South Australian Paediatric Clinical Practice Guidelines

# Burns in Children

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**Note:**

This guideline provides advice of a general nature. This statewide guideline has been prepared to promote and facilitate standardisation and consistency of practice, using a multidisciplinary approach. The guideline is based on a review of published evidence and expert opinion.

Information in this statewide guideline is current at the time of publication.

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Health practitioners in the South Australian public health sector are expected to review specific details of each patient and professionally assess the applicability of the relevant guideline to that clinical situation.

If for good clinical reasons, a decision is made to depart from the guideline, the responsible clinician must document in the patient's medical record, the decision made, by whom, and detailed reasons for the departure from the guideline.

This statewide guideline does not address all the elements of clinical practice and assumes that the individual clinicians are responsible for discussing care with consumers in an environment that is culturally appropriate and which enables respectful confidential discussion. This includes:

- The use of interpreter services where necessary,
- Advising consumers of their choice and ensuring informed consent is obtained,
- Providing care within scope of practice, meeting all legislative requirements and maintaining standards of professional conduct, and
- Documenting all care in accordance with mandatory and local requirements

*Explanation of the aboriginal artwork*:

The aboriginal artwork used symbolises the connection to country and the circle shape shows the strong relationships amongst families and the aboriginal culture. The horse shoe shape design shown in front of the generic statement symbolises a woman and those enclosing a smaller horse shoe shape depicts a pregnant woman. The smaller horse shoe shape in this instance represents the unborn child. The artwork shown before the specific statements within the document symbolises a footprint and demonstrates the need to move forward together in unison.

***Cultural safety enhances clinical safety.***

***To secure the best health outcomes, clinicians must provide a culturally safe health care experience for Aboriginal children, young people and their families. Aboriginal children are born into strong kinship structures where roles and responsibilities are integral and woven into the social fabric of Aboriginal societies.***

***Australian Aboriginal culture is the oldest living culture in the world, yet Aboriginal people currently experience the poorest health outcomes when compared to non-Aboriginal Australians.***

***It remains a national disgrace that Australia has one of the highest youth suicide rates in the world. The over representation of Aboriginal children and young people in out of home care and juvenile detention and justice system is intolerable.***

***The cumulative effects of forced removal of Aboriginal children, poverty, exposure to violence, historical and transgenerational trauma, the ongoing effects of past and present systemic racism, culturally unsafe and discriminatory health services are all major contributors to the disparities in Aboriginal health outcomes.***

***Clinicians can secure positive long term health and wellbeing outcomes by making well informed clinical decisions based on cultural considerations.***

The term 'Aboriginal' is used to refer to people who identify as Aboriginal, Torres Strait Islanders, or both Aboriginal and Torres Strait Islander. This is done because the people indigenous to South Australia are Aboriginal and we respect that many Aboriginal people prefer the term 'Aboriginal'. We also acknowledge and respect that many Aboriginal South Australians prefer to be known by their specific language group(s).

## Purpose and Scope of PCPG

The Burns in Children guideline is primarily aimed at medical staff working in any of the primary care, local, regional, general or tertiary hospitals. It may however assist the care provided by other clinicians such as nurses. The information is current at the time of publication and provides a minimum standard for the assessment (including investigations) and management of paediatric burns; it does not replace or remove clinical judgement or the professional care and duty necessary for each specific case.

## Abbreviations

| | |
|---|---|
| ABCD | Airway, Breathing, Circulation, Disability |
| ABG | Arterial blood gas |
| BGL | Blood glucose level |
| BBQ | Barbecue |
| Ca+ | Calcium |
| CBE | Complete Blood Examination |
| Coags | Coagulation study |
| CRP | C-reactive protein |
| CXR | Chest X-ray |
| D/C | Discharge |
| ECG | Electrocardiogram |
| EUC | Electrolytes (sodium, potassium and chloride), urea, creatinine |
| FBC | Full blood count |
| FU | Follow up |
| HDU | High Dependency Unit |
| HF | Hydrofluoric acid |
| IDC | Indwelling Urinary Catheter |
| IV | Intravenous |
| Kg | kilogram |
| LFT | Liver function test |
| LPG | Liquefied Petroleum Gas |
| LOS | Length of stay |
| MBA20 | Multiple Biochemical Analysis (consisting of 20 tests) |
| Mg++ | Magnesium |
| mL | millilitres |
| MO | Medical Officer |
| MRSA | Methicillin-resistant Staphylococcus aureus |
| MVA | Motor Vehicle Accident |
| NGT | Nasogastric tube |
| NRB | non-rebreather mask |
| OPD | Outpatient Department |
| ED | Emergency Department |
| PICU | Paediatric Intensive Care Unit |
| PPE | Personal Protective Equipment |
| RDR | Rapid Detection and Response |
| SSD | Silver sulfadiazine |
| TBSA | Total Body Surface Area |
| TPT | Transpyloric feeding tubes |
| TSST | Toxic shock syndrome toxin |
| VBG | Venous blood gas |

