

Women's & Children's Hospital

Guidelines for the Management of Paediatric Burns



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Government
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SA Health



Women's
& Children's
Hospital

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Considerable care has been taken to ensure that the information included in these guidelines is accurate. These guidelines are intended as an aid and should not replace clinical judgment. Any loss or damage incurred as a consequence of using these guidelines is not the responsibility of the Women's and Children's Hospital/CYWHS.

1. INTRODUCTION TO THE BURNS SERVICE AT THE WOMEN'S AND CHILDREN'S HOSPITAL

The Paediatric Burns Service is responsible for inpatient and outpatient treatment of children up to 16 years of age. The Service provides the majority of paediatric burn care in SA and its catchment population includes metropolitan and country SA, NT and western parts of NSW and Vic. The care requirements of burns patients are considerable and complex. In the case of severe burn injuries an initial period of hospitalisation is followed by extensive follow-up and rehabilitation. Referral criteria are based on the Australia and New Zealand Burn Association's 'Transfer Guidelines for Burn Service Referrals (2007)' – See following page. A Telephone consultancy service is provided to general practitioners, health services and parents. A wound management consultancy is provided within the hospital. Digital photos can be sent to linda.quinn@health.sa.gov.au.

The Burns Advanced Clinical Practice Consultant and Burns Clinical Nurse provide a burns dressing service during office hours and Newland ward staff provide this service out-of-hours.

For burn wound advise contact **08 8161 7000** and ask for burns nurse 24 hours/day.
For all burn transfers contact **08 8161 7000** and ask for Burns registrar.

The Burns Service is involved in prevention programs to assist in lowering the number of paediatric burns, as well as education programs to improve the treatment of burns. Examples include fire safety and burns education programs for kindergarten and primary school students and campfire safety campaigns. The team also has a focus on community education about prevention of burns and care of children with burn injuries in Aboriginal communities. If you would like further information please contact the Burns Advanced Clinical Practice Consultant via email linda.quinn@health.sa.gov.au.

The Paediatric Burns Service is a multidisciplinary team consisting of:

- 3 General Surgeons: Mr Anthony Sparnon (Head of Unit)
Mr Chris Kirby
Mr Sanjeev Khurana
- 2 Plastic Surgeons: Dr Michelle Lodge
Mr Bernard Carney
- Burns Advanced Clinical Practice Consultant: Ms Linda Quinn
- Burns Clinical Nurse
- Burns Registrar
- Burns Fellow
- Burns RMO
- Social Worker: Karla Matousek
- Physiotherapist: Kathryn Heath
- Occupational Therapist: Vanessa Timbrell
- Dietitian

The Paediatric Burns Service also works closely with the WCH Acute Pain Service.

2. REFERRAL CRITERIA TO WOMEN'S AND CHILDREN'S HOSPITAL (WCH) BURNS SERVICE

Including telephone consultations and patient transfers for persons aged 0-16 years

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

This criterion is based on the Australian and New Zealand Burn Association transfer guidelines for Burn Service referrals (2007).

3. FIRST AID

3.1 DANGER – ensure own safety

3.2 STOP THE BURNING PROCESS

3.3 COOL THE BURN WOUND

- For flame burns instruct the person to “stop, drop, cover and roll” – extinguish flames with a blanket.
- Remove the heat source: clothing, embers, chemicals, etc.
- Apply cool running water for 10- 20 minutes¹
- Remove anything tight: jewellery, non-adherent clothing etc.
- **Minor Burn** – continue cool water irrigation for 20 minutes. Cover with non-adherent dressing (e.g. cling wrap).^{2,3} Warm the patient. Seek medical advice.
- **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.

Ice should never be used – it causes vasoconstriction leading to further tissue damage and hypothermia⁴.

Gel Pads (such as Hydrogel, Burnaide™) can be used as an alternative to running tap water where water is unavailable or not practical. Must be removed after 20 minutes. **Running tap water is still the best means of cooling the burn wound**⁵.

Please refer to the Hydrogel protocol – Appendix 1.

3.4 First Aid – Burn Type Specific

3.4.1 Scalds

- Remove all soaked clothing
- 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
- Immediately cool the burn with cool running water.

3.4.2 Electrical Burns

- Turn off mains/ switch off source (power point)
- Remove patient from electricity source remembering your own safety
- **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
- **Cervical Spine Protection**
- **ECG**^{6,9}

3.4.3 Chemical Burns

The most common cause of childhood chemical burns are from household cleaning agents such as bleach, oven cleaners, toilet cleaners and automatic dishwashing chemicals.

Residual chemicals on the skin or clothing will allow the burning to continue. Chemicals may continue the burning process until diluted with copious amounts of water.

**Staff providing first aid (including ongoing irrigation if required) must wear Personal Protective Equipment (PPE):
Gown, gloves, mask and eye protection.**

Treatment:

For most chemicals found in the home:

- remove clothing
 - powdered agents should be brushed from the skin
 - wash the burn with copious amounts of water, preferably within 10 minutes of the burn injury
 - chemical eye injuries require continuous irrigation until ophthalmologic review. Always ensure that the unaffected eye is uppermost when irrigating to avoid contamination.⁶
-
- **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

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

- **Hydrofluoric (HF) Acid** - exposure may be dermal, inhalation, ocular or oral. Toxicity ranges from minor dermal injury to life threatening systemic complications. Ingestion of HF is potentially lethal.

Decontamination:

- Dermal exposure
 - Remove clothing
 - Irrigate with water
 - Ingestion
 - Do not induce vomiting
- Ocular exposure
 - Irrigate thoroughly with water or saline

Hydrofluoric Acid skin exposure:

- Topical 2.5% calcium gluconate burn gel (minor burns)
- Local injection of calcium gluconate 1g/10ml
 - Consider if topical application fails to stop pain
 - Inject 0.5ml/cm² depots intradermally and subcutaneously using a 25G needle into burn wound.
- Biers block (forearm regional intravenous injection)
 - Consider for large HF exposures
 - Insert intravenous line proximally in affected forearm
 - Dilute 1g (10 ml) calcium gluconate in 40 ml of normal saline
 - Inject diluted calcium gluconate solution intravenously with pneumatic tourniquet inflated (Bier's technique)
 - Release cuff after 20 minutes
- Intra-arterial infusion
 - Insert intra-arterial line into radial, brachial or femoral artery of affected limb.
 - Dilute one ampoule calcium gluconate (1g/10mL) in 40ml of normal saline. Infuse diluted calcium gluconate solution over 4 hours^{7,8}.

4. PRIMARY SURVEY

- A. Airway maintenance with Cervical Spine Control
- B. Breathing and Ventilation
- C. Circulation with Haemorrhage control
- D. Disability – neurