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.
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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 (2017)’.

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:

- Surgical Consultant Team
  - Mr Bernard Carney (Head of Unit)
  - Dr Michelle Lodge
  - Dr Amy Jeeves
  - Dr Rebecca Cooksey
  - Dr Darren Molony
- Burns Advanced Nurse Consultant
  - Ms Linda Quinn
- Burns Fellow
- Burns Registrar
- Burns RMO
- Social Worker
  - Liz Davies
- Physiotherapist
  - Brett Hermann
- Occupational Therapist
  - Vanessa Timbrell
- Dietician
  - Melissa Colombo

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% 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 (2017).

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 Burns Registrar

To arrange a burns outpatient clinic appointment
Call: 08 8161 7000
During hours ask for: Burns Advanced Nurse Consultant
Out of hours ask for: On Call Burns Registrar

Fax referral to: 08 8161 6246

To arrange a referral and review of digital photos
Call: 08 8161 7000
During hours ask for: Burns Advanced Nurse Consultant
Out of hours ask for: On Call Burns Registrar

Generic email for Digital Burns Referral Service
childrensburns@health.sa.gov.au

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 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. Cover with non-adherent dressing (e.g. cling wrap). Warm the patient. Seek medical advice.

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.

Refer to APPENDIX A: major burn flow chart

Ice should never be used – it causes vasoconstriction leading to further tissue damage and hypothermia.

Gel Pads (such as Hydrogel, BurnaidTM) 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.

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.

4. Cervical Spine Protection

5. ECG

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
2. Remove all contaminated clothing
3. Powdered agents should be brushed from the skin
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

Hydrofluoric acid
Refer to Appendix F & G

Note: Calcium gluconate (1g/10mL) and 2.5% calcium gluconate burn gel is no longer stocked at the WCH but is available from the RAH Emergency Department if required. 2.5% calcium gluconate burn gel can also be sourced from the RAH Burns Unit.
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.

- 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 injuries
   A. Airway Maintenance with Cervical Spine Control
      > Ensure airway patent
      > Appropriate c-spine immobilisation e.g. sandbag inline stabilisation or collar
   B. Breathing and ventilation
      > Expose the chest and assess ventilation
      > Administer oxygen to all patients with a major burn

> 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 injury
   - 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
> Commence formal intravenous resuscitation for burns >10% TBSA (See section F)

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 warm
> Calculate the burn size using the Paediatric Lund and Browder chart
> Refer to APPENDIX C: Paediatric Burns Assessment Form
> Log roll to visualise posterior surfaces
F. Fluid Resuscitation
> With Hartmann’s Solution Calculated using the Parkland Formula
4ml x weight (kg) x % 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
> The time of injury marks the start of fluid resuscitation
> Adjust fluids as indicated by urine output
> Output should be at least:
1 ml/kg/hr
Children also require maintenance fluids with 5% dextrose and 0.9% Normal Saline (4ml/kg/hour for the first 10kg + 2 ml/kg/hour for next 10kg + 1ml/kg thereafter) e.g. 24kg Child

<table>
<thead>
<tr>
<th>40</th>
<th>20</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>64ml/hr</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Analgesia
Intravenous morphine titrated to effect
0.05-0.1mg/kg
(See analgesia for minor burns and procedural doses page 17)

Tests and Tubes
> Trauma series X-rays
> Urinary catheter if receiving fluid resuscitation
> Nasogastric tube for >15% TBSA

Secondary Survey
> 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.

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 electrical injury. 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 electrical injury:
1. Abnormal ECG on presentation
2. Loss of consciousness at time of electrical injury
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 electrical injury

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

See Appendix E 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

NO

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

YES

What type of blister is it?

Thin

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

Thick

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

NO

Burn colour

Red

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

White

FULL THICKNESS
Other signs: No sensation, no capillary refill, may be charred, black, tan, dry with no blisters.
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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>
<th>Deep-Dermal</th>
<th>Full Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="image1" alt="Epidermal" /></td>
<td><img src="image2" alt="Superficial Dermal" /></td>
<td><img src="image3" alt="Mid-Dermal" /></td>
<td><img src="image4" alt="Deep-Dermal" /></td>
<td><img src="image5" alt="Full Thickness" /></td>
</tr>
</tbody>
</table>

**Assess Depth**

**Epidermal**
- **Appearance** – pink or red erythema with no blisters.
- **Capillary return** – Rapid <2 seconds.
- **Sensation** – painful.
  Most common cause is sunburn.
  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.

**Superficial Dermal**
- **Appearance** – Wet, pale pink or blotchy with blisters. Epidermis may not lift off for 12 to 24 hours increasing risk of inaccurate assessment of burn as superficial epidermal.
- **Capillary return** – Brisk <2 seconds.
- **Sensation** – Very painful as sensory nerves are exposed.

**Mid-Dermal**
- **Appearance** – Red, dark pink, white with blisters.
- **Capillary return** – Sluggish, varies with depth.
- **Sensation** – Adequate.
  Susceptible to conversion to a deeper thickness wound.

**Deep-Dermal**
- **Appearance** – Blotchy red due to extravasation of haemoglobin, or mottled or waxy and white. Will sometimes have blisters.
- **Capillary return** – Absent.
- **Sensation** – Absent.
  Very prone to conversion to a deeper injury and to infection.

**Full Thickness**
- **Appearance** – 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.
<table>
<thead>
<tr>
<th>Burn</th>
<th>Epidermal</th>
<th>Superficial Dermal</th>
<th>Mid-Dermal</th>
<th>Deep-Dermal</th>
<th>Full Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Dressing</td>
<td>Moisturiser</td>
<td>Hydrocolloid®</td>
<td>Mepilex Ag®</td>
<td>Mepilex Ag®</td>
<td>Acticoat®</td>
</tr>
<tr>
<td>(Dependant on size of burn, exudate, and contamination)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mepilex Ag® Transfer®</td>
</tr>
<tr>
<td>Follow up</td>
<td>None</td>
<td>Local follow up +/- Digital Referral Service</td>
<td>Local follow up +/- Digital Referral Service</td>
<td>Local follow up +/- Digital Referral Service</td>
<td>Local follow up +/- Digital Referral Service</td>
</tr>
<tr>
<td>Outcome</td>
<td>May require hospitalisation for pain management</td>
<td>Will heal in 7–10 days as epidermal appendages remain intact</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>
<td>Will heal in 2–3 weeks, as epidermis, dermis, and epidermal appendages are lost. If infected may convert to full thickness injury requiring grafting</td>
<td>Large areas will not heal without surgical intervention; small areas may heal from the edges after several weeks. This wound will not re-epithelise and whatever area of the wound is not closed by wound contraction will require skin grafting</td>
</tr>
</tbody>
</table>

If there is no epidermal loss, use moisturiser only several times a day. Sun protection advice: Hats and clothing SPF Factor 30+. Sun exposure will enhance the healing process.