## Introduction

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.

The Women's and Children's Hospital 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 South Australia, Northern Territory and western parts of New South Wales and Victoria.

Further information on burns injuries and prevention can be found on the Women's and Children's Hospital website
http://www.wch.sa.gov.au/services/az/divisions/psurg/burns/index.html.

## Referral criteria to the Women's and Children's Hospital 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 19).

This criterion is based on the Australian and New Zealand Burn Association Transfer Guidelines for Burn Service referrals (2017).

## How to refer to the Women's and Children's Hospital burns 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**

**OR**

**Email referral to:** childrensburns@health.sa.gov.au

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.

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## 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.

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

**Gel Pads** (such as Hydrogel, Burnaid®) 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.

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 Electrical Burns (page 11), including the APPENDIX D: Electrical Injury Protocol flowchart.

### 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 E and APPENDIX F (Hydroflouric Acid Treatment Protocols).

**Note:** Calcium gluconate (1g/10mL) and 2.5% calcium gluconate burn gel is no longer stocked at the Women's and Children's Hospital but is available from the Royal Adelaide Hospital after hours Emergency Department if required. 2.5% calcium gluconate burn gel can also be sourced from the Royal Adelaide Hospital 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.

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- 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.

**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.

## Emergency Management

**Level 1 Trauma Team Activation Criteria**

- Airway or Inhalation Burns
- Partial or Full thickness burns to > 20% TBSA

1. First Aid (see First Aid page 6)
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.**

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 APPENDIX E: Hydroflouric Acid Treatment Protocol)

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 B: Paediatric Burns Assessment Form)
- Log roll to visualise posterior surfaces

F. Fluid Resuscitation

- With Hartmann's Solution Calculated using the Parkland Formula

  3ml 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 % glucose / 0.9% sodium chloride (4mL/kg/hour for the first 10kg + 2 mL/kg/hour for next 10kg + 1mL/kg thereafter)**

e.g. 24kg Child:

40
20
4

———

64mL/hr

### Analgesia

Intravenous morphine titrated to effect 0.05-0.1mg/kg
See analgesia for minor burns and procedural doses (page 19)

### 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 Ilnesses

**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

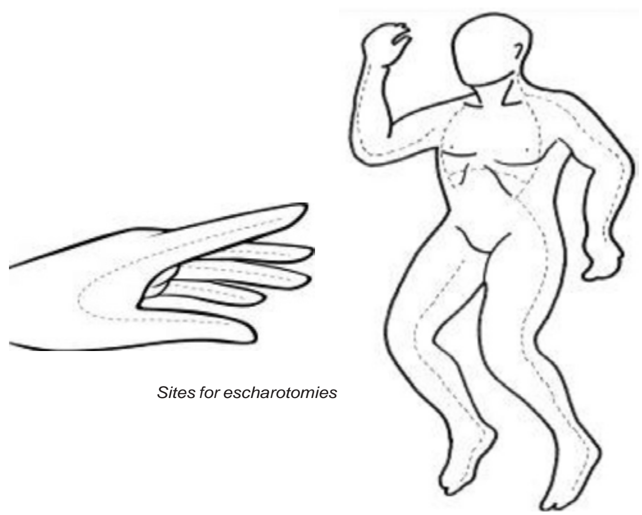
### Limbs

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.



