mask while any burn wounds are exposed.
> Staff to use gown/apron, sterile gloves and mask when dealing with an open wound.
> All PPE to be removed immediately upon leaving the room.
> Equipment in the room must, where possible, be dedicated for use with that patient. The patient should have their own dedicated stethoscope, blood pressure cuff etc.
> Ensure all equipment that is brought in and taken out of the patient’s room is thoroughly cleaned or decontaminated as appropriate.
> Keep charts and notes and other paper work outside of the room to reduce the risk of contamination.
> Avoid fresh flowers or plants being placed in the room as they can serve as a reservoir for bacteria and/or fungal spores.
> Non-washable toys, cloth objects and paper books should be kept to a minimum and remain with that patient only or discarded (refer to the WCHN Procedure: “Toy Use within the Health Care Setting”). Toys may be taken home for washing (refer to the WCHN Procedure: “Management of patients colonised or infected with multi-resistant organisms (MROs)”)
> Toys should be non-porous and washable and disinfected after use (refer to the WCHN Procedure: “Toy Use within the Health Care Setting”)
> Visitors should be restricted to 2 at a time, discourage young children from visiting.
> Visitors should wear gloves and a gown for any direct patient contact.
> Transfers should be minimised, where practicable procedures should be conducted in the patient’s room. If this is unavoidable the receiving department must be informed of the transfer prior to transferring. The patient should not be placed in a communal waiting area.

Outpatients

> Staff attending burns patients in the outpatient setting should observe Standard Precautions at all times, including:
  – Hand Hygiene according to the ‘5 Moments’
  – Aseptic non-touch technique (ANTT)
  – Personal Protective Equipment (PPE) relevant to the task.

8. Pain relief

General Information

Analgesics should never be given by the intramuscular (IM) route due to unpredictable absorption.

The Department of Children’s Anaesthesia provides an Acute Pain Service which coordinates pain management within the hospital and provides specialised techniques. The parent clinic should, however, be involved in maintaining pain management programs and request review as required.

Advice or consults can always be requested from the Clinical Practice Consultant – Pain Management (pager 4302). Out of hours contact the Duty Anaesthetist (Direct dial 50217). Several of the consultants in Children’s Anaesthesia are involved with the Acute Pain Service.

Full details of all pain management methods and protocols are contained in the Women’s and Children’s Hospital Intranet – Pain Management Guidelines.

> Ongoing pain and the need for regular dressings are a feature of burn injuries.
> If children do not receive adequate analgesia in the early treatment period, they become increasingly distressed as time goes on, resulting in greater analgesic need.
> Recommended doses, especially for dressings may appear large, but they have been used safely at the WCH for several years.

Major Burns >15% TBSA

Short term after initial burn (first 1 to 4 days):

> Most children are managed initially with intravenous opioid infusions or Patient Controlled Analgesia (PCA) and regular paracetamol (15mg/kg QID)
> Contact the Acute Pain Service for opioid infusions or PCA
> Consult with the Acute Pain Service to determine drug doses for infants under 1 year of age
Guidelines for the management of Paediatric Burns

If standard doses of opioid do not provide adequate analgesia for pain, early introduction of a low dose ketamine infusion may improve analgesia without the side effects that can result from escalating opioid doses. Contact the Acute Pain Service or Duty Anaesthetist.

In PICU a midazolam infusion may also be required. This will be prescribed and managed by PICU medical staff.

Please liaise with the Acute Pain Service if, at any time, analgesia is sub-optimal.

Early involvement with the Acute Pain Service facilitates the use of adjuvant analgesic medications which can influence the overall opioid requirement, resulting in a decrease in opioid related side effects.

Transition to oral analgesia

The aim is to provide:

1. Background analgesia using continuous slow release agents e.g. MS Contin® or Tramadol SR.
2. Breakthrough analgesia using an immediate acting medication e.g. oxycodone, tramadol.

Oral analgesics are started 1–2 hours before the infusion/PCA is ceased to help with a smooth transition. Recommended medication orders for oral background and breakthrough are as follows:

**Oral background:**

**MS Contin® (suspension or tablets): starting dose 0.6mg/kg/dose 12 hourly regularly (for opioid naive)**

The Acute Pain Service orders and oversees the administration when MSContin, or other slow/sustained release opioids are required for children following burn injury.

MS Contin® is the background drug of first choice because of its consistent mechanism of delivery. This avoids potential problems of over-sedation when combined with other sedative agents e.g. dressing analgesia or sedating antihistamines.

Particular care/observation is required when opioids are administered to infants under 1 year refer to paediatric Pain Management and Opioid Safety website.

Dosage adjustments are made to the slow release opioid depending on the amount of breakthrough analgesic use per 24 hours, patient somnolence or other concerns.

The Acute Pain Service will develop an opioid weaning regimen when appropriate.

Many burn injured children have a naso-gastric tube in situ to facilitate nutrition and this is often used for medication administration. Opioid medications should only be administered when a child is awake, as a precaution against opioid-induced over-sedation.

The Acute Pain Service may prescribe methadone instead of MSContin for children with extensive burns. Methadone provides the required opioid analgesia but also targets the NMDA receptors which play a role in the moderation of neuropathic pain.

