Management of a paediatric burn patient

Purpose

The purpose of the document is to guide Medical, Nursing and Allied Health staff in the most appropriate way to treat a paediatric burn patient. This document includes;

- Introduction to the Paediatric Burns Centre
- Referring a paediatric burns patient
- First Aid
- Estimating Total Body Surface Area (TBSA)
- Burn Depth
- Fluid resuscitation
- Wound cleansing and Blister debridement
- Wound dressings
- Splinting requirements
- Nutrition
- Pain Management
- Complications
- Discharging a paediatric burns patient

Scope

This guideline applies to all medical and nursing staff within QH who are treating a paediatric burns patient
Introduction

The Paediatric Burns Centre (PBC) provides the only specialist dedicated paediatric burns centre in Queensland according to the Australian and New Zealand Burns Association (ANZBA) Guidelines. Other Burns Units in Queensland include Townsville Hospital and The Gold Coast University Hospital, who are only able to provide treatment for small to medium size burns in children.

The PBC provides inpatient care (acute and rehabilitation), together with ambulatory and outreach care, for any child referred with a burn injury irrespective of size or depth.

The PBC also has a burns theatre. This theatre operates twice weekly for dressing changes, steroid injections and ranging under general anaesthetic.

Currently we treat approximately 900 new burns per year. The most common mechanisms of burns reviewed within the unit are:

- Scalds - tea/coffee, kettles, baths, noodles
- Contact – iron, hair straighteners, exhausts, campfires
- Friction – treadmills, MVA
- Flame – kerosene, petrol, house fires

Directed by Professor Roy Kimble, our multidisciplinary team consists of Surgical Consultants, Medical, Nursing, Allied Health, psychologists, administration and research staff.

We care for both acute, post-acute and reconstruction burns from newborn through to adolescents until they are then transitioned to the adult Burns Centre at the Royal Brisbane and Women’s Hospital if required.

While burns are predominately our main focus, we also consult and advise on other conditions including:

- Meningococcal septicemia
- Epidermylosis Bullosa
- Scalded Skin Syndrome
- Steven Johnson Syndrome
- Vascular Anomalies
- Intravenous Extravasations
- Graft vs Host
- Neonatal Burns

Burns Outpatient provides Consultant led clinics Monday - Friday, except public holidays. All clinics are attended by Social Work, Occupational Therapy and Physiotherapy.

The PBC multidisciplinary team includes:

- 5 Paediatric Consultants
- Burns Clinical Nurse Consultant
- Burns Clinical Nurse
- Burns Registered Nurse
- Social Worker
- Occupational Therapists
- Physiotherapists
- Music Therapy
- Dietician
- School teacher
- Research
- Child and Youth Mental Health

**Referring a burn**

The PBC offers a 24/7 referral service. For a referral coming from regional QLD, an email referral service is available. Criteria for referring to our service is based on the Australian New Zealand Burns Association transfer guidelines for Burns Service referral. For those burns located in the Mackay region and above, please refer to Townsville Hospital first. For those burns located in the Gold Coast region and below, please refer to Gold Coast University Hospital first. If they are unable to care for the patient then please follow the information below to refer to LCCH

To refer a patient to the PBC:

- Contact the Burns Register on call via switch (07) 3068 1111
- Complete Category 1 Referral to Burns Outpatients (QH staff only)
- Submit referral form by clicking 'submit at the end of the form or by emailing through to burns-opd@health.qld.gov.au
- Attach any photos to this email if possible
- If advised that the patient can be treated locally, continue to contact the burns Registrar at each dressing change to update progress and send through photos to above email address

All paediatric patients should be referred to the PBC however they may not physically be required to attend the LCCH. If treatment can be managed in the local area then this is the preferred treatment

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**ALERT**

Patient referrals will not be accepted unless completed referral form is sent

Telehealth Emergency Support Unit (TEMSU) is available to improve access and provide support to emergency specialist from rural areas. TEMSU can be used for services such as; advice for acute burns, dressing instructions, debridement advice. TEMSU will link the rural area with the Burns Specialists within the Lady Cilento Children’s Hospital

To contact TEMSU please call 1800114414

**First Aid**

Recent studies have enabled detailed recommendations for appropriate first aid in burns treatment. The application of cold water to the wound has multiple benefits including pain relief, decreased cell damage, improved wound healing and scar formation $^{1,2}$.

Steps for providing adequate first aid

1. Stop
   a. Stop drop and roll
b. Remove all heat source including clothes, nappies, jewellery

2. Cool
   a. Running cold tap water for 20mins
   b. Do NOT use ice

3. Cover
   a. Use cling film to cover wound

Helpful links for further information on first aid in burns

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**ALERT**

Ensure that patient is asked ‘how long’ has first aid been applied prior to admission to hospital. If less than 20mins, place under cool running water until a total of 20min has been completed.
Ensure unburnt areas are kept covered and warm to prevent hypothermia
First aid is effective for up to 3hrs post burns

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**Estimating TBSA**

Total Body Surface Area (TBSA) is to be undertaken on admission to Emergency department. While there are multiple techniques and apps that can assist with this calculation, the following are recommended.

Lund and Browder form (Appendix 1). This is more accurate when estimating TBSA in paediatric patients.

ITIM app, designed by NSW Institute of Trauma and Injury Management. This app includes many different calculators including estimating TBSA and Fluids Resuscitation.

For small areas, the palm, including fingers, of the patient equates to approximately 1% of the patient’s body surface.

Superficial burns (Erythema only) are not included in estimating burn TBSA

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**Burns Depth**

Estimating burn depth allows us to further plan treatments for our patients and likelihood of scarring. Terminology has changed over the years with 1st, 2nd and 3rd degrees no longer used.

**Superficial**

- Previously called erythema.
- Involve only the epidermis
- These burns are not included in estimating TBSA
- Characterised by redness that slowly disappears, no blistering present
Superficial Partial thickness
- Involve both the epidermis extending into the dermis
- Characterised by blistering skin, blanches when touched
- Often most painful burns

Deep dermal Partial thickness
- Involves the epidermis and further into the dermis
- Can often have areas of blistering with other pale areas
- Some areas may blanches however deeper areas often will not
- Can often get areas that look ‘cherry red’ in colour, while it may look nice and pink these areas generally will not blanch and are caused by red bloods cells that have extravasated

Full thickness
- Involves the epidermis, the dermis and often extends into subcutaneous fat.
- These appear white in colour and can be quite thick to touch or leathery
- Generally has no sensation

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**ALERT**
Burns can often change appearance within the first 72 hrs, especially scald burns. It is hard to determine depth until after the first dressing change has occurred

**Fluid Resuscitation**

The systemic result following a burn injury causes increased capillary permeability resulting in fluid shifting into the interstitial space around the burn. This can occur up to around 24 hrs. Fluid Resuscitation is required to replace this large fluid loss over the first 24hrs. According to ANZBA guidelines, fluid resuscitation should be administered if TBSA
- >10% in under 18mth old
- >15% in over 18mth old

The Parkland formula is recommend ([Appendix 2](#)), half given over the first 8 hrs from time of injury. The remaining half given over the following 16hrs.

Maintenance fluid should also be commenced BUT must be on a separate line and NOT combined with fluid resuscitation

For large burns (>25%), Albumin has been shown to decrease total amount of fluids required. Albumin should not be used within the first 6hrs of sustaining a burn injury. After this time, Albumin should be given as a 50:50 ratio to the resuscitation crystalloid

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**ALERT**
All patients commenced on fluid resuscitation should have an IDC inserted. Aim for output of 1ml/kg/hr
All patients commenced on fluid resuscitation should have an NGT inserted. Feeds should be commenced at 10ml/hr and slowly increased to full feeds within 24hrs of sustaining a burn injury. Dietician review is required.

Wound cleansing and Blister debridement

Once first aid has been completed, the wound can be cleaned and blisters debrided in preparation for dressing application. Prior to commencing procedure, please ensure that adequate pain relief has been administered and appropriate time has elapsed for medication to become effective.

The burn wound should be cleansed with water mixed with Chlorhexidine Gluconate 5% (Appendix 3). If this is not available then washing with Normal Saline will be adequate.

Blisters should be debrided prior to application of dressing. To do this, use a cloth to wipe over wound and remove surrounding tissue. If blisters are quite thick and unable to be wiped away, use a pair of sterile scissor to remove top of blister.

Any remaining skin can be removed at next dressing change

ALERT

DO NOT use needles to express blisters. There is a high risk of sustaining a needle stick injury

Wound Dressings

While there are many different dressings on the market that may be suitable for treating burns, the dressings used within our department are evidenced based and most suitable for the paediatric population

Once the wound has been cleaned, follow the flow chart (Appendix 4) to determine the most appropriate dressings choice. Once dressing has been chosen, please refer to the following video and standards for correct application.

Acticoat Standard (QH staff only)
Mepilex Ag (QH staff only)
Burns - Hand Dressings (QH staff only)

How to apply a burns dressings video-  https://vimeo.com/153986604. Password: burns-opd
How to attend a burns dressing fingers, toes and ears video-  https://vimeo.com/user40367044/review/189879919/b1a0e64213

Patients that require fluid resuscitation should be considered for dressing changes under a general anaesthetic initially

ALERT

Flammazine is not to be used in paediatric patients. If Mepilex Ag or Mepitel and Acticoat are not available, then patient must be transferred to LCCH for further treatment
Splinting requirements

Some burns may require review by the Occupational Therapist on call. These may include:

- Deep partial or full thickness burn injury crossing the flexor surface of a joint, placing joint at risk of contracture.
- Immobilisation by use of a splint is required to ensure safe position or integrity of underlying body structures and function, and suitable short-term alternatives (e.g., armboard, positioning devices and bandaging techniques) are not available or considered suitable.
- Significant oedema present limiting function or contributing to vascular insufficiency as indicated by poor capillary return and cool to touch distal limb.
- Continuation of occupational therapy intervention commenced during business hours is required to maintain current level of patient function or to minimise risk of irreversible harm, as determined by Occupational Therapist in conjunction with a medical Consultant.

Occupational Therapy provides a Burns On-Call Service at LCCH between 8am-5pm on weekends and public holidays. Children identified as requiring Occupational Therapy input is to be determined by a Burns/Surgical Consultant or Registrar and meeting criteria outlined in the Occupational Therapy Burns On-Call procedure (QH staff only)

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Alert

If splint is required and Occupational Therapists are unavailable, armboards are NOT appropriate and patient should be admitted until review by Occupational Therapist is available

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Nutrition

Nutrition is an important facet of burns care especially within the paediatric burns population. Children are more vulnerable to the metabolic demands and consequences of a burn injury compared to adults\(^3\). They have limited fat and lean body reserves, increased body surface area in relation to weight, and extra need for nutrients for growth and development\(^4\).

All children requiring Burns Fluid Resuscitation should have a NGT inserted and commenced on enteral feeds. A dietician review is required to ensure appropriate formula is used.

Some children not requiring fluid resuscitation may require admission to ward to monitor oral intake. It is common for children who have sustained burns involving the face will have decreased oral intake over the following days. They may also require insertion of a NGT if oral intake is poor.

For more information regarding nutritional requirements of Burns patient please refer to Nutrition Management of Paediatric Burns Patients (QH staff only)

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Pain Management

Pain management is an integral part of Burns care. No procedures should be undertaken without adequate pain relief and constant reassessing of the patient. It has been prove that there is a correlation between pain, stress, anxiety and their effect on burn wound re-epithelialisation.

Pain relief does not have to be just pharmaceutical. It is important to have non pharmaceutical, age appropriate devices available for the children prior to commencing the procedure. Such items include;

- Ditto
We have distinguished certain burns that tend to require greater amounts of pain relief during dressing procedures. These include:

- Circumferential burns
- Contact burns from hot coals
- Burns > 5%
- Patients suffering anxiety
- Previous distressing dressing changes

For these patients we will progress them onto our Burns Procedural Pain (QH staff only). Please ensure you have adequate Medical Staff available when undertaking these procedures and consult with your hospital guidelines to determine the most appropriate medication and administration route.

## Complications

### Escharotomy

Circulation may become impaired in circumferential burns of the limbs and torso due to increased oedema. In the first instance the limbs should be elevated to reduce swelling and closely monitored for decreases in:

- Colour
- Capillary return
- Coolness

If this occurs, an escharotomy may be required. This is an emergency procedure and consultation with the Burns Surgeon on call is required.

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**ALERT**

An escharotomy should be anticipated prior to the loss of pulses and numbness

### Toxic Shock

Toxic Shock Syndrome (TSS) is a severe systemic illness which can cause death. While it is very rare, TSS is more common in children under the age of 4yr with skin loss due to the fact they have not developed the antibodies to the toxins. TSS is characterised by:

- shock
- pyrexia
- erythematous rash
- diarrhoea and vomiting
- lethargy and irritability.
Treatment for TSS can include
- Intravenous fluids
- Intravenous antibiotics
- Intravenous immunoglobulin (IVIG)

While TSS is not common, if you have a patient exhibiting similar signs, TSS must be considered. If you have not already referred the patient to a Burns Specialists, this should occur urgently

**Discharging a burn**

For small burns, they can often be treated as outpatients and only return to the hospital once or twice a week for dressing changes and review by the Consultants. If the patient has adequate pain relief and there is no concern regarding the burn, mechanism or attendance, they may be suitable for discharge home

Discharge information should be provided to the family. This can include the following fact sheets

Ensure appointment has been organised for review at the PBC within the next 3 days

For those patients from rural areas, Telehealth follow up can be arranged. This will be organised through the Centre of On-line Health