*Sites for escharotomies*

## 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 D: Electrical Injuries Protocol.

## 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 <2secs, 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.

**Flow-chart for Assessment and Management of Burns**

| Burn Depth | Epidermal | Superficial Dermal | Mid-Dermal | Deep-Dermal | Full Thickness |
|---|---|---|---|---|---|
| | | | | | |
| **Assess Depth** | **Appearance –** Pink or red erythema with no blisters.<br><br>**Capillary return –** Rapid <2 seconds.<br><br>**Sensation** – painful.<br><br>Most common cause is sunburn.<br>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. | **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.<br><br>**Capillary return** – Brisk <2 seconds.<br><br>**Sensation** –<br>Very painful as sensory nerves are exposed**.** | **Appearance** – Red, dark pink, white with blisters.<br><br>**Capillary return** -Sluggish, varies with depth.<br><br>**Sensation** – Adequate.<br><br>Susceptible to conversion to a deeper thickness wound. | **Appearance –** Blotchy red due to extravasation of haemoglobin, or mottled or waxy and white. Will sometimes have blisters.<br><br>**Capillary return** – Absent.<br><br>**Sensation** - To pressure but not pain.<br><br>Very prone to conversion to a deeper injury and to infection. | **Appearance** – White, charred, black, tan, no blisters.<br><br>**Capillary return** – Absent.<br><br>**Sensation** - Absent.<br><br>Epidermis, dermis and epidermal appendages are destroyed, injury may involve fascia, muscle and bone. |

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| Burns | Epidermal | Superficial Dermal | Mid-Dermal | Deep-Dermal | Full Thickness |
|---|---|---|---|---|---|
| **Primary Dressing**<br>(Dependant on site of burn, size of burn, exudate, pain, pt ability to manage dressing, cost and contamination) | If there is no epidermal loss, use moisturiser only several times a day.<br>Sun protection advice:<br>• Hats and clothing<br>• SPF Factor 30+ | Hydrocolloids Mepilex® Mepilex Ag®<br>Mepilex Ag Transfer® Flamazine® (SSD)<br>Acticoat® | Acticoat® Mepilex Ag®<br>Mepilex Ag Transfer® Flamazine® (SSD) | Acticoat® Mepilex Ag®<br>Mepilex Ag Transfer® Flamazine® (SSD) | Acticoat® Mepilex Ag®<br>Mepilex Ag Transfer® Flamazine® (SSD) |
| **Follow up** | None required | Local follow up +/- Digital Referral Service | Local follow up +/- Digital Referral Service | Local follow up +/- Digital Referral Service referral to Women's and Children's Hospital Burns Service | Local follow up +/- Digital Referral Service referral to Women's and Children's Hospital Burns Service |
| **Outcome** | May require hospitalisation for pain management. Will heal in 3–5 days with no resulting cosmetic blemish. | Will heal in 7–10 days as epidermal appendages remain intact. Minimal or no scarring but a colour defect may remain. | Will heal in 10 to 14 days, except in the very young where the dermis is thin and depth of burn is invariably deeper. | 2–3 weeks, as epidermis, dermis and epidermal appendages are lost. If infected may convert<br>to full thickness injury requiring grafting. | Large areas will not heal without surgical intervention; small areas<br>may heal from the edges after several weeks.<br>This wound will not re-epithelialise and whatever area of the wound is<br>not closed by wound contraction will require skin grafting. |

### Frequently used burn dressings

| Dressing | Type of Burn | Suitable Use | Dressing Change |
|---|---|---|---|
| Acticoat®<br>Fixed with Hypafix® | Partial/Full thickness | > All areas of the body, except in the perineum<br>> Colonised but not infected burns<br>> Non-infected burns | 3–7 days |
| Mepilex Ag®<br>Fixed with Hypafix® | Partial/Full thickness | > All areas of the body, except in the perineum<br>> Colonised but not infected burns<br>> Non-infected burns | 4–7 days |
| Aquacel-Ag® | Superficial/ Partial thickness | > All areas of the body except over joints or in the perineum.<br>> Colonised but not infected burns.<br>> Non-infected burns | Until dressing separates from wound.<br>**Do not take dressing off unless infected.** |
| Hydrocolloids: Duoderm® Comfeel®<br>(Hypafix to secure edges) | Superficial/Partial Thickness | > Flat surfaces<br>> Not suitable for infected burns | Up to 7 days or sooner if there is excessive exudate or loss of dressing. |
| Flamazine® (SSD)<br><br>Generously soaked in gauze and wrapped in dry gauze/ crepe bandages | Full thickness/infected/ contaminated burns | > ALL areas of the body except the face. | Change daily<br>**Admission may be necessary DO NOT USE in children <6 MONTHS OF AGE.** |
| Hypafix® | | > Dressing fixation<br>> Scar management | At least once a week or as necessary. |
| White soft paraffin | Face, buttocks, genitalia | > Only areas that cannot be covered with dressings: face, buttocks, genitalia | At least three times a day or as necessary.<br>**Admission is usually indicated.** |
| Topical antibiotic ointment e.g. mupirocin (Bactroban) | Face, perineum, or any other area that may be infected | > All areas of the body | Twice a day or prescribed for infected burns. |