Follow up: If there is no epidermal loss, use moisturiser only several times a day. Sun protection advice: Hats and clothing SPF Factor 30+. Sun exposure will enhance the healing process.

Outcome: May require hospitalisation for pain management. Will heal in 3–5 days with no resulting cosmetic blemish.

Follow up: If there is no epidermal loss, use moisturiser only several times a day. Sun protection advice: Hats and clothing SPF Factor 30+. Sun exposure will enhance the healing process.

Outcome: May require hospitalisation for pain management. Will heal in 3–5 days with no resulting cosmetic blemish.

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Outcome: May require hospitalisation for pain management. Will heal in 3–5 days with no resulting cosmetic blemish.
### 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>
<tbody>
<tr>
<td>Acticoat®&lt;br&gt;Fixed with Hypafix®</td>
<td>Partial/Full thickness</td>
<td>&gt; All areas of the body, except in the perineum&lt;br&gt;Colonised but not infected burns&lt;br&gt;Non-infected burns</td>
<td>3–7 days</td>
</tr>
<tr>
<td>Mepilex Ag®&lt;br&gt;Fixed with Hypafix®</td>
<td>Partial/Full thickness</td>
<td>&gt; All areas of the body, except in the perineum&lt;br&gt;Colonised but not infected burns&lt;br&gt;Non-infected burns</td>
<td>4–7 days</td>
</tr>
<tr>
<td>Aquacel-Ag®</td>
<td>Superficial/ Partial thickness</td>
<td>&gt; All areas of the body except over joints or in the perineum.&lt;br&gt;Colonised but not infected burns&lt;br&gt;Non-infected burns</td>
<td>Until dressing separates from wound. Do not take dressing off unless infected.</td>
</tr>
<tr>
<td>Hydrocolloids:&lt;br&gt;Duoderm®&lt;br&gt;Comfeel®&lt;br&gt;(Hypafix to secure edges)</td>
<td>Superficial/Partial Thickness</td>
<td>&gt; Flat surfaces&lt;br&gt;Not suitable for infected burns</td>
<td>Up to 7 days or sooner if there is excessive exudate or loss of dressing.</td>
</tr>
<tr>
<td>Flamazine® (SSD, (silver sulfadiazine)&lt;br&gt;Generously soaked in gauze and wrapped in dry gauze/crepe bandages</td>
<td>Full thickness/infected/contaminated burns</td>
<td>&gt; ALL areas of the body except the face.</td>
<td>Change daily&lt;br&gt;Admission may be necessary DO NOT USE in children &lt;6 MONTHS OF AGE</td>
</tr>
<tr>
<td>Hypafix®</td>
<td></td>
<td>&gt; Dressing fixation&lt;br&gt;Scar management</td>
<td>At least once a week or as necessary.</td>
</tr>
<tr>
<td>White soft paraffin</td>
<td>Face, buttocks, genitalia</td>
<td>&gt; Only areas that cannot be covered with dressings: face, buttocks, genitalia</td>
<td>At least three times a day or as necessary. Admission is usually indicated.</td>
</tr>
<tr>
<td>Topical antibiotic ointment e.g. mupirocin (Bactroban)</td>
<td>Face, perineum, or any other area that may be infected</td>
<td>&gt; All areas of the body</td>
<td>Twice a day or prescribed for infected burns.</td>
</tr>
</tbody>
</table>
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 Clinical Procedure Facial Burns Management.

If requiring enteral feeds consider securing NGT/TPT with AMT Bridle®.

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

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.

Consider using colloidal moisturiser in healed burns. Non-sedating antihistamines provide a safe option for children:

<table>
<thead>
<tr>
<th>First Line treatment</th>
<th>Oral cetirizine (1mg/mL syrup or 10mg tablets)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td><strong>Dose</strong></td>
</tr>
<tr>
<td>Infants 6 month-1 year</td>
<td>0.125mg/kg/dose TWICE daily prn</td>
</tr>
<tr>
<td>Age 1-2 years</td>
<td>2.5mg TWICE daily</td>
</tr>
<tr>
<td>Age 2-6 years</td>
<td>5mg ONCE daily OR 2.5mg TWICE daily</td>
</tr>
<tr>
<td>Age 6-12 years</td>
<td>10mg ONCE daily OR 5mg TWICE daily</td>
</tr>
<tr>
<td>Age 12-18 years</td>
<td>10mg ONCE daily</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Second Line treatment</th>
<th>Ranitidine oral liquid (15mg/mL) injection (25mg/mL) tablet (150mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td><strong>Dose</strong></td>
</tr>
<tr>
<td>1-6 months</td>
<td>1mg/kg TWICE daily</td>
</tr>
<tr>
<td>6 months-18 years</td>
<td>2.5mg/kg (max.150mg) TWICE daily</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Third Line treatment</th>
<th>Promethazine oral liquid (1mg/mL) tablet (10mg and 25mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td><strong>Dose</strong></td>
</tr>
<tr>
<td>&gt;2 years</td>
<td>0.125mg/kg THREE times daily (max 12.5mg/dose)</td>
</tr>
</tbody>
</table>
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 sepsis.

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.

Refer to APPENDIX B: Toxic Shock Protocol

Hypermetabolic State

The hypermetabolic state is an extensive and prolonged period of catabolism and inflammation that persists beyond 12 months after a major burn. This state leads to loss of lean body mass, reduction in bone mineral density, lipolysis, delayed wound healing and an extended length of stay. Whilst excision of the burn scar remains the most important factor in attenuating this process, there have been numerous recent studies examining the role of various medications in reducing the impact of the hypermetabolic state. After extensive literature review and discussion with other paediatric burn units, the WCH Burn Service have incorporated Propranolol and Oxandrolone into its treatment algorithm for all burns over 30% TBSA.

Propranolol:

Major burns place a significant stress on the heart via several mechanisms including the release of catecholamines. Propranolol has been used safely in the paediatric population for decades and, its successful use in major trauma cases, lead to trials in major paediatric burns with great success. Herndon et al found propranolol reduced the impact of major burns on the heart whilst also reducing lipolysis and improving recovery.

Patients: All major burns greater or equal to 30% TBSA should receive propranolol. Burns above 20% TBSA may be considered at the discretion of the treating team.

Dose: 1mg/kg/day divided into 4 doses and titrated up to achieve a reduction in heart rate of 20% or a maximum dose of 4mg/kg/day

Commencement: Optimally propranolol should be introduced within the first 72 hours of the burn during the ebb phase of the hypermetabolic state.

Monitoring: All patients require close monitoring of heart rate and blood pressure every 2 hours and 4 hourly blood glucose monitoring for the first week. CBE, EUC, LFTS and CMP bloods should also be sent prior to commencement.

Length of treatment: Patients should remain on therapy for the first 6 months following the burn with review by cardiology and endocrinology for consideration of extending treatment to one year post burn.