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**ALERT**

Circumferential burns should not be discharged within first 24hrs

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**Consultation**

Key stakeholders who reviewed this version:
- Professor Roy Kimble- Director Paediatric Surgery, Urology, Burns
- Catherine McMillan- CN Burns
- Wendy Chamberlain- RN Burns

**Definition of terms**

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<th>Definition</th>
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References and suggested reading


Guideline revision and approval history

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<th>Modified by</th>
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<tr>
<td>1.0</td>
<td>Kristen Storey, CNC Burns</td>
<td>Executive Director Medical Services</td>
<td>Executive Director Hospital Services</td>
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| 2.0         | Kristen Storey, CNC Burns | Nursing Director, Division of Surgery | Executive Director Nursing Services

Keywords

- Burns, paediatric, wounds, dressings, first aid, Acticoat, Mepilex Ag, 06003

Accreditation references


Appendix 1: Lund and Browder

ASSESS THE EXTENT AND DEPTH OF THE BURN
SHADE AREA • INDICATE DEPTH • IGNORE SIMPLE ERYTHEMA

REGION

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Relative percentage of body surface area affected by burn growth:

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Small burns - Palm of hand (including fingers together) approximately 1% of body surface area.
Appendix 2: Fluid Resuscitation guideline

The modified Parkland Hospital Formula for burns resuscitation is used within the Pegg Leditschke Children’s Burns Centre.

Fluid Resuscitation is required for:

- Any burn ≥10% in an infant 0-18mth
- Any burn ≥15% in a child 18mth and older

### Fluid Resuscitation Formula

3-4mL Hartmanns’ Solution x Body Weight (kg) x Area of Burn (TBSA)

Plus

Maintenance Fluid of Hartmanns and 5% Dextrose

<table>
<thead>
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<th>Fluid Resuscitation Formula (24hr)</th>
<th>Maintenance Formula</th>
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<tr>
<td>First half of total volume given over first 8hrs from time of injury</td>
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<tr>
<td>Second half given over remaining</td>
<td>50ml/kg for each kg between 10-20kg</td>
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<tr>
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<td>20ml/kg for each kg over 20kg</td>
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IDC must be inserted for all children receiving fluid resuscitation

Aim for 1ml/kg/hr of urine output

NGT to be inserted for all children receiving fluid resuscitation

Commence at 10ml/hr and titrate with maintenance fluid. Dietician to be notified

Note: This is a guideline only and should be used for initial assessment. Fluid resuscitation should be re-assessed hourly for effectiveness and altered accordingly.

For large burns (>25%), Albumin has been shown to decrease total amount of fluids required. Albumin should not be used within the first 6hrs of sustaining a burn injury. After this time, Albumin should be given as a 50:50 ratio to the resuscitation crystalloid.

CHQ-GDL-06003 – Management of a paediatric burn patient within the Pegg Leditschke Children’s Burns Centre
Appendix 3: Chlorhexidine Calculations

Amount of Chlorhexidine Gluconate 5% added to water to maintain concentration of 0.1%.

Small size disposable bowl: ½ full = 500mls
+ 10 mls Chlorhexidine Gluconate

Round disposable paper bowl: ¾ full = 2L
+ 40 mls Chlorhexidine Gluconate

Bath water: 10cm = 65 Litres
+ 1.3 Litres Chlorhexidine Gluconate

Bath water: 15 cm = 110 litres
+ 2.200 Litres Chlorhexidine Gluconate

Formula for Calculation.
\[ C_1 \cdot V_1 = C_2 \cdot V_2 \]
Concentration Stock \( \times \) Volume = Concentration Final \( \times \) Volume final

Eg.
\[ C_1 \text{ Chlorhex Stock} = 5\% \]
Final volume = 2000ml
Final concentration = 0.1%

\[ 5\% \times V_1 = 0.1\% \times 2000ml \]
\[ 5\% \]
\[ V_1 = 40 \text{ mls} \]
Appendix 4: Dressing flowsheet

For all paediatric burns
1. Ensure adequate first aid is provided, 20 mins cool running water up to 3hr post burn
2. Contact the LCCH Burns Registrar (07)30681111 prior to dressing, or sending referral
3. Complete online referral
4. Email referral with photos to burns-opd@health.qld.gov.au
5. We do not recommend the use of Silver Sulphadiazine or ice.
6. All paediatric burns, irrespective of size, should be discussed with the Burn Registrar. However many can be cared for in local centre under our supervision.

TBSA  Total body surface area
SPT-DPT All partial thickness burns (superficial to deep partial)
FT Full thickness
Unclean first aid eg water from creek/river, pond/unevent/wash water, dirty water
Child unwell URI, viral illness, etc.