

# Guideline

## Management of a paediatric burn patient

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<b>Applicable to</b>	Medical and Nursing staff				
<b>Authorisation</b>	Executive Director Hospital Services				

### 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
- Epidermolysis 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](mailto: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



### 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 <sup>1,2</sup>.

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

<http://anzba.org.au/care/first-aid/>

<http://www.ccbtr.com.au/burn-first-aid/>

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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

## 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 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> 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

**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**

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**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

**ALERT**

**All patients commenced on fluid resuscitation should have an IDC inserted. Aim for output of 1ml/kg/hr**

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**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**

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## 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 scissors 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**

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## 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**

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## 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)



### 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**

## 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<sup>3</sup>. 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<sup>4</sup>.

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 [Nutritional Management of Paediatric Burns Patients](#) (QH staff only)

## 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

- Bubbles
- Toys
- TV, DVD
- Music Therapist
- Breast Feeding

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<sup>5</sup>



#### **ALERT**

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

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### *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<sup>6</sup>.

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 Specialist, 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

Acticoat care - <https://www.childrens.health.qld.gov.au/fact-sheet-acticoat-care/>

Mepilex Ag care - <https://www.childrens.health.qld.gov.au/fact-sheet-mepilex-ag/>

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



### ALERT

**Circumferential burns should not be discharged within first 24hrs**

## 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

Term	Definition	Source
Mepilex Ag™	Is a trade mark product of Molnlycke Health Care	www.molnlycke.com.au
Acticoat™	Is a trade mark product of Smith & Nephew	Smith & Nephew – Australia

## References and suggested reading

1. Cuttle, L., Pearn, J., McMillan, J.R. & Kimble, R.M. (2009). A review of first aid treatments for burn injuries. *Burns*, 35 (6), 768-775. doi:10.1016/j.burns.2008.10.011
2. Cuttle, L., Kravchuk, O., Wallis, B., & Kimble, R.M (2009) An audit of first-aid treatment of pediatric burns patients and their clinical outcome. *Journal of Burn Care and Rehabilitation*, 30(6), 1028-1034. doi:10.1097/BCR.0b013e3181bfb7d1
3. D'Cruz, R., Martin, H. C., & Holland, A. J. (2013). Medical management of paediatric burn injuries: Best practice Part 2. *Journal of Paediatrics and Child Health*. 49(9), E397-E404. Retrieved October 27,2016 from <http://onlinelibrary.wiley.com/doi/10.1111/jpc.2013.49.issue-9/issuetoc>
4. Chan, M.M., Chan, G. M. (2009). Nutritional therapy for burns in children and adults. *Nutrition*. 25(3), 261-269. Retrieved October 27,2016, from <https://www.clinicalkey.com.au/#!/content/journal/1-s2.0-S0899900708004462>
5. Children's Health Queensland Hospital and Health Service, (2016). *Paediatric Trauma Service: Trauma Manual* (8<sup>th</sup> ed.). Brisbane: Queensland Government.
6. Women's and Children's Hospital (2010). *Guidelines for the Management of Paediatric Burns*. Adelaide: Government of South Australia. Retrieved October 27,2016 from [http://www.wch.sa.gov.au/services/az/divisions/psurg/burns/documents/burns\\_guidelines.pdf](http://www.wch.sa.gov.au/services/az/divisions/psurg/burns/documents/burns_guidelines.pdf)

## Guideline revision and approval history

Version No.	Modified by	Amendments authorised by	Approved by
1.0	Kristen Storey, CNC Burns	Executive Director Medical Services	Executive Director Hospital Services
2.0	Kristen Storey, CNC Burns	Nursing Director, Division of Surgery	Executive Director Nursing Services

<b>Keywords</b>	Burns, paediatric, wounds, dressings, first aid, Acticoat, Mepilex Ag, 06003
<b>Accreditation references</b>	NSQHS Standards (1-10): Standard 1 – Governance for Safety and Quality in Health Service Organisations, Standard 2 – Partnering with Consumers, Standard 3 – Preventing and Controlling Healthcare Associated Infections  EQuIP National Standards (11-15): Standard 11 – Service Delivery, Standard 12 – Provision of Care

## Appendix 1: Lund and Browder

**ASSESS THE EXTENT AND DEPTH OF THE BURN**

SHADE AREA • INDICATE DEPTH • IGNORE SIMPLE ERYTHEMA

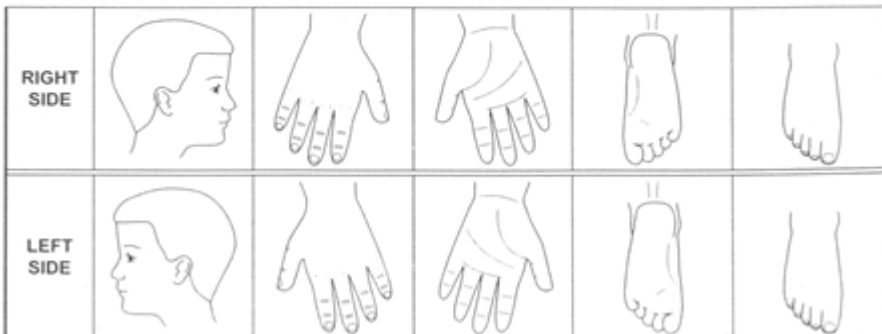
REGION	%
Head	
Neck	
Anterior Trunk	
Posterior Trunk	
Right Arm	
Left Arm	
Buttocks	
Genitalia	
Right Leg	
Left Leg	
<b>Total Burn</b>	

	<b>Superficial</b> (brisk capillary refill, painful, pink, blisters, moist)
	<b>Deep or Indeterminate</b> (nil or sluggish capillary refill, less sensation, white, mottled, dark red, brown or black, dry, leathery)

Relative percentage of body surface area affected by growth.