**Oral breakthrough:**

**Oxycodone:**

0.2mg/kg/dose 4 hourly PRN if child over 1 year

0.1mg/kg/dose 4 hourly PRN for children less than 1 year

And may include one or both of the below options

**Ibuprofen:**

10mg/kg/dose 6–8 hourly PRN (Cease 48 hours prior to surgery/grafting). Do not routinely prescribe for children <3 months

**Tramadol:**

1–2 mg/kg/dose 6 hourly PRN

Consult APS for children <12 months

**Adjuvant medications:**

Include methadone, gabapentin and clonidine and can contribute to the analgesic outcome for the child. Please discuss analgesic options with the Acute Pain Service.

**Minor burns <15% TBSA**

May require opioid infusion or PCA as for more extensive burns or adequate analgesia may be achieved with oral analgesia as appropriate.

All children should have:

**Paracetamol:**

15mg/kg/dose 6 hourly regularly

Breakthrough analgesia may comprise all or any of the following medications

**Oxycodone:**

0.2mg/kg/dose 4 hourly PRN if child over 1 year

0.1mg/kg/dose 4 hourly PRN for children less than 1 year

**Ibuprofen:**

10mg/kg/dose 6–8 hourly PRN (Cease 48 hours prior to surgery/grafting). Do not routinely prescribe for children <3 months

**Tramadol:**

1–2 mg/kg/dose 6 hourly PRN

Minor burns may also require MS Contin® 0.6mg/kg/ dose 12 hourly to maintain comfort and/or to facilitate regular face care – Contact the Acute Pain Service. (If used for one week or less, MS Contin® can be ceased without weaning)
Post-operative management

Please ensure the morning dose of slow release opioids, if ordered, is given prior to theatre even if the child is fasting. Depending on the surgery undertaken there may be an acute increase in analgesic requirements post-op e.g. after extensive grafting. This may be managed in a number of ways and requires consultation with the Acute Pain Service.

1. Continue opioid infusion/PCA if already running
2. If on slow release opioids (MS Contin®, methadone) these will frequently be continued with a Nurse controlled or PCA opioid to provide breakthrough analgesia.
3. If the oral route is not available the anaesthetist can convert to administer all analgesia via the IV route. Please note that when opioids are given orally, approximately 3 times the IV dose is required as most of the opioid becomes ineffective because of metabolism by the liver. Conversely when the dose is converted from oral to IV, approx 1/3rd of the oral dose is required.

Please Note: opioid infusions or PCA background infusions are usually not run simultaneously with oral opioids (MS Contin®, methadone, morphine or oxycodone) or intranasal fentanyl unless specifically ordered by the Acute Pain Service, with documentation of the exception recorded in the patient record.

Refer to WCH Procedural Sedation Guidelines to ensure safe practices are observed for children receiving sedation/analgesia for burn dressings.

Dressing procedures

- Dressing procedures require sedation + analgesia.
- It is essential to consider the cumulative sedative effect of analgesic, sedative and sedating antihistamine medications.
- If the patient is receiving an opioid infusion, oral/intranasal opioids should be omitted and the bolus facility of the infusion used to provide analgesia for the dressing.
- If the patient is using a PCA, oral/intranasal opioids should be omitted. Encourage the patient to use the bolus facility starting 10–15 minutes prior to the dressing.
- Consult the Acute Pain Service if patients have the potential for airway obstruction e.g. sleep apnoea, craniofacial syndromes or cerebral palsy or are <1 year old.
- Consult the Acute Pain Service if you have concerns regarding analgesia/sedation.

Minor burn injuries – minimal debridement

Minor burn injuries presenting to PED require assessment regarding the extent of analgesia required for their initial dressing. If it is only a small area requiring minimal debridement, intranasal fentanyl may provide adequate analgesia.

- If the child is comfortable on presentation PED staff can order a dose of intranasal fentanyl which can be administered immediately prior to the dressing.
- If a dose is required in PED for initial analgesia, PED staff can order an additional dose that may be administered immediately prior to the dressing.
- Intranasal fentanyl dose is 1.5 micrograms/kg.
- Paracetamol administered on presentation will assist fentanyl during the procedure and provide ongoing analgesia following the dressing.
- Ibuprofen and tramadol may also be used.

Minor burn injuries – requiring more debridement

These children will require a longer period of analgesia and will commonly require analgesia on presentation.

- Administer oral morphine syrup 0.5 mg/kg on presentation or if intranasal fentanyl is used, ensure there is a second order to be administered immediately prior to the dressing.
- Paracetamol administered on presentation will assist fentanyl during the procedure and provide ongoing analgesia following the dressing.
- Ibuprofen and tramadol may also be used.
- Staff will assess if an anxiolytic/sedative is also required.
- Children receiving midazolam + morphine syrup/intranasal fentanyl at this concentration will require a Type C or overnight admission for their care in Newland ward.

Routine oral dressing analgesia + sedation

This is the initial dosing regime for inpatient and day case patients requiring analgesia and sedation for children over 1 year requiring burn dressings.

- It may be adjusted in relation to specific child risk factors (refer to WCH procedural sedation guidelines).
- Alterations may need to be made to either the analgesic or sedative component for subsequent dressings e.g. morphine dose may need to be increased or changes made to the choice of sedative on evaluation of previous sedative experience.
Medication is usually given orally 30 to 45 minutes prior to the procedure as follows:

**Oral midazolam solution 0.5mg/kg (max 15mg) for children over 6 months.**

Intranasal midazolam can be used, if the child will not take the oral solution, however it stings during administration. Administer 5–10 minutes prior to commencing dressing.

Dose 0.2mg/kg (max 5mg)

Then either

**45 minutes prior to dressing oral morphine syrup: 0.5mg/kg for children over 1 year**

**OR**

**5 minutes prior to taking down dressing intranasal fentanyl: 1.5micrograms/kg**

If ordered, a second dose of intranasal fentanyl may be given a minimum of 30 minutes following previous dose.

If a child is particularly anxious regarding dressing changes the Acute Pain Service may choose to order oral clonidine as an adjunct to the above medications.

To be effective clonidine requires administration 90 minutes prior to the dressing and will prolong the recovery period because of increased somnolence.

9. Psychosocial Issues

When a child sustains a burn injury the consequences to their family's psychological, emotional, social and financial well-being can be profound. The impact will be determined by a wide range of factors, not necessarily by the size of the burn.

Interventions are aimed at promoting the psychosocial well-being of family members so that as primary caregivers they are in an optimal position to provide effective support for their child. As their injuries heal counselling with the child / young person may be beneficial.

Throughout the child's admission families may benefit from individual and family counselling and regular consultations with the burns team. The focus will change according to the stages of the healing process.

**Recommendations:**

**Acute phase**

- Psychosocial assessment focussing on the accident causing injury and family member's perceptions around this, past experiences of trauma, family dynamics, cultural and socio-economic factors, barriers to coping and family strengths and supports.
- Offer opportunities for family members to express emotions about the accident and normalize as appropriate
- Assist family members / caregivers to avoid catastrophizing and to manage coping with the unknown
- Identify and promote ways that family members can help with the care of their child
- Education with family members about age specific psychological / behavioural responses to trauma and how they may best comfort their children (patient and siblings)
- Helping families to manage other parts of their lives which have been impacted by the child/ young person's injury and admission to hospital

**Prior to discharge**

- Promote confidence in parents / caregivers by including them in wound care and scar management before discharge
- Address issues related to stigma and altered appearance including education about dealing with questions and comments from other people. Written material may help parents, siblings and the injured child prepare for various potential scenarios
- Referral to community agencies for extra support at home if required

**Rehabilitation phase**

- Ongoing support with adjustment for family and child
- Help manage cooperation between family and child's school
- Address and prepare for possible changes in body image concurrent with different stages of the child's life cycle
- Encourage families to access their own social supports and appropriate community resources

**Back to school**

- Preparation should begin as soon as possible including an assessment of the child's developmental level where appropriate.
- A gradual re-integration planned in collaboration with the family, school staff and the burns team will assist transition
- Offer individual and family counselling specifically around school issues prior to and during reintegration phase.
- Visit the school with the burns team to educate generally about burns, stigma associated with altered appearance and an assessment of the school environment for safety and access issues
> On going liaison (with parental permission) between the school and burns psychosocial team as needed.

The relationship between the burn injured child, their family and the burns team will continue throughout childhood. Monitoring for psychosocial issues at regular intervals will allow for a timely response to concerns as they occur.

Young people may develop strong emotional bonds to the burns team after years of reconstructive surgeries and therapy. Early preparation for transition to adult services may help ease anxieties related to change. Communication between paediatric and adult services may prevent some young people from disengaging from burns services once they have reached adulthood.

Further information can be found from the following resources:

www.changingfaces.org.uk
“Changing Faces: The way you face disfigurement”
www.siblingsaustralia.org.au
“Services for Siblings of Children with Special Needs”

10. Mandatory Reporting

It is not the task of medical, nursing or psychosocial staff in the Burn Team to evaluate the probability of abuse and neglect. However, it is part of the burns assessment to attempt to fully understand how the injury happened so as to help reduce the risks of similar injuries to other children. We should show that we understand the difficulties in watching the child constantly and how demanding it is to keep children safe.

Any suspicion of neglect or an inflicted injury requires mandatory notification to Families S.A. Child Abuse Report Line (ph 131478).

Indicators for a possible non-accidental burn include the following:

> delay in seeking help
> different accounts of history of injury over time
> injury inconsistent with history or with the developmental capacity of the child
> past abuse or family violence
> inappropriate behaviour/interaction of child or caregivers.
> obvious immersion patterns e.g. glove or sock patterns
> symmetrical burns of uniform depth
> restraint injuries on upper arms
> other signs of abuse or neglect such as numerous healed wounds.

Refer to: http://inside.wchn.sa.gov.au “Guidelines for reporting Child Abuse and Neglect”

11. Physiotherapy/Occupational Therapy

Major burn patients should be assessed within 24 hours of admission.

Chest physiotherapy

> Assess and treat if indicated.
> Consider triflow, PEP, bubble PEP
> Patients with an inhalation injury or large burns on a fluid resuscitation regime should be closely monitored.

Positioning

> Burn areas should be elevated to assist in the reduction of oedema. This should be modified if peripheral circulation is compromised.
> When a burn crosses a joint, the joint should be positioned to maintain an optimal functional ROM, ensuring that peripheral nerves are not compromised.

Head and Neck

> Elevate head of bed to 45°
> No pillows beneath the head – a bolster can be placed under the shoulders to
  – maximise air entry
  – extend the neck.
> Avoid pressure on the ears – foam doughnut ring can be used.

Axillae

> Shoulder abducted to 80° with 10°–30° of horizontal adduction (i.e. arm is slightly elevated from the bed.)
  – Young children – may use wrist ties attached to the cot with arms rested on baffling or foam wedges.
  – Older children use arm extensions attached to the bed with the addition of baffling or foam blocks.

Arm

> Elbow extended and supinated.
> Elbow splints may be required if maintaining extension is difficult.

Wrist/Hand

> Wrist: 30–45° extension
> Hand: In functional position
  – i.e. MCP F=70° with IP extension
  – thumb in palmar abduction
> Maintained using thermoplastic resting splints.
Lower Limb

> Elevate end of bed 30–40°
> Alternatively elevate the legs on baffling or pillows.

Hips

> Each hip in approximately 30° of abduction with neutral rotation/extension.
> A charnley pillow can be used.
> Prone lying for part of the day if possible.

Knees

> Extended and in neutral rotation. Splints may be required.

Ankles

> Plantar grade.
> May be maintained with foam-lined splints with relief for the heels.

Range of movement

Prior to Grafting

Mainly indicated for large deep burns over joints.

Aims

> Maintain full range of movement.
> Stretch multijoint muscles.
> Assist in reducing oedema.

Management

> Passive range of movement/stretches.
> Active/assisted exercises.
> Positioning/Splinting.
> Constructive play.
> Assist with daily living activities as appropriate.

Precautions

> Exposed tendons
  - Splint off stretch
  - Maintain tendon glide
  - Care with passive ROM i.e. not to end range, no composite flexion of hand
> Cellulitic areas
  - Splint in good position
  - Rest in splint until infection subsides
  - Mobilise.

Post Grafting

Aims

> Full range of movement as soon as possible after graft take.
> Normal functional use of the affected part as soon as possible.
> Keep elevated when rested until good function is achieved.
> Restore strength.

Upper limbs

> Positioning – The use of Hypafix® as a graft retention dressing has significantly reduced the need for splinting for graft take. Positioning the body area ± bed rest depending on site of burn, age of child and TBSA burned is usually sufficient for burns to limbs. Grafts over joints are usually protected with a plaster of paris backslab post operatively and may be replaced with a thermoplastic splint a week later.
> Commence gentle active movement once the graft has taken.
> From Day 10 post graft take passive overpressure may be used if necessary to regain range of movement.
> Protect vascularity when limbs are dependent (if applicable to site/area of burn).
  - Tubigrip/garment
  - Gloves may be appropriate.

Lower Limbs

> Positioning – hips in neutral; knees in extension and ankles in planter grade.
> POP backslabs may be replaced with Zimmer splints for the knees and padded ankle splints or off the shelf AFO’s for the ankles, a week later.
> Legs positioned as appropriate for the grafts and non-weight bearing should be observed at least until graft take.
> Elevate limbs.
> Assess graft take and stability.
> Commence ambulation once the grafts are stable.
> Protect vascularity when limbs are dependent (if applicable to site/area of burn).
  - Tubigrip®/garment
Mobilisation

Inspect graft

> If there is no bleeding and the graft is a healthy pink colour walking is commenced, with vascular support on the lower limbs. Walking commences initially for a few minutes only and is progressed according to the condition of the graft. It is recommended that the child keep moving when weight bearing to help prevent venous pooling in the limbs.
> Legs should be elevated at rest.
> Continue with elastic support until grafts/donor does not turn purple when dependent.

Scar management

> All burns that take longer than 14 days to heal, are grafted or retain a florid appearance have the potential for hypertrophy especially within 12 weeks of healing and are treated in accordance with the appearance of the scar.
> Once dressings are no longer required, healed burns should be moisturised and gently massaged. (Dermaveen, Sorbolene or vitamin E cream are appropriate moisturisers).
> Healed burns at risk of hypertrophy are reviewed regularly and assessed for signs of early scarring which would indicate need for scar management.
> Scar Management is tailored to the individual patient according to their site of burn, age and response to treatment and is continued until scar maturation, ie pale, soft and flat. This can take many months.

Common scar management treatments include:
> Various silicone gels
> Pressure garments such as gloves or vests
> Elastomer putty (Elastofix patches)

12. Dietary Requirements

Nasogastric tube

For burns >15% TBSA

Nutrition support is an important component of the overall medial management of paediatric burns patients. The aim of nutritional support is to:
> Promote optimal wound healing and recovery from burn injury;
> Decrease the risk of metabolic complications associated with feeding, and
> Provide nutrients to promote wound healing, normal growth and development.

It is well documented that improved nutritional status in the critically ill patient reduces the likelihood of complications (e.g. infection, poor wound healing) and the length of stay in hospital.

In particular, it is important that the child receives adequate amounts of protein and energy to meet their nutritional requirements for both wound healing and growth. A child with a burn injury may require twice the energy and protein compared to a healthy child of the same age. There are currently limited studies assessing the vitamin and mineral requirements for children with burns. Specific requirements for patients with severe burns have not been established however, provision of at least the RDI of nutrients that are known to be beneficial for wound healing (zinc, Vitamins A and C) have been suggested. The trace element requirements for paediatric burns patients remain undefined.

The Burns Unit Dietitian will assess relevant micro and macro nutrient intake from prescribed enteral feeds and any supplementation.

Common nutritional issues for children admitted to hospital with burns.

Children with burn injuries are often unable to meet their increased nutritional needs orally for a variety of reasons including:
> Pain and effect on appetite
> Sedation/medications and effect on appetite
> Disruptions to normal feeding patterns and frequent periods of fasting
> Amount of time asleep
> Change to environment / unfamiliar environment
> Unable to use mouth/hands to eat normally due to a burn injury
> Fussy eating.
Standard protocol for ALL burns patients

All patients admitted under the burns unit are to receive:

**Nutrition Information pamphlet**
> All parents with children admitted under the burns unit should receive the ‘Nutrition for Burns – a guide for parents and caregivers’ pamphlet prior to their child's discharge.

**High-energy snacks**
> All patients admitted under the burns unit are automatically commenced on high-energy snacks (nourishing snacks list). The nursing staff organise this.

**Indications for referral to the dietician**

Referral to a dietician for assessment would be recommended for:
> Burn ≥ 10% TBSA
> Burn to child <1 year
> Burn to area that affects oral intake (e.g. hands, mouth).

The medical team and Burns Adv. CPC may also refer a patient for nutritional assessment regarding concerns about oral intake or nutritional status. The dietician will make recommendations based on the nutritional assessment.

**Oral intake**

> All children admitted with burns receive high energy snacks (nourishing snacks list) to supplement intake. The nursing staff organise this by notifying the menu co-ordinator upon admission.
> Parents/caregivers and nursing staff can help by offering and encouraging small amounts of high protein, high energy food and drink at regular intervals. However it is important that children are not pressured to eat and the child should never be force fed.
> Recording of oral intake is considered essential in order to assess the adequacy of nutrient intake. Nursing staff have an important role in monitoring this by accurately documenting oral intake on the fluid balance/observation chart (AD 164). If nutrient intakes are suboptimal, enteral feeding may be required.

**Enteral Feeding**

> If enteral feeding is indicated it should be commenced within the first 24–48 hours (ideally within first 24hrs) of burn injury to optimize nutritional support / nutritional status for wound healing and decrease the risk of feeding complications.
> Feeds may be given continuously via an enteral feeding pump, as a number of boluses during the day, or a combination of both methods. Nasogastric feeds may be used in the short term. PEG feeds should be considered if long term feeding is required, or for severe burn injuries.
> Nasojejunal feeding should be considered if nasogastric feeding is not tolerated.
> A variety of different formulas are used for tube feeds. The feeding regime chosen will take into account age; gender, weight, type and extent of the burn injury, nutritional status prior to burn injury, special dietary needs and gastrointestinal function.
> Oral intake should be encouraged even when enteral feeding is being used. The transition phase from enteral feeding to oral feeding is an important one. It is important that the nasogastric tube be left in situ until it is clear that the child is able to achieve their requirements via the oral intake alone. The removal of a feeding tube prematurely may result in negative patient outcomes around wound healing, graft success, nutritional status, growth and length of hospital admission.
> If enteral nutrition is not tolerated, peripheral nutrition should be initiated.

**Monitoring**

> Regular weight checks and accurate food record charts are important tools for the nutritional monitoring of children with burns. Children should be weighed twice weekly using the same scales and without wet dressings wherever possible. All children should be weighed on arrival to the ward where possible.
> Regular weigh is the main tool used to establish if children are receiving the nutrition they need for wound healing and growth.
> Height/length to be measured when clinically appropriate.
All patients with >15% TBSA are supplemented with vitamins and minerals (as per burns unit doctors)

<table>
<thead>
<tr>
<th>Multi Vitamins</th>
<th>0–3 YEARS</th>
<th>Over 3 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pentavite infant 0.45ml daily</td>
<td>Pentavite mixture 5ml daily</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Iron supplement</th>
<th>0–30kg</th>
<th>Over 30kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5mg/kg (0.4ml/kg) daily Ferroliq (6mg elemental iron/ml)</td>
<td>Ferrogradumet 1 tablet (105mg) daily</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ascorbic Acid</th>
<th>&lt;2 years</th>
<th>&gt;2 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>250mg daily ½ tablet crushed</td>
<td>500mg daily crushed</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Zinc</th>
<th>For all ages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc Sulphate 1mg/kg/day (of elemental zinc) in 1–3 divided doses</td>
<td>For these reasons, children with severe forms of acute blistering disorders are often best managed by the multidisciplinary burns team. These disorders include:</td>
</tr>
<tr>
<td>Zine Sulphate capsule 220mg (elemental zinc 50mg)</td>
<td>&gt; SJS Steven-Johnson Syndrome</td>
</tr>
<tr>
<td>Zine Sulphate mixture 44mg/ml (elemental zinc 10mg/ml)</td>
<td>&gt; TEN – Toxic epidermal necrolysis</td>
</tr>
<tr>
<td>Note: if these patients are receiving enteral feeds they may already be receiving large doses of zinc from their feeds. Check current provision of zinc from enteral feeds with the Dietitian before prescribing.</td>
<td>&gt; SJS/TEN overlap</td>
</tr>
<tr>
<td>Zine Sulphate capsule 220mg (elemental zinc 50mg)</td>
<td>&gt; SSSS – Staphylococcal scalded skin syndrome</td>
</tr>
</tbody>
</table>

13. Acute Severe Skin Loss Disorders

Blistering can occur in many skin diseases in children with certain acute severe conditions being potentially life threatening. The problems associated with these diseases are similar to those patients with a major burn injury.51 These include:

- Risk of septicaemia
- Significant fluid loss and shifts
- Impaired thermoregulation
- Increased nutritional requirements
- Pain
- Specialised wound care and dressings

Definitions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Detachment area (% of TBSA)</th>
<th>Definition</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steven-Johnson Syndrome</td>
<td>&lt; 10%</td>
<td>A group of severe potentially life threatening exfoliative diseases of skin and mucous membranes, differing by the area of involved skin.</td>
<td>Predominately caused by an adverse drug reaction</td>
</tr>
<tr>
<td>Toxic epidermal necrolysis</td>
<td>&gt;30%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SJS/TEN overlap</td>
<td>10–30%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staphylococcal scalded skin syndrome</td>
<td>Mild &lt;10% Moderate 10–20% Severe &gt;20%</td>
<td>Rare potentially life threatening blistering skin disease caused by exfoliative staphylococcal toxins.</td>
<td>Staphylococcus aureus</td>
</tr>
</tbody>
</table>
14. References

35. Schlievert 1982 Enhancement of host susceptibility to lethal endotoxin shock by staphylococcal pyrogenic exotoxin type C Infect Immune 36 123
38. Frame et al 1985 The toxic shock syndrome in burned children Burns 11 234
39. McAllister et al 1993 Early diagnosis of staphylococcal toxemia in burned children Burns 1, 22
40. Brown et al 2003 Bacterial toxicosis/toxic shock syndrome as a contributor to morbidity in children with burn injuries Burns 29 733–8
41. Brown et al 2003 Bacterial toxicosis/toxic shock syndrome as a contributor to morbidity in children with burn injuries Burns 29 733–8


52. Ladhini S Recent developments in staphylococcal scalded skin syndrome. Clinical microbiology and infection. 7 (6); June 2001


57. Shiga S, Carlotto R. What are the fluid requirements in toxic epidermal necrosis? Journal of Burn Care and Research. 31 (1); January/February 2010.


Appendix

Appendix A Major Burn Flow Chart
Appendix B Code Brown Burns Disaster Flow Chart

**Paediatric Burns Disaster Plan Notification & Assessment Phase**

**Notification of an external disaster ‘CODE BROWN’**
In the event where Burns account for the significant number of injuries

SAAS or State Controller informs the hospital via the GRN in the PED of a CODE BROWN

Hospital Coordinator to relay the disaster phase to the:
- Chief Executive Officer/Executive on Call
- Executive Director – Acute Services

Nursing Divisional Director of Surgical Services
- Tracy Carroll notified 0401 125 629
- Burns Advanced Clinical Practice Consultant
  - Linda Quinn notified 0488 052 886

Burns Adv CPC will liaise with:
- Medical Head of Burns
- RAH Burns CSC
- Burns CN/ Newland Coordinator
- Burns Consultant on Call

Burns Adv CPC to obtain:
- Bed status
- Rosters
- Disaster Plan including updated Burns Nurse List
- Theatre Lists

Newland Shift Coordinator to:
- Arrange stock take

Nursing Divisional Director of Surgical Services will liaise with the following as required until activation stage:
- Medical Divisional Director of Surgical Services
- Management Facilitator /Out of Hours Hospital Coordinator
- CSC – Newland Ward, PSAS, Elective Surgery Manager
- Theatre Manager
Appendix C Toxic Shock Protocol

**TOXIC SHOCK PROTOCOL**

**Child with burns and temperature >39**

**Child has any of following:**
- Rash
- Irritability
- Diarrhoea +/- vomiting

**Child is well**

**Established shock**

**Bloods:** CBE, MBA20, Coags, CRP, septic screen (Urine, CXR, blood cultures)
- Start antibiotics
- Hourly observations

**Bloods:** CBE, MBA20, Coags, CRP, septic screen (Urine, CXR, blood cultures)
- Start antibiotics
- Hourly observations

**PICU review**

**IF ANY DETERIORATION**

**ANTIBIOTICS:**
- **Flucloxacillin** 50mg/kg up to 2g IV 6/24
- **Clindamycin** 15mg/kg up to 600mg IV 8/24

OR if any penicillin allergy / previous MRSA:
- **Vancomycin** 30mg/kg up to 1g IV 12/24
- **Clindamycin** 15mg/kg up to 600mg IV 8/24