## Speciality areas

### Facial burns

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

**Consider admission for face care**

- Leave face open and apply white soft paraffin after cleaning.
- 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) 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**

## 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:

| ***First Line treatment***<br>**Oral cetirizine** (1mg/mL syrup or 10mg tablets) | |
|---|---|
| **Age** | **Dose** |
| Infants 6 month-1 year | 0.125mg/kg/dose TWICE daily prn |
| Age 1-2 years | 2.5mg TWICE daily |
| Age 2-6 years | 5mg ONCE daily OR 2.5mg TWICE daily |
| Age 6-12 years | 10mg ONCE daily OR 5mg TWICE daily |
| Age 12-18 years | 10mg ONCE daily |
| ***Second Line treatment***<br>**Ranitidine oral liquid** (15mg/mL) injection (25mg/mL) tablet (150mg) | |
| **Age** | **Dose** |
| 1-6 months | 1mg/kg TWICE daily |
| 6 months- 18 years | 2-5mg/kg (max.150mg) TWICE daily |
| ***Third Line treatment***<br>**Promethazine oral liquid** (1mg/mL) tablet (10mg and 25mg) | |
| **Age** | **Dose** |
| >2 years | 0.125mg/kg THREE times daily (max 12.5mg/dose) |

## 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 emergency department, 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 A: Toxic Shock Protocol

### Minor burn injuries – minimal debridement

> Minor burn injuries presenting to ED 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 ED staff can order a dose of intranasal fentanyl which can be administered immediately prior to the dressing.

> If a dose is required in ED for initial analgesia, ED staff can order an additional dose that may be administered immediately prior to the dressing.

> **Intranasal fentanyl dose is 1.5 micrograms/kg/dose. Maximum dose 100 micrograms**

> Paracetamol administered on presentation will assist fentanyl during the procedure and provide ongoing analgesia following the dressing.

> Ibuprofen and tramadol may also be used.

## 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/report to the Department for Child Protection **Child Abuse Report Line (CARL) – phone 131 478**.

Local Health Network staff are to record the information provided to CARL in the patient's medical record (electronic or paper-based) on the **SA Health Record of Mandatory Notification MR-MNR**.

The use of the designated SA Health Record of Mandatory Notification MR-MNR replaces the need to document within the body of the health record (e.g. clinical progress sheets). This separate designated Mandatory Notification Record for Suspected Child Abuse or Neglect is to be placed in the health record.

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

> delay in seeking help

> different accounts of history of injury over time

> injury inconsistent with history or with the developmental capacity of the child

> past abuse or family violence

> inappropriate behaviour/interaction of child or caregivers.

> obvious immersion patterns e.g. glove or sock patterns

> symmetrical burns of uniform depth

> restraint injuries on upper arms

> other signs of abuse or neglect such as numerous healed wounds.

Refer to your local Mandatory Reporting Guidelines for reporting child abuse and neglect.

## References

1. Women's & Children's Hospital. 2018. *Paediatric Burns Service Guidelines.* [ONLINE] Available at: http://cger.cywhs.sa.gov.au/cgu/governing_docs/documents/paed_burns.pdf . [Accessed 31 January 2019].

## Acknowledgements

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### Major contributors

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### SA Paediatric Clinical Practice Guideline Reference Group Members

## Document Ownership & History

**Developed by:** SA Child & Adolescent Health Community of Practice
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**Endorsed by:** Commissioning and Performance, SA Health
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Does this policy amend or update and existing policy? **Y**
If so, which version? **V3**
Does this policy replace another policy with a different title? **Y**
If so, which policy (title)? **Management of Paediatric Burns Clinical Guideline**

| Approval Date | Version | Who approved New/Revised Version | Reason for Change |
|---|---|---|---|
| 18/06/20 | V4 | Lynne Cowan, Deputy CE, Commissioning and Performance, SA Department for Health and Wellbeing | Formally reviewed in line with 1-5 year scheduled timeline for review. |
| 10/12/15 | V3 | SA Health Safety and Quality Strategic Governance Committee | Formally reviewed in line with 1-2 year scheduled timeline for review. |
| 19/12/14 | V2 | SA Health Safety and Quality Strategic Governance Committee | Minor edits |
| 30/05/13 | V1 | SA Health Portfolio Executive | Original |

## APPENDIX A – Burns Referral Form

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

**Client details:**

Surname: First Name: Middle Name/s:

Date of Birth: Gender: WCH UR No. (Enter if known)

Address: Suburb:
Post Code:

Medicare No: Expiry Date:

Is the client of Aboriginal or Torres Strait Islander origin?

Is the client under the Guardianship of the Minister?

Parent/ Caregivers full name:

Phone contact: Home: Work: Mobile:

**Burn Details:**

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

**Dear Burns Team**
**Reason for referral:**

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

Has a *Photographic Consent Form* been completed?

**Referring Clinic Details:**

Referring Doctor Name: Surgery Name:

Provider No: Contact Phone:

Address: Suburb: Post Code:

Signature: ________________________________________ Date: _____/____/_____

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

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

Email this form to: childrensburns@health.sa.gov.au 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 B – Paediatric Burns Assessment Form (page 1)

| Women's and Children's Health Network<br><br>**PAEDIATRIC BURNS ASSESSMENT** | PATIENT LABEL<br>UR Number: ______<br>Surname: ______<br>Given Name: ______<br>D.O.B.: ______ Sex: ______ |
|---|---|

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:**

Last ate: ........:........

Last drank: ........:........

**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

**BURNS REGISTRAR NOTIFIED FOR:**

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

Revised August 2019 version 6

PAEDIATRIC BURNS ASSESSMENT

MR*

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Government of South Australia
SA Health

## APPENDIX B – Paediatric Burns Assessment Form (page 2)

**Women's and Children's Health Network**

**PAEDIATRIC BURNS ASSESSMENT**

PATIENT LABEL

UR Number: ____________

Surname: ____________

Given Name: ____________

D.O.B.: ____________ Sex: ____________

### INITIAL ASSESSMENT AND IMMEDIATE MANAGEMENT *(document on RDR chart)*

| Time | Weight | Height | Temp | Pulse | Resp | $SaO_2$ | BP | Pain Score |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

**Is this an isolated burn injury?** **Yes** ☐ **No** ☐ **– Perform trauma assessment**

### AIRWAY / BREATHING

☐ No to all questions below, no airway concerns *(go to next section)*

**Are any of the following present?**

☐ Possible cervical spine injury
☐ Possible inhalation injury (confined space, combustible plastics)
☐ Respiratory distress
☐ Accessory muscle use / tracheal tug
☐ Stridor
☐ Burns to mouth / nose / pharynx
☐ Hoarse cough or voice change
☐ Sooty or productive cough
☐ Singed nasal hairs
☐ Neck burns / oedema
☐ Circumferential chest / abdominal burn

**MANAGEMENT:**

☐ Cervical collar placed for any potential cervical spine injury
☐ ED Consultant notified / Code Blue called immediately for all potential inhalation injuries
☐ Humidified $O_2$ 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

### 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

3 x weight (................ kg) x % TBSA burnt (................ %) = ................ ml over 24 hours

**50% of total = ................ ml in first 8 hours *from time of burn* = ................ ml/hr now for ................ hours**

*50% of total = ................ ml over next 16 hours* = ................ ml/hr to start at time ........:........

☐ Maintenance fluids with 5% Dextrose and 0.9% 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)

### DISABILITY

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

**Burns Service Guidelines for procedural sedation and analgesic recommendations.**

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## APPENDIX B – Paediatric Burns Assessment Form (page 3)

| Women's and Children's Health Network<br><br>**PAEDIATRIC BURNS ASSESSMENT** | PATIENT LABEL<br>UR Number: __________<br>Surname: __________<br>Given Name: __________<br>D.O.B.: ________ Sex: ______ |
|---|---|

**EXPOSURE / ENVIRONMENT**

Ignore simple erythema

Partial

Full thickness

LEFT

RIGHT

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## APPENDIX B – Paediatric Burns Assessment Form (page 4)

**Women's and Children's Health Network**

**PAEDIATRIC BURNS ASSESSMENT**

PATIENT LABEL

UR Number: ____________________

Surname: ____________________

Given Name: ____________________

D.O.B.: ____________ Sex: ____________

**Notes**

........................................................................................................................

........................................................................................................................

........................................................................................................................

........................................................................................................................

........................................................................................................................

........................................................................................................................

........................................................................................................................

........................................................................................................................

**Lund and Browder Chart**

| % TBSA | 0 - 1 yr | 1 - 4 yr | 5 - 9 yr | 10 - 14yr | 15 yr | Adult | Total |
|---|---|---|---|---|---|---|---|
| Head (A) | 19 | 17 | 13 | 11 | 9 | 7 | |
| Neck | 2 | 2 | 2 | 2 | 2 | 2 | |
| Ant. Trunk | 13 | 13 | 13 | 13 | 13 | 13 | |
| Post. Trunk | 13 | 13 | 13 | 13 | 13 | 13 | |
| R. Buttock | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | |
| L. Buttock | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | |
| Genitalia | 1 | 1 | 1 | 1 | 1 | 1 | |
| R. Upper arm | 4 | 4 | 4 | 4 | 4 | 4 | |
| L. Upper arm | 4 | 4 | 4 | 4 | 4 | 4 | |
| R. Lower arm | 3 | 3 | 3 | 3 | 3 | 3 | |
| L. Lower arm | 3 | 3 | 3 | 3 | 3 | 3 | |
| R. Hand | 2 | 2 | 2 | 2 | 2 | 2 | |
| L. Hand | 2 | 2 | 2 | 2 | 2 | 2 | |
| R. Thigh (B) | 6 | 7 | 8.5 | 9 | 9.5 | 10 | |
| L. Thigh (B) | 6 | 7 | 8.5 | 9 | 9.5 | 10 | |
| R. Leg (C) | 5 | 5 | 5.5 | 6 | 6.5 | 7 | |
| L. Leg (C) | 5 | 5 | 5.5 | 6 | 6.5 | 7 | |
| R. Foot | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | |
| L. Foot | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | |
| | | | | | | **% TBSA total** | |

☐ Lund and Browder chart completed at left
***If TBSA > 10% circulation section of form MUST be completed**

**<u>**ERYTHEMA IS NOT INCLUDED IN TBSA CALCULATIONS**</u>**

☐ **If TBSA > 20% activate Level 1 Trauma team and refer to Major Burn Pathway**

☐ Other examination findings noted above *(include medical findings and secondary survey for trauma)*

☐ Log roll to assess posterior thorax burn and potential for spinal injury or soft tissue trauma

☐ Ensure environmental control and commence active warming methods if required

☐ All jewellery / constrictive clothing removed

☐ Beware potential need for escharotomy in circumferential limb and trunk burns. Contact Burns Registrar

**Sign:** .................................... **Name:** .................................... **Designation:** ....................................
*(print clearly)*

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## APPENDIX B – Paediatric Burns Assessment Form (page 5)

**Women's and Children's Health Network**

**PAEDIATRIC BURNS ASSESSMENT**

PATIENT LABEL

UR Number: ____________

Surname: ____________

Given Name: ____________

D.O.B.: ____________ Sex: ____________

**TO BE COMPLETED BY BURNS SERVICE**

**Age:** ........... **yrs** ........... **month** **Postcode:** ............... **Ethnic background:** ..............................

**First language:** .............................. **Interpreter required? Yes / No**

**PATIENT INITIALLY PRESENTED TO:**

PED (WCH) ☐ GP ☐ Other Hospital ☐ Where: ..............................

**WHERE DID THE INJURY OCCUR?**

Home ☐ Workplace ☐ School ☐ Road ☐ Traffic Way ☐ Waterway ☐ Campsite ☐

Farm ☐ Shop ☐ Park ☐ Other ☐ Specify: ..............................