Age (years)	0	1	5	10	15	Adult
<b>A</b> 1/2 of head	9 1/2	8 1/2	6 1/2	5 1/2	4 1/2	3 1/2
<b>B</b> 1/2 of one thigh	2 3/4	3 1/4	4	4 1/2	4 1/2	4 3/4
<b>C</b> 1/2 of one leg	2 1/2	2 1/2	2 3/4	3	3 1/4	3 1/2

Small burns - Palm of hand (including fingers together) approximates 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  $\geq 10\%$  in an infant 0-18mth
- Any burn  $\geq 15\%$  in a child 18mth and older

<b><u>Fluid Resuscitation Formula</u></b>	
3-4mL Hartmanns' Solution x Body Weight(kg) x Area of Burn (TBSA)  Plus  Maintenance Fluid of Hartmanns and 5% Dextrose	
<b><u>Fluid Resuscitation Formula (24hr)</u></b>	<b><u>Maintenance Formula</u></b>
<ul style="list-style-type: none"> <li>• First half of total volume given over first 8hrs from time of injury</li> <li>• Second half given over remaining</li> </ul>	100ml/kg up to 10kg  50ml/kg for each kg between 10-20kg  20ml/kg for each kg over 20kg
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 reassessed 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

## Appendix 3: Chlorhexidine Calculations

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

Small size disposable bowl:  $\frac{1}{2}$  full = 500mls  
+ 10 mls Chlorhexidine Gluconate

Round disposable paper bowl:  $\frac{3}{4}$  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.

$$C_1 V_1 = C_2 V_2$$

Concentration Stock x Volume = Concentration Final x volume final

Eg.

$C_1$  Chlorhex Stock = 5%

Final volume = 2000ml

Final concentration = 0.1%

$$5\% \times V_1 = \frac{0.1\% \times 2000\text{ml}}{5\%}$$

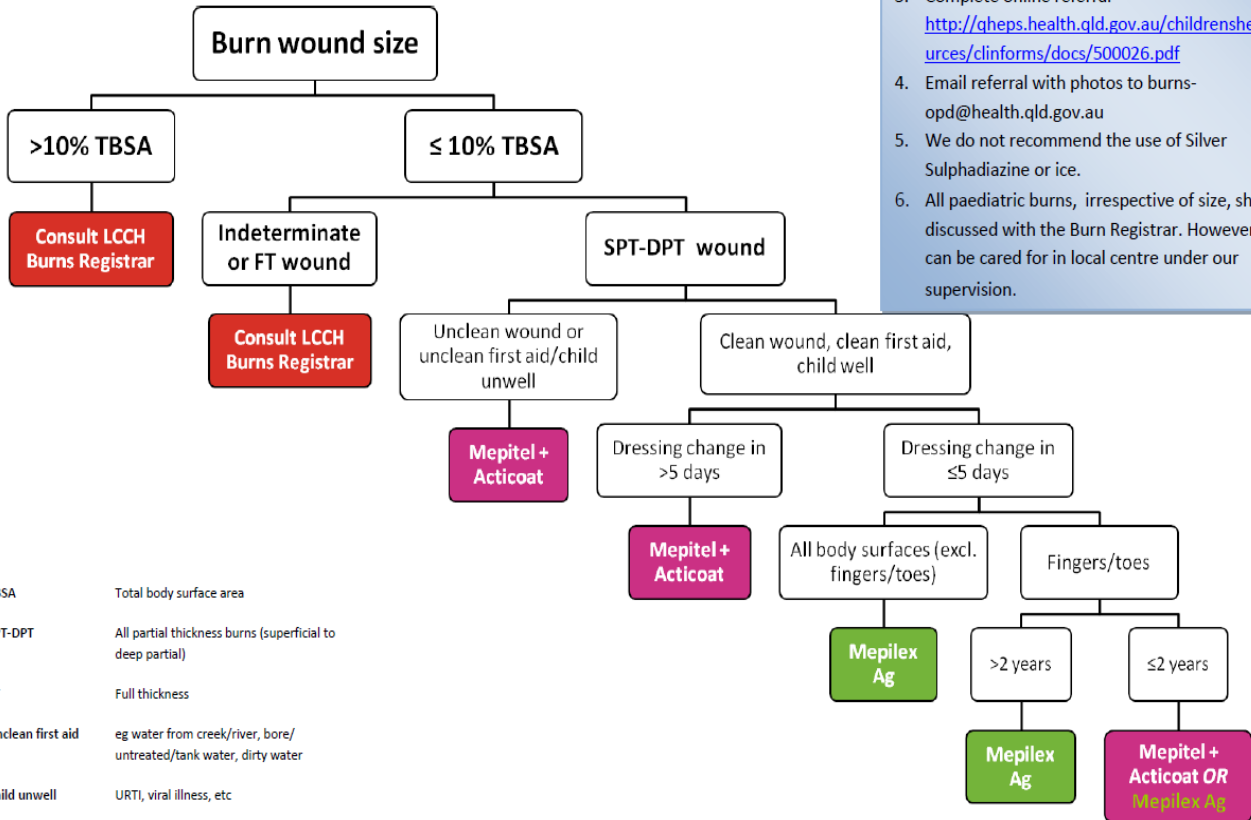
$$V_1 = 40 \text{ mls}$$

## 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 <http://qheps.health.qld.gov.au/childrenshealth/resources/clinforms/docs/500026.pdf>
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, bore/untreated/tank water, dirty water  
 Child unwell URTI, viral illness, etc