If not responsive by 30 minutes:
- Start Immunoglobulin
- Consider adding Amphotericin B

Pending confirmation, do not delay management.
### INITIAL ASSESSMENT AND IMMEDIATE MANAGEMENT

<table>
<thead>
<tr>
<th>Time</th>
<th>Weight</th>
<th>Height</th>
<th>Temp</th>
<th>Pulse</th>
<th>Resp</th>
<th>SaO₂</th>
<th>BP</th>
<th>Pain Score</th>
</tr>
</thead>
</table>

### AIRWAY / BREATHING

- No to all questions below, no airway concerns (go to next section)
- Possible cervical spine injury
- Possible inhalation injury (confined space, combustible plastics?)
- Accessory muscle use / tracheal tug
- Hoarse cough or voice change
- Neck burns / oedema

### MANAGEMENT

- Cervical collar placed for any potential cervical spine injury
- ED Consultant notified / Code Blue called immediately for all potential inhalation injury
- Humidified O₂ by NRB at 8L/min for all inhalation burns
- Anaesthesia / PICU consulted for potential difficult airway
- Intubation / Surgical airway placed (document details on page 4)
- Arterial blood sent for: ABG / Carboxyhaemoglobin for inhalation injuries
- ASH

### CIRCULATION

- Minor, non-electrical burn (<10% TBSA), no circulation concerns (go to next section)
- 2 x IV cannulae placed for Burns >10%
- 0.9% normal saline bolus(es) of 20 ml/kg (_____ mL) for haemodynamic instability
- IV fluids started for all burns >10% TBSA (must have both of the following)
- Burn resuscitation with Hartmann’s solution using Modified Parkland Formula
  - 4 x weight (_____ kg) x % TBSA burnt (______ %) = _____ ml over 24 hours
  - 50% of total = _____ ml in first 8 hours from time of burn = _____ ml/hr now for _____ hours
  - 50% of total = _____ ml over next 16 hours = _____ ml/hr to start at time ______:____
- Maintenance fluids with 5% Dextrose and 0.45% Normal Saline (4ml/kg/hr for first 10kg body weight + 2 ml/kg/hr for next 10kg + 1 ml/kg thereafter) = _____ ml/hr starting now
- Venous blood sent for: CBE / LFTs / BGL / Coags / Group/Save for >25% TBSA
- Urinary catheter placed for all burns >10% TBSA or any genital / perineal burns;
  - goal urine output of 0.5 - 2ml/kg/hr (_____ - _____ mL/hr)

### DISABILITY / PAIN

- Glasgow Coma Score: Eyes_____ / 4 Verbal _____ / 5 Motor_____ / 6 Total_____ / 15
- Minor burns: oral Paracetamol or Oxycodeone (see Burns Guideline)
- Burns requiring minimal debridement: Intranasal Fentanyl ~1.5 mcg/kg (~ mcg, max 90 mcg)
- Given in PED and/or ordered to be given by Burns nurse immediately prior to debridement
- Burns requiring more debridement and admission: Follow Burns Guideline or APS

- Admitted patients / Major Burns >10% TBSA should have ongoing pain relief ordered by the Burns team

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**Guidelines for the management of Paediatric Burns**

**Appendix D Paediatric Burns Assessment Form (page 2)**
Appendix D Paediatric Burns Assessment Form (page 3)

EXPOSURE / ENVIRONMENT

<table>
<thead>
<tr>
<th>% TBSA</th>
<th>0-1 yr</th>
<th>1-4 yr</th>
<th>5-9 yr</th>
<th>10-14 yr</th>
<th>15 yr</th>
<th>Partial</th>
<th>Full</th>
<th>Thickness</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>Head (A)</td>
<td>19</td>
<td>17</td>
<td>13</td>
<td>11</td>
<td>9</td>
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<tr>
<td>Neck</td>
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<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
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<td>Act. Trunk</td>
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<td>13</td>
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</tr>
<tr>
<td>Post. Trunk</td>
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<td>13</td>
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</tr>
<tr>
<td>R.Butterck</td>
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<td>2.5</td>
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<td>2.5</td>
<td>2.5</td>
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<td></td>
<td></td>
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<tr>
<td>L.Butterck</td>
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<td>R.Upper arm</td>
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<tr>
<td>L.Upper arm</td>
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<tr>
<td>R.Lower arm</td>
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<tr>
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<tr>
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<td>R.Foot</td>
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<tr>
<td>L.Foot</td>
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<td>3.5</td>
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<td></td>
</tr>
</tbody>
</table>

Lund and Browder chart completed at left
* If TBSA >15% circulation section of form MUST be completed

- Individual burns drawn on body chart and features such as colour, exudate, blisters, pain, sensation, estimated depth, contamination or infection noted in space provided
- Other examination findings noted above (include medical findings and secondary survey for trauma)
- Log roll to assess potential spinal injury
- Cool running water immediately for 20 minutes if not previously done and presenting within one hour of burn
- Chemical burns irrigated for one hour or until pain stops if not previously done
- Warming commenced for hypothermia (blankets, Bair hugger etc)
- All jewellery / constrictive clothing removed
- Burns registrar notified for any circumferential burns of extremities (possible need for escharotomy)
- Urinary catheter placed for all genital/perineal burns (see circulation section for goal UOP)
- Burn-aid cream removed and burns wrapped in gladwrap if burn unit review imminent
Appendix D Paediatric Burns Assessment Form (page 4)
Completed By: ____________________________                     Date ____ / ____ / ____
Appendix D Paediatric Burns Assessment Form (page 6)

**PATIENT SUMMARY:** (to be completed by Burns M.O. at time of discharge)

- Admission date: ____ / ____ / ____
- Discharge date: ____ / ____ / ____
- Consultant: _______________________
- Final estimated % TBSA: _______
- Burn distribution / depth: ________________

**MANAGEMENT:**

- Debridement in theatre: Yes / No Date(s): ________________
- Skin graft: Yes / No
- Split skin graft:
  - Area: ___________________%TBSA: _______ meshed Yes / No Dated: ____ / ____ / ____
  - Area: ___________________%TBSA: _______ meshed Yes / No Dated: ____ / ____ / ____
  - Area: ___________________%TBSA: _______ meshed Yes / No Dated: ____ / ____ / ____
  - Area: ___________________%TBSA: _______ meshed Yes / No Dated: ____ / ____ / ____
- Donor sites: ___________________________________________________________
- Other: Integra / Biobrane / CEA site: ____________________________ Dated: ____ / ____ / ____
  - Integra / Biobrane / CEA site: ____________________________ Dated: ____ / ____ / ____
- Positive swabs / cultures Date: ____ / ____ / ____ Organism: __________________ Site: ________________
  - Date: ____ / ____ / ____ Organism: __________________ Site: ________________
- Antibiotics: Yes / No: IV / po / topical: __________________ Duration: ________________
- Other injuries / comorbidities: ___________________________________________
- Complications: _______________________________________________________
- Child protection / FAYS involvement: Yes / No Outcome: ____________________

**NURSING DISCHARGE CHECKLIST**

- Current dressings: _______________________________________________________
- Follow up: OPD / Day case Date: ____ / ____ / ____ Time: ____ : _____
- Parent / carer education (eg dressing care/signs of infection)
- Parent information brochure given
- Discharge medication

- Discharge date: ____ / ____ / ____ Discharge to care of: ___________________________
- Completed by: ___________________________________________________________(print clearly)
Appendix E Burns Referral Form

Referral to Women's and Children’s Hospital Burns Service

Client details:
Surname:                   First Name:                  Middle Name/s:
Date of Birth:                  Gender:     WCH UR No.                 (Enter if known)
Address:                       Suburb:
Post Code:
Medicare No:                   Expiry Date:

Is the client of Aboriginal or Torres Strait Islander origin?
Is the client under the Guardianship of the Minister?

Parent/ Caregivers full name:
Phone contact:  Home:                  Work:                   Mobile:

Burn Details:
Date of burn:      Approximate time of burn:
Cause:
Site:                       % TBSA:
First Aid:
Estimate of Depth:

Dear Burns Team
Reason for referral:

Past Medical History Please note any current medications, immunisations or allergies that may impact on this patient's care

Has a Photographic Consent Form been completed?

Referring Clinic Details:
Referring Doctor Name:                     Surgery Name:
Provider No:                  Contact Phone:
Address:                      Suburb:                  Post Code:

Signature: ________________________________  Date: _____/____/______

Has this digital referral to the Women's and Children's Hospital been discussed with the Parent/ Caregiver

Do you wish further input from the Women’s and Children’s Hospital Burns Service

Email this form to: childrensburns@health.sa.gov.au

Telephone: 08 8161 7000 - During business hours, ask for the Burns Advanced Clinical Practice Consultant or After Hours ask for the Burns/Surgical Registrar.
Appendix F Electrical Injuries Protocol

**Electrical Injuries Protocol**

Patient presents to PED following electrical injury

- Assess ABCD
- Resuscitate as necessary
- Perform secondary survey

- Perform baseline ECG

**<1000 Volts**
- Low voltage injury
  - *No burns*
  - Asymptomatic
  - No associated injuries

- No monitoring required
- Discharge

**>1000 Volts**
- High voltage injuries
- Lighting injuries
- Low voltage injuries with *significant burns*
- Other associated injuries
- Loss of consciousness
- Abnormal initial ECG

- Admit to PICU / HDU for cardiac monitoring
- IDC to monitor urine output and haemoglobinuria

**Low voltage injury with small burns not requiring admission**
- Asymptomatic
- No loss of consciousness
- Baseline ECG normal

- No monitoring required
- Discharge
- Burns OPD follow up