**IN WHAT LOCATION?**

Bathroom ☐ Bedroom ☐ Dining ☐ Kitchen ☐ Laundry ☐ Living ☐ Shed ☐

Vehicle ☐ Outdoors ☐ Unknown ☐ Other ☐ Specify: ..............................

**TYPE OF BURN?**

Chemical ☐ Contact ☐ Electrical ☐ Flame ☐ Friction ☐ Inhalation ☐ Sun ☐ Cold ☐

Radiation ☐ Scald ☐ Specify fluid: ........................ Unknown ☐ Other ☐ ..............................

**CAUSE OF BURN?**

Bath ☐ Bucket ☐ Cup/Mug ☐ Bowl ☐ Kettle ☐ Microwave ☐

Stove ☐ Frypan ☐ Saucepan ☐ BBQ ☐ Heater ☐ Flammable liquid ☐

Fireplace ☐ Housefire ☐ Campfire ☐ MVA ☐ Exhaust pipe ☐ Hair straightener ☐

Iron ☐ Powerpoint ☐ Treadmill ☐ Flash ☐ Ingestion ☐ Cleaning products ☐

Explosion ☐ Aerosol ☐ Unknown ☐ Other ☐ Specify: ..............................

**WERE FLAMES PUT OUT?**

Yes / No ☐ Unknown ☐ Not a flame burn ☐

Blanket ☐ Drop and roll ☐ Hands ☐ Water ☐ Other ☐ Specify: ..............................

**WHAT FIRST AID WAS ADMINISTERED?**

Running water ☐ For how long?: .............................. Mins

Wet cloth ☐ Ice ☐ Creams ☐ None ☐ Unknown ☐

Other ☐ Specify: ..............................

**WAS THERE CLOTHING ON THE AFFECTED AREA?**

Yes / No ☐ Was this removed immediately? Yes / No ☐

Cotton ☐ Synthetic ☐ Wool ☐ Other ☐

Completed by: .............................................................. Date: ......../......../........

*(print clearly)*

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## APPENDIX B – Paediatric Burns Assessment Form (page 6)

| Women's and Children's Health Network<br><br>**PAEDIATRIC BURNS ASSESSMENT** | PATIENT LABEL<br>UR Number: ________<br>Surname: ________<br>Given Name: ________<br>D.O.B.: ________ Sex: ________ |
|---|---|

**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.**

   **Dietician 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 | LFTs = liver function tests |
| ABG = arterial blood gas | BSL = blood sugar level |
| FBC = full blood count | NAI = non-accidental injury |
| EUC = electrolytes, urea, creatinine | |

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## APPENDIX C – 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**

→ **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

→ **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 + IV immunoglobulin**

**IV fluid therapy**
**PICU medical review**
**Admission to PICU or HDU**
**ID referral**

Dressing change
**Contact Burns consultant**

**IF ANY DETERIORATION**

**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 continuance at 48 hours – observations & clinical situation**

**Antibiotics**
**(No penicillin allergy):**
IV Flucloxacillin 50mg/kg (up to 2g) per dose, 6hrly
**PLUS**
IV Clindamycin 15mg/kg (up to 600mg) per dose, 8hrly
**PLUS**
*IV Vancomycin 30mg/kg (up to 1.5g) 12hrly