Oxandrolone:

The anabolic effects of oxandrolone have been found to reduce the loss of lean body mass and bone mineral density that occurs during the hypermetabolic state induced by major paediatric burns. Overall muscle power, along with wound healing and infection rates, have also been found to be improved by oxandrolone, without significant side effects or androgenic complications. Propranolol and oxandrolone also appear to have synergistic properties as reported by Herndon et al.
Patients: All major burns greater or equal to 30% TBSA should receive propranolol. Burns above 20% TBSA may be considered at the discretion of the treating team.

Dose: 0.1mg/kg twice daily

Commencement: Optimally oxandrolone should be introduced within the first 72 hours of the burn during the ebb phase of the hypermetabolic state.

Monitoring: Routine monitoring of the patient should occur. Prior to commencement liver function should be assessed and testosterone and IGF-1 levels should be assessed and compared with post commencement levels. Routine bloods, CBE, EUC, LFTS and CMP, should also be sent prior to commencement.

Length of treatment: Patients should remain on therapy for the first 6 months following the burn with review by endocrinology for consideration of extending treatment to one year post burn.

7. Other Medication Requirements

Iron infusions in burns:
Burns, particularly larger burns, can be associated with a significant haemoglobin drop, both from perioperative bleeding and related to the pathological changes associated with the burn injury. Iron infusions have been used to good effect in numerous settings, including acute paediatric injuries, where anaemia complicates a patient's admission. Iron infusion should be considered for any child with a burn and associated iron deficiency anaemia. Guidelines for implementation can be found under the WCH intranet intravenous guidelines section.

Tranexamic acid in burns:
Burn wound debridement and grafting can be complicated by bleeding with potentially severe consequences. A study by Budny et al, suggested as much as 3.4% of the patient's blood volume can be lost per 1% of TBSA grafted. Whilst multiple modalities should be used to reduce intraoperative blood loss, including adrenaline soaked sponges, diathermy and tourniquet use, tranexamic acid offers a safe, additional option for larger TBSA burns. Tranexamic acid has been used extensively in paediatric craniofacial surgery and has achieved good success in reducing blood loss and the need for blood transfusion in major adult burns.

Currently our unit uses a single dose of tranexamic acid at the start of a case for all burns with an area to be grafted equal to or greater than 5% TBSA. A maintenance dose may be required for predicted graft area size greater than 20% TBSA.

Loading dose: 50-100 mg/kg given undiluted over 15 minutes.

Maintenance dose: if required, 10 mg/kg/hour given undiluted for the duration of anaesthesia

Enoxaparin in burns:
Recent audit undertaken by the unit found that major burns, those greater than 30% TBSA, have an increased risk of central intravenous line and deep vein thrombosis. All major burns should therefore be considered for prophylactic enoxaparin or heparin from day one of admission. Patients above the age of 13 with risk factors such as obesity, should also be considered for prophylactic enoxaparin or heparin. Haematology and Pharmacy should be consulted as required for dosing.

8. Infection Control

All patients

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

  - 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: “Patients colonised or infected with Multi Resistant Organisms (MROs) – Management of”.
  - 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, wash bowl, 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: “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 Technique (AT)
  – Personal Protective Equipment (PPE) relevant to the task.

9. 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 Nurse Consultant – Pain Management (pager 4302). Out of hours contact the Duty Anaesthetist (Direct dial 50217). Many 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.
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
> 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
> 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®, Tramadol SR or Methadone.
2. Breakthrough analgesia using an immediate acting medication e.g. oxycodone, tramadol.

Smooth transition to oral background analgesia: start oral analgesics 4 hours before the infusion/PCA is ceased. Smooth transition to breakthrough analgesia: start oral analgesics 30 minutes–1 hour before the infusion/PCA is ceased. Recommended medication orders for oral background and breakthrough analgesia are as follows:

Oral background:

After careful consideration and opportunity to assess the patients response to immediate release opioids, slow release opioids in a previously opioid-native patient maybe considered.

MS Contin® (suspension or tablets): starting dose 0.6mg/kg/dose 12 hourly PO 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 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 monitoring 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.

Methadone: (liquid or tablets)

0.1-0.2mg/kg/dose 8–12 hourly PO regularly (for opioid naive)

Oral breakthrough:

Oxycodone:

≥1 year: 0.1-0.2mg/kg/dose 4 hourly PRN
<1 year: 0.05-0.1mg/kg/dose 4 hourly PRN

And may include one or both of the below options

Ibuprofen:

For infants >3 months of age
5-10mg/kg/dose 6–8 hourly PRN, max 3 doses in 24 hours (Cease/hold 48 hours prior to surgery/grafting) NB: consider diclofenac suppository if oral route not appropriate

Tramadol:

Not for infants <12 months of age
0.5-1mg/kg/dose 6 hourly PRN

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:**

≥1 year: 0.1-0.2mg/kg/dose 4 hourly PRN
<1 year: 0.05-0.1mg/kg/dose 4 hourly PRN

**Ibuprofen:**

*For infants >3 months of age*

5-10mg/kg/dose 6–8 hourly PRN, max 3 doses in 24 hours (cease/hold 48 hours prior to surgery/grafting)

*NB: consider diclofenac suppository if oral route not appropriate*

**Tramadol:**

*Not for infants <12 months of age*

0.5-1mg/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

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 Contir®, 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 most analgesia via the IV route. Please note that when morphine 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 Contir®, 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, cerebral palsy or are <1year old.

> Consult the Acute Pain Service if you have concerns regarding analgesia/sedation.

> Promote distraction therapy including movies, play therapist.

### Minor burn injuries – minimal debridement

Minor burn injuries presenting to PED require assessment regarding the amount 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/dose

> 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 (immediate release) syrup 0.5 mg/kg/dose 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 if not contraindicated.

Staff will assess if an anxiolytic/sedative is also required.

Children receiving midazolam + an opioid may require admission to Newland ward for their care particularly if administered in the evening/overnight.

**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 30–45 minutes prior to the procedure as follows:

**Oral midazolam solution 0.5mg/kg (max 15mg) for children over 12 months.**

**Intranasal midazolam** can be used, if the child will not take the oral solution, however it stings during administration. Administer 15–20 minutes prior to commencing dressing. Intranasal midazolam dose: 0.2-0.3mg/kg/dose (max 10mg/dose)

Then either

- **30–60 minutes prior to dressing oral morphine syrup: 0.5mg/kg/dose for children over 1 year.**

  OR

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

  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 60–90 minutes prior to the dressing and will prolong the recovery period because of increased somnolence.

**Entonox®** (pre-mixed Nitrous Oxide and Oxygen 50:50): Entonox® can provide analgesia, anxiolysis and some sedation for short term painful procedures. It has a short duration of action with rapid onset and wears off in 5 minutes. Recommended for children ≥ 5 years of age who are able to understand and have the manual dexterity to manage the self-demand system. Refer to WCH clinical procedure for contraindications.