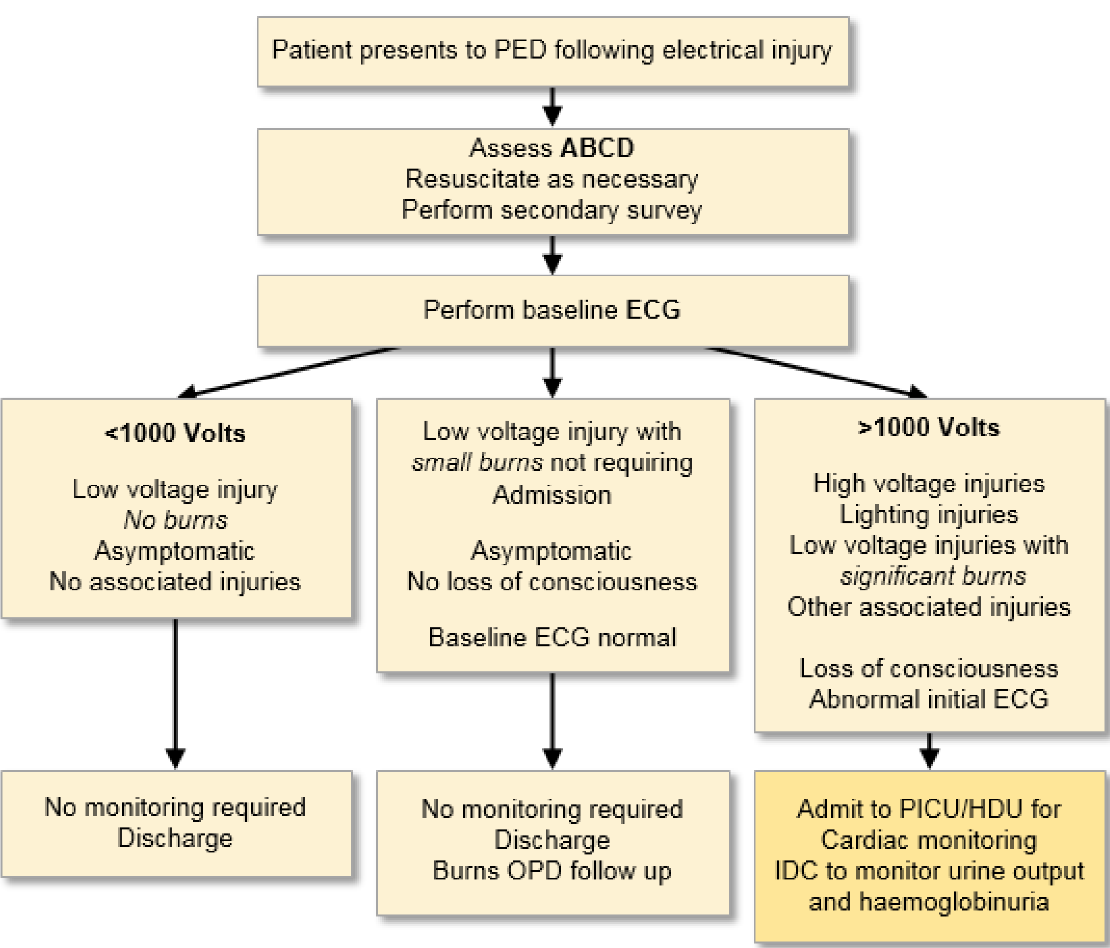
**Antibiotics**
**(Non-severe penicillin allergy):**
IV Cefazolin 50mg/kg (up to 2g) per dose, 8hrly
**PLUS**
IV Clindamycin 15mg/kg (up to 600mg) per dose, 8hrly
**PLUS**
*IV Vancomycin 30mg/kg (up to 1.5g) 12hrly

**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 Vancomycin.

## APPENDIX D – Electrical Injuries Protocol



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## APPENDIX E – Hydroflouric Acid Treatment Protocol

(Burns <2% TBSA of 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

↓

Burns Unit Consultant and Toxicology consults

**No deep tissue discomfort** (left branch):

- 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

**Deep tissue discomfort (aching/pain subcutaneously)** (right branch):

Single digit:

- Single digit: sites of aching/ deep pain injected with 10% Calcium Gluconate solution 0.5ml/cm² into affected subcutaneous tissue, pulp spaces and compartments of digit.

  If nail bed affected, nail removal mandatory followed by injection into nail bed).
- ↓ Spreading/continuing ache → Intra-arterial injection (see below)

>1 digit affected:

- >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 dilutes in normal saline 40 mls. Deflate cuff in 20 minutes.
- ↓ Spreading/continuing ache
- ↓ Consider isolated limb perfusion

*Acknowledgement to the Royal Adelaide Hospital Burns Unit*

## APPENDIX F – Hydroflouric Acid Treatment Protocol

(Burns >2% TBSA of 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<br>Twice daily MBA20 | HDU/ICU |
| | ↓ |
| | Aggressive replacement of Ca++ and Mg++ |
| | ↓ |
| | Hourly VBG/ABG<br>6 hoursly ECG, MBA, Mg++ |

*Acknowledgement to the Royal Adelaide Hospital Burns Unit*