10. **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.

Education Pathway

- 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"

11. Mandatory Reporting

It is part of the burns assessment to attempt to 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 The Department for Child Protection. Child Abuse Report Line (ph 131 478).

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.


12. 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/stretching.
> 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, i.e. 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)
- CO₂ laser therapy

CO₂ laser therapy for hypertrophic burn scars:
CO₂ laser therapy is a new and changing technique for managing and lessening the impact of hypertrophic burn scars. Stimulated beams of light target water molecules in the scar, which results in small areas of micro trauma. This results in remodelling of the scar making the scar softer and flatter. Itch and pain associated with burn scars may also be reduced.

Treatment plan:
- QV wash clean of the area to be treated
- Mark the appropriate areas for different laser therapy types
- SCAAR FX and/or Deep FX first, Active FX second
- A cool flannel can be applied for analgesia and topical LMX cream can be massaged into the treated area
- Hypafix should be applied or paraffin if on the face
- Laser can be provided as an adjunct to steroid injection, z-plasties and other reconstruction options
- Sunscreen and sun protection must be diligently worn for 12 months following treatment
- Laser therapy can be provided every 3-6 months to ensure assessment of the success of the treatment is observed prior to subsequent treatments
- Other scar therapies, such as gel pads and compression garments, can be restarted one week following treatment

Our technique is utilise SCAAR FX on thicker scar bands with Deep FX for blending the edges into the normal skin and on thinner scars. Active FX can then be used to ablate scar ridges and resurface scars.

Settings are dependent on the thickness of the scar, region of the body and response to laser. We will titrate these settings to the patient’s intraoperative response.

Typical
- SCAAR FX: density 1%, power 90-150MJ, rate 250hertz
- Deep FX: density 5%, power 20-35MJ, rate 300hertz
- Active FX:
  - Resurfacing: density 2 or 3%, power 70-90MJ, rate 150 hertz
  - Ablating: density 1%, power 100-120MJ, rate 200hertz
13. Nutrition

Nasogastric tube
For burns >15% TBSA

Nutrition support is an important component of the overall medical 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 requirement or 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, selenium, copper, iron and vitamins A, C, D and E) have been suggested. Supplemental enteral glutamine has also been shown to be beneficial for reducing infective complications and promoting wound healing however; at the time of this review no enteral glutamine formulations are available for use in Australia. 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 dietitian**

Referral to a dietitian 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

> Children with burn injuries >10–15% TBSA commonly struggle to meet their requirements without the use of enteral feeding.

> Enteral feeding is indicated in the following groups of patients:
  – Burns <15% TBSA with an inability to meet requirements via oral intake alone
  – Burns >15% TBSA enteral feeding should be commenced as early as possible.

> 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.

> A bridle tube should be considered where there is a risk/ incident of frequent NGT removals by the child and enteral feeding is still indicated.

> 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 weighs are 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.

> For children who are inpatients for > 3 months, micronutrients including Vitamins D, A, E, selenium, copper and zinc should be monitored and corrected where appropriate.

> On discharge, if the patient requires ongoing supplementation, this should be reviewed after 3 months.
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></td>
<td>Centrum Advance ½ tablet, crush and add cordial. Consider using Pentavite Infant 0.45mL daily if difficulty in administering Centrum Advance</td>
<td>Centrum Advance 1 tablet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Iron supplement</th>
<th>0–30kg</th>
<th>Over 30kg</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.5mg/kg (0.4mL/kg) daily Ferroliquid (6mg elemental iron/ml)</td>
<td>Ferro- F-tab 1 tablet (105mg) folic acid 350micrograms daily</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></td>
<td>250mg daily ½ tablet crushed</td>
<td>500mg daily crushed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Zinc</th>
<th>For all ages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Elemental zinc 1mg/kg/day in 1–3 divided doses. 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 Dietician before prescribing. Available forms of zinc: Capsule 50mg elemental zinc (220mg zinc sulphate) Mixture 10mg/mL elemental zinc (44mg/mL zinc sulphate)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vitamin D</th>
<th>For all ages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colecalciferol</td>
<td>Oral 25 micrograms (1000 international units) once daily * Available as: Liquid 25 micrograms (1000 international units) /0.5mL Tablet 25 micrograms (1000 international units)</td>
</tr>
</tbody>
</table>

*Please check serum 25-hydroxy vitamin D concentration when initiating supplementation then dose
14. 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. These include:

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

For these reasons, children with severe forms of acute blistering disorders are often best managed by the multidisciplinary burns team.

These disorders include:

> SJS – Steven-Johnson Syndrome
> TEN – Toxic epidermal necrolysis
> SJS/TEN overlap
> SSSS – Staphylococcal scalded skin syndrome

**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>
15. References


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


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


44. Australian and New Zealand Burn Association (ANZBA), 2007, “Burn Survivor Rehabilitation: Principles and Guidelines for the Allied Health Professional”.


47. European Burns Association “Working with Families and Siblings”

48. WCHN Procedure, 2012. Management of patients colonised or infected with multi-resistant organisms (MROs)

49. WCHN Procedure, 2011. Toy Use within the Health Care Setting

50. WCHN Procedure 2013 Hand Hygiene and Hand Care PR2013_036


Propranolol and oxandrolone:


Tranexamic Acid:

Thromboprophylaxis in major burns: based on our own research:

Iron supplementation:
Appendix

Appendix A Major Burn Flow Chart
Appendix B Toxic Shock Protocol

Any child with burns and temperature >39
Inform Burns Fellow (in hours) or Burns Registrar (after hours) +/- Burns consultant

Child is well

Child has any of following:
- Rash
- Altered mental state
- Diarrhoea +/- vomiting
- Hypotension (as per red zone in RDR chart)
- Tachycardia (as per red zone in RDR chart)

Bloods: CBE, EUC, LFTs, Coags, CRP, septic screen (Urine, CXR, blood cultures)
Swab burn
MRSA screening
IV access
Start IV antibiotics
Hourly observations
Regular MO review

Bloods: CBE, EUC, LFTs, Coags, CRP, septic screen (Urine, CXR, blood cultures)
Swab burn
MRSA screening
IV access
Start IV Antibiotics + IV immunoglobulin
IV fluid therapy
PICU medical review
Admission to PICU or HDU
ID referral
Dressing change
Contact Burns consultant

IF ANY DETERIORATION

Antibiotics (No penicillin allergy):
- IV flucloxacillin 50mg/kg (up to 2g) per dose, 8hrly
- PLUS
- IV clindamycin 15mg/kg (up to 600mg) per dose, 8hrly
- PLUS
- IV vancomycin 30mg/kg (up to 1.5g) 12hrly

Antibiotics (Non-severe penicillin allergy):
- IV cefazolin 50mg/kg (up to 2g) per dose, 8hrly
- PLUS
- IV clindamycin 15mg/kg (up to 600mg) per dose, 8hrly
- PLUS
- IV vancomycin 30mg/kg (up to 1.5g) 12hrly

Antibiotics (Severe/life threatening penicillin allergy):
- *IV vancomycin 30mg/kg (up to 1.5g) per dose, 12hrly
- PLUS
- IV clindamycin 15mg/kg (up to 600mg) per dose, 8hrly

*Check most recent EUC to ensure that renal function has been normal. Contact Infectious Diseases for dosing advice if concerns.
- Prior to subsequent vancomycin doses, ensure that renal function has been checked. If it has deteriorated, discuss with Infectious Diseases team before next dose of vancomycin.
- Check trough vancomycin levels prior to 4th dose. Hold the 4th dose until the trough level has been checked.
- No non-steroidal anti-inflammatory drugs, including ibuprofen, to be given whilst patient on

Special note: Consider daily Flamazine dressing.
Urgent gram stain and susceptibilities notify SA Pathology on 8161 7483

ANTIBIOTICS:
See over for recommended regime.

Review Antibiotic continuation at 48 hours – observations & clinical situation

Page 3 of 5
## Appendix C Paediatric Burns Assessment Form (page 1)

### Women’s and Children’s Health Network

**PAEDIATRIC BURNS ASSESSMENT**

<table>
<thead>
<tr>
<th>UR Number:</th>
<th>Surname:</th>
<th>Given Name:</th>
<th>D.O.B.:</th>
<th>Sex:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Date: ______/_____/______  Time: ____________  ☐ Inpatient  ☐ Outpatient

### FIRST AID

- Cool running water applied for 20 minutes prior to arrival, if burn occurred within previous 3 hours (refer to Paediatric Burns Service Guidelines for chemical burns)  ☐ Yes  ☐ No
- Cling film applied  ☐ Yes  ☐ No

### HISTORY

- History obtained from: ..........................................................................................................................
- When did the injury occur? Date: _____/_____/______  Time: ______:______
- Has there been any delay in seeking medical attention? Yes / No (If Yes, does this need further consideration?)
- What occurred / caused the injury? .......................................................................................................
- ..................................................................................................................................................
- ..................................................................................................................................................
- ..................................................................................................................................................
- ..................................................................................................................................................
- ..................................................................................................................................................
- ..................................................................................................................................................
- Was the incident witnessed? Yes / No  By whom? ..................................................................................
- Does the history, development level of the child and proposed mechanism of injury fit the clinical findings? Yes / No
- Was the child being adequately supervised at the time of injury? Yes / No / Unclear

**Conclusion about the injury:** (circle applicable)  Clearly accidental / Neglectful / Inflicted / Unclear

Note the following situations must be discussed with the PED Consultant:

Any child under 18 months with unclear, neglectful or inflicted injuries where there is a supervision issue or the development capabilities of the child do not fit the injury or its explanation.

- Past Medical History: ..........................................................................................................................
- ..................................................................................................................................................
- ..................................................................................................................................................
- ..................................................................................................................................................

### ALLERGIES (document on Alert MR-1 if any):  ......................  MEDICATIONS:  ......................

### FASTING STATUS:

- IS THE CHILD UP TO DATE WITH SCHEDULED IMMUNISATIONS?  ☐ Yes  ☐ No
  (*if no, prompt to attend to for Immunisation)
- DO THEY REQUIRE ADDITIONAL TETANUS PROPHYLAXIS?  ☐ Yes  ☐ No

- Last ate:  ........:........
- Last drank:  ........:........

### BURNS REGISTRAR NOTIFIED FOR:

- ☐ circumferential burns
- ☐ burns to face / hands / feet / genitalia / perineum / major joint
- ☐ electrical burns
- ☐ all burns > 5% TBSA
- ☐ chemical burns
- ☐ inhalation injury
- ☐ associated trauma
- ☐ suspicion of NAI

---

**Guidelines for the management of Paediatric Burns**

*Revised March 2017*

*Version 5*
## Appendix C Paediatric Burns Assessment Form (page 2)

### 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>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Is this an isolated burn injury? Yes □  No □  – Preform trauma assessment

### 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
- □ Cervical collar placed for any potential cervical spine injury
- □ ED Consultant notified / Code Blue called immediately for all potential inhalation injuries
- □ Humidified O₂ by NRB at 15L/min for all inhalation burns
- □ Anaesthesia / PICU consulted for potential difficult airway
- □ Intubation / Surgical airway placed
- □ Arterial blood sent for: □ ABG  □ Carboxyhaemoglobin for inhalation injuries

### MANAGEMENT

- □ Circumferential chest / abdominal burn
- □ Cervical burn
- □ Venous bleeding
- □ Edema
- □ Erythema
- □ Hyperpigmentation
- □ Pyoderma
- □ Scald
- □ Superficial
- □ Third degree
- □ Tissue necrosis
- □ Wound infection
- □ Wound separation
- □ Wound sloughing
- □ Wound vapourization

### 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
  (consider other sources if haemodynamically unstable, such as associated blood loss with trauma)
- □ IV fluids started for all burns > 10% TBSA (must have both burn resuscitation and maintenance fluids below)
- □ Burn resuscitation with Hartmann’s solution using Modified Parkland Formula
  
  \[
  4 \times \text{weight (…………… kg)} \times \% \text{TBSA burnt (…………… %)} = \text{…… ml over 24 hours}
  \]

  \[
  50\% \text{ of total} = \text{……… ml in first 8 hours from time of burn} = \text{……… ml/hr now for ………… hours}
  \]

  \[
  50\% \text{ of total} = \text{……… ml over next 16 hours} = \text{……… ml/hr to start at time ………:………}
  \]

- □ Maintenance fluids with 5% Dextrose and 0.9% 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 □ FBC  □ EUC / LFTs / BSL  □ Coags  □ Group/Save for > 25% TBSA

- □ Urinary catheter placed for all burns > 10% TBSA or any genital / perineal burns;
  target urine output of 0.5 - 2 ml/kg/hr (…………… - ………… ml/hr)

### CIRCULATION

Glasgow Coma Score: Eyes ………/4  Verbal ………/5  Motor ………/6  Total ………/15

Burns Service Guidelines for procedural sedation and analgesic recommendations.
### Appendix C Paediatric Burns Assessment Form (page 4)

#### Women’s and Children’s Health Network

**PAEDIATRIC BURNS ASSESSMENT**

<table>
<thead>
<tr>
<th>LEFT</th>
<th>RIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lund and Browder Chart</strong></td>
<td><strong>Lund and Browder chart completed at left</strong>&lt;br&gt;“If TBSA &gt; 10% circulation section of form MUST be completed**&lt;br&gt;<strong>ERYTHEMA IS NOT INCLUDED IN TBSA CALCULATIONS</strong></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>% TBSA</td>
<td>0 - 1 yr</td>
</tr>
<tr>
<td>Head (A)</td>
<td>19</td>
</tr>
<tr>
<td>Neck</td>
<td>2</td>
</tr>
<tr>
<td>Ant. Trunk</td>
<td>13</td>
</tr>
<tr>
<td>Post. Trunk</td>
<td>13</td>
</tr>
<tr>
<td>R. Buttock</td>
<td>2.5</td>
</tr>
<tr>
<td>L. Buttock</td>
<td>2.5</td>
</tr>
<tr>
<td>Genitalia</td>
<td>1</td>
</tr>
<tr>
<td>R. Upper arm</td>
<td>4</td>
</tr>
<tr>
<td>L. Upper arm</td>
<td>4</td>
</tr>
<tr>
<td>R. Lower arm</td>
<td>3</td>
</tr>
<tr>
<td>L. Lower arm</td>
<td>3</td>
</tr>
<tr>
<td>R. Hand</td>
<td>2</td>
</tr>
<tr>
<td>L. Hand</td>
<td>2</td>
</tr>
<tr>
<td>R. Thigh (B)</td>
<td>6</td>
</tr>
<tr>
<td>L. Thigh (B)</td>
<td>6</td>
</tr>
<tr>
<td>R. Leg (C)</td>
<td>5</td>
</tr>
<tr>
<td>L. Leg (C)</td>
<td>5</td>
</tr>
<tr>
<td>R. Foot</td>
<td>3.5</td>
</tr>
<tr>
<td>L. Foot</td>
<td>3.5</td>
</tr>
<tr>
<td>% TBSA total</td>
<td></td>
</tr>
</tbody>
</table>

**Designation:**

<table>
<thead>
<tr>
<th>Sign:</th>
<th>Name:</th>
<th>Designation:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(print clearly)</td>
</tr>
</tbody>
</table>

---

Note: This image contains a table and a diagram for assessing pediatric burns, including the Lund and Browder chart to estimate the body surface area (% TBSA) affected by burns. The chart is used for evaluating the distribution of burns across different body parts, with specific % TBSA values provided for various body regions. The form also includes sections for patient demographics and medical history, as well as guidelines for care, including resuscitation, blood work, and monitoring parameters. The form is designed to facilitate comprehensive assessment and management of pediatric burn injuries, emphasizing early intervention and multidisciplinary care.
### Guidelines for the management of Paediatric Burns

**Appendix C Paediatric Burns Assessment Form (page 5)**

<table>
<thead>
<tr>
<th>TO BE COMPLETED BY BURNS SERVICE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age:</strong> __________ yrs __________ month</td>
</tr>
<tr>
<td><strong>First language:</strong> ____________________________</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PATIENT INITIALLY PRESENTED TO:</th>
</tr>
</thead>
<tbody>
<tr>
<td>PED (WCH) □</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WHERE DID THE INJURY OCCUR?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home □</td>
</tr>
<tr>
<td>Farm □</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IN WHAT LOCATION?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bathroom □</td>
</tr>
<tr>
<td>Vehicle □</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TYPE OF BURN?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical □</td>
</tr>
<tr>
<td>Radiation □</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUSE OF BURN?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bath □</td>
</tr>
<tr>
<td>Stove □</td>
</tr>
<tr>
<td>Fireplace □</td>
</tr>
<tr>
<td>Iron □</td>
</tr>
<tr>
<td>Explosion □</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WERE FLAMES PUT OUT?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes / No □</td>
</tr>
<tr>
<td>Blanket □</td>
</tr>
<tr>
<td>Specify: __________</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WHAT FIRST AID WAS ADMINISTERED?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Running water □</td>
</tr>
<tr>
<td>Wet cloth □</td>
</tr>
<tr>
<td>Other □</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WAS THERE CLOTHING ON THE AFFECTED AREA?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes / No □</td>
</tr>
<tr>
<td>Cotton □</td>
</tr>
</tbody>
</table>

Completed by: __________________________________________ Date: __________
Appendix C Paediatric Burns Assessment Form (page 6)

<table>
<thead>
<tr>
<th>Women’s and Children’s Health Network</th>
<th>PATIENT LABEL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UR Number:</td>
</tr>
<tr>
<td></td>
<td>Surname:</td>
</tr>
<tr>
<td></td>
<td>Given Name:</td>
</tr>
<tr>
<td></td>
<td>D.O.B.:</td>
</tr>
<tr>
<td></td>
<td>Sex:</td>
</tr>
</tbody>
</table>

## PAEDIATRIC BURNS ASSESSMENT

### BRANZ ASSESSMENT QUALITY INDICATORS for INPATIENTS ONLY

1. **Physical functioning assessment by Physiotherapist / Occupational Therapist** if LOS > 48 hours
   
   Yes  Date / Time .................................................................  No / NA / Not stated

2. **Paediatric Nutrition Screening Tool** completed  Date / Time .................................................................
   
   1. Has the child unintentionally lost weight lately?  Yes / No
   2. Has the child had poor weight gain over the last few months?  Yes / No
   3. Has the child been eating/feeding less in the last few weeks?  Yes / No
   4. Is the child obviously underweight?  Yes / No

   If yes to two or more of the above check if the child is known to a dietician and if no refer the child to the burn dietician.

   Dietitian referral Date / Time .................................................................

   Burns service screening
   
   1. Burn > 10% TBSA  Yes / No
   2. Burn to child < 12 months  Yes / No
   3. Burn to area that effects oral intake (e.g. hands, mouth)  Yes / No

   Dietician referral Date / Time .................................................................

   Dietician assessment Date / Time .................................................................

3. Did the patient receive **enteral or parental feeding**?  Yes  Date / time commenced .................................................................  No / Not stated

4. If > 10% TBSA was the **Parkland Formula used to estimate the fluid resuscitation** requirements?  Yes / No / Not stated

5. **Psychosocial screening** if LOS > 24 hours  Date / time seen by social worker .................................................................

6. **Pain assessment completed within 24 hours of admission**  Yes / No

### Legend

- TBSA = total body surface area
- ABG = arterial blood gas
- FBC = full blood count
- EUC = electrolytes, urea, creatinine
- LFTs = liver function tests
- BSL = blood sugar level
- NAI = non-accidental injury

---

Women’s and Children’s Hospital
# Appendix D 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:
- **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**

### Contact Information:

- **Email this form to:** [childrensburns@health.sa.gov.au](mailto:childrensburns@health.sa.gov.au) *or Fax (08) 8161 6246*

- **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 E 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**

**Admit to PICU/HDU for**
**cardiac monitoring**
**IDC to monitor urine output**
**and haemoglobinuria**
Appendix F Hydrofluoric Acid Treatment Protocol (Burns <2% TBSA or HF Concentration <10%)

Hydrofluoric Acid Treatment Protocol

(Burns <2% TBSA and HF concentration <10%)

Irrigation for 30 minutes to 1 hour to remove H+ ion effect (burn) ends with patient's subjective cessation of 'burning' sensation

Apply Calcium Gluconate 2.5% gel to skin of entire burn area. Wash and reapply gel every 15 minutes

If primary survey passed transport to RAH, if not, consult at nearest Trauma Centre

No deep tissue discomfort

Burns Unit Consultant and Toxicology consults

Deep tissue discomfort (aching/pain subcutaneously)

Wash and reapply gel every 15 minutes for 1 hour or cessation of pain, consider removal of nails and application of gel to bed if affected

No Deep tissue discomfort develops

Burn Unit Admission overnight then D/C and standard FU

>1 digit affected

Intra-arterial (via radial artery) injection of 10% Calcium Gluconate (after Allen’s test shows patent ulna artery)

1g of Calcium Gluconate in 40 mls of Normal Saline over 4 hours

Spreading/continuing ache

Intravenous injection of calcium gluconate using modified Bier's Block technique

Place IV proximal to burn. Inflate cuff above arterial pressure. Instil 1g of calcium gluconate diluted in normal saline 40 mls. Deflate cuff in 20 minutes.

Consider isolated limb perfusion

>1 digit affected

Intra-arterial (via radial artery) injection of 10% Calcium Gluconate (after Allen’s test shows patent ulna artery)

1g of Calcium Gluconate in 40 mls of Normal Saline over 4 hours

Spreading/continuing ache

Intravenous injection of calcium gluconate using modified Bier's Block technique

Place IV proximal to burn. Inflate cuff above arterial pressure. Instil 1g of calcium gluconate diluted in normal saline 40 mls. Deflate cuff in 20 minutes.

Consider isolated limb perfusion

Acknowledgement to the Royal Adelaide Hospital Burns Unit
Appendix G Hydrofluoric Acid Treatment Protocol (Burns >2% TBSA and HF concentration >10%)

Hydrofluoric Acid Treatment Protocol
(Burns >2% TBSA or HF Concentration >10%)

Patient is at risk of systemic fluoride poisoning

Immediate Burns Unit and Toxicology consultation

Local burn management as per protocol for <2% TBSA flow chart

VBG or ABG (check Ca++/K+), MBA20 and Mg++
ECG

Patient stable and investigations normal

Patient unstable or investigations abnormal

6 hourly ECG and venous gas Twice daily MBA20

HDU/ICU

Aggressive replacement of Ca++ and Mg++

Hourly VBG/ABG
6 Hourly ECG, MBA, Mg++

Acknowledgement to the Royal Adelaide Hospital Burns Unit
Appendix H Antibiotic Prophylaxis Guideline

Summary
The Paediatric Surgical Antibiotic prophylaxis guidelines provide recommendations on appropriate antibiotic prophylaxis for specific surgical procedures.

Background
This guideline is adapted from the Surgical Antibiotic Prophylaxis guidelines developed by South Australian expert Advisory Group on Antibiotic Resistance (SAAGAR), last reviewed in August 2014.

Paediatric Considerations
- Dosing of antibiotics should generally be based on actual body weight except for gentamicin where ideal body weight (IBW) should be used (see table below)
- Paediatric doses should never exceed the recommended adult dose

Table 1: Average weight and height according to growth percentile

<table>
<thead>
<tr>
<th>Age</th>
<th>3rd percentile Weight (kg)</th>
<th>50th percentile Weight (kg)</th>
<th>9th percentile Weight (kg)</th>
<th>Height (cm)</th>
<th>3rd percentile Height (cm)</th>
<th>50th percentile Height (cm)</th>
<th>9th percentile Height (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth (term)</td>
<td>2.4</td>
<td>3.3</td>
<td>4.4</td>
<td>45</td>
<td>45</td>
<td>50</td>
<td>55</td>
</tr>
<tr>
<td>1 month</td>
<td>3.2</td>
<td>4.4</td>
<td>5.5</td>
<td>49</td>
<td>55</td>
<td>55</td>
<td>59</td>
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<tr>
<td>2 months</td>
<td>4.0</td>
<td>5.4</td>
<td>6.6</td>
<td>52</td>
<td>58</td>
<td>62</td>
<td>64</td>
</tr>
<tr>
<td>3 months</td>
<td>4.6</td>
<td>6.1</td>
<td>7.2</td>
<td>55</td>
<td>61</td>
<td>64</td>
<td>68</td>
</tr>
<tr>
<td>4 months</td>
<td>5.7</td>
<td>6.7</td>
<td>8.0</td>
<td>60</td>
<td>63</td>
<td>68</td>
<td>72</td>
</tr>
<tr>
<td>6 months</td>
<td>6.0</td>
<td>7.6</td>
<td>9.4</td>
<td>67</td>
<td>67</td>
<td>72</td>
<td>80</td>
</tr>
<tr>
<td>1 year</td>
<td>8.0</td>
<td>9.7</td>
<td>12.1</td>
<td>68</td>
<td>75</td>
<td>80</td>
<td>93</td>
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<tr>
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<td>11.2</td>
<td>15.5</td>
<td>80</td>
<td>87</td>
<td>93</td>
<td>102</td>
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<tr>
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<td>12.0</td>
<td>13.4</td>
<td>18.1</td>
<td>90</td>
<td>96</td>
<td>102</td>
<td>110</td>
</tr>
<tr>
<td>4 years</td>
<td>13.0</td>
<td>14.9</td>
<td>21.0</td>
<td>100</td>
<td>103</td>
<td>110</td>
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<td>125</td>
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<tr>
<td>6 years</td>
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<td>18.7</td>
<td>28.0</td>
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<td>127</td>
<td>125</td>
<td>139</td>
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<tr>
<td>8 years</td>
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<td>21.0</td>
<td>37.0</td>
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<td>139</td>
<td>151</td>
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<tr>
<td>10 years</td>
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<td>25.1</td>
<td>49.0</td>
<td>139</td>
<td>150</td>
<td>151</td>
<td>163</td>
</tr>
<tr>
<td>12 years</td>
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<td>33.3</td>
<td>64.0</td>
<td>150</td>
<td>164</td>
<td>163</td>
<td>178</td>
</tr>
<tr>
<td>14 year old Boy</td>
<td>37.0</td>
<td>41.0</td>
<td>76.0</td>
<td>164</td>
<td>178</td>
<td>178</td>
<td>192</td>
</tr>
<tr>
<td>14 year old Girl</td>
<td>36.0</td>
<td>51.0</td>
<td>76.0</td>
<td>160</td>
<td>178</td>
<td>178</td>
<td>192</td>
</tr>
</tbody>
</table>


Neonatal Considerations
- Neonatal patients may require different dosing regimens. Consult a neonatal guideline
- The risk of neurotoxicity caused by penicillins in neonatal patients is considered low. Neonatal patients treated with narrow spectrum penicillins for sepsis should have treatment converted to broad spectrum beta-lactams dosed according to the neonatal medication manual when warranted
Appendix H Antibiotic Prophylaxis Guideline

PLASTIC SURGERY AND BURNS PROCEDURES

Pre-Operative considerations
Consider individual risk factors for every patient - need for prophylaxis, drug choice or dose may alter (e.g. immune suppression, presence of prostheses, allergies, obesity, diabetes, remote infection, available pathology or malignancy).

Pre-existing Infection (known or suspected) - if present, use appropriate treatment regimen instead of prophylactic regimen for procedure. Doses should be scheduled to allow for re-dosing just prior to skin incision.

Practice Points

Drug Administration
- IV bolus – should be timed ≤ 60 minutes before skin incision (optimal 30 minutes). Administration after skin incision or > 60 minutes before incision reduces effectiveness
- IV infusion – should be timed to end ≤ 30 minutes before skin incision (e.g. metronidazole, vancomycin)
- Penicillin/beta-lactam allergy (severe type 1 penicillin or cephalosporin allergy), unless otherwise indicated:
  - Replace penicillin or cefazolin with vancomycin (see vancomycin administration below)
  - Add gentamicin IV 5 mg/kg (IBW) when Gram negative cover required

MRSA risk (defined as history of MRSA colonisation or infection, OR inpatient of metropolitan or other high risk hospital for more than the last 5 days)
- Add vancomycin to penicillin or cefazolin.

Vancomycin administration
- Give vancomycin IV 30 mg/kg (up to 1.5 g) given over 2 hours (4 hours for history of ‘red-man’ syndrome)

Repeat doses
A single pre-operative dose is sufficient for most procedures, however repeat intra-operative doses are advisable:
- If surgery is delayed or prolonged, administer a second dose of antibiotics after half the normal dosing interval (4 hours for cefazolin, metronidazole, 6 hours for vancomycin and 12 hours for gentamicin)
- If major blood loss occurs (>15-20% of blood volume) following fluid resuscitation

Recommended Prophylaxis

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Antibiotics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Clean bone or soft tissue surgery</td>
<td>Prophylaxis NOT recommended</td>
</tr>
<tr>
<td>2. Open reduction and internal fixation of fractures</td>
<td>cefazolin 30 mg/kg up to 2 g IV</td>
</tr>
<tr>
<td>3. Insertion of prostheses, screws, plates, etc</td>
<td>cefazolin 30 mg/kg up to 2 g IV</td>
</tr>
<tr>
<td>4. Craniotherapy procedures</td>
<td>cefazolin 30 mg/kg up to 2 g IV</td>
</tr>
<tr>
<td>5. Head and neck procedures involving incision through oropharyngeal muscosa</td>
<td>cefazolin 30 mg/kg up to 2 g IV, then cefazolin 30 mg/kg up to 2 g IV 8 hourly for 3 doses, commencing 4 hours after the initial dose PLUS metronidazole 7.5 mg/kg up to 500 mg IV, then metronidazole 7.5 mg/kg up to 500mg IV 8 hourly for 3 doses commencing 4 hours after the initial dose</td>
</tr>
<tr>
<td>6. Burns</td>
<td>cefazolin 30 mg/kg up to 2 g IV</td>
</tr>
<tr>
<td>7. Escharotomy</td>
<td>cefazolin 30 mg/kg up to 2 g IV</td>
</tr>
<tr>
<td>8. Debridement</td>
<td>cefazolin 30 mg/kg up to 2 g IV</td>
</tr>
<tr>
<td>9. Skin graft</td>
<td>cefazolin 30 mg/kg up to 2 g IV</td>
</tr>
</tbody>
</table>

Post-Operative Care
- Except where included above, post-operative antibiotics are NOT indicated unless infection is confirmed or suspected, regardless of the presence of surgical drains
- If infection is suspected or in the event of operative/post-operative complications which increases the risk of infection, post-operative antimicrobial therapy tailored to the situation may be required (seek ID opinion). Requirement must be documented in the post-operative orders and directly communicated to the PICU registrar/consultant when admitted in PICU/HDU.
Appendix I Education Pathway for Children with a Burn Injury

**Hospital School SA (HSSA)**
- Discuss educational expectations with family
- Consider educational needs of siblings
- Contact child’s enrolled school
- Commence educational programs:
  - Ward/classroom
  - Learning Online
  - Connecting Kids
- Undertake diagnostic testing

**Burns Team**
- Discuss educational expectations with family
- Refer to HSSA when appropriate
- Ongoing communication with HSSA re medical progress

**HSSA**
- Maintain connection with class peers
- Consider school visit to assist with transition
- Assist school with a transition plan when appropriate

**Burns Team**
Consider:
- Healthcare Plan
- School visit
- Education resources
- Nursing, Psychology, Occupational therapy, Physiotherapy and Social Work requirements

**Inpatient**

**Discharge Planning**

**At Discharge**
- Ensure child and family know when the child can return to school
- Ensure school work continues at home until school return
- HSSA provides enrolled school with a Student Progress Report

**Post Discharge**
- Follow-up post-school re-entry
- Referral to HSSA by Burns Team if any school related issues are identified at appointments
Appendix J Initial Dressing

MEMO

To: PED, Kate Hill, Campbell and Newland (Surgical Services) staff,
   After hours Management Facilitators,
   Burns Consultants, Plastic and Paediatric Registrars

From: Jane Jennings: A/Advanced Divisional Nursing Director- Surgical Services
      Monique Anninos: Nursing Service Director PED
      Linda Quinn: Advanced Nurse Consultant- Burns
      Jess Simpson: A/Nurse Unit Manager- Newland

Date: 20th November 2017

Subject: Initial dressing management of acute burns

To clarify the initial dressing management of acute burns please be reminded of the process that has been effective since October 2014.

1. Ambulatory treatment of minor burns in the Paediatric Emergency Department (PED):

   The following criteria must be referred to the Paediatric Surgery or Plastics Registrar on call for burns:
   - Burns to the face/hand/feet/genitalia/perineum/major joint
   - All burns >5 % TBSA
   - Chemical or electrical burns
   - Associated trauma
   - Inhalation injury
   - Suspicion of NAI
   - Full thickness burns
   - Circumferential burns
   - Pre – existing medical condition

   If after this referral it is determined that the patient does not require admission the dressing is to be managed by PED staff. This referral does not necessarily require the on call registrar to review the patient, a phone consult may be sufficient. The patient will always be referred for follow up with the Burns service.

   If the patient does not fit referral criteria, the dressing management automatically is the responsibility of PED staff.

2. Inpatients: If the patient is to be admitted the initial dressing is to be attended by Newland ward staff on the ward (or in the Operating Theatre by the surgical team).

Outpatients = PED staff
Inpatients = Ward staff

The level of debridement and dressing expertise required for an inpatient falls outside of the scope of training provided to PED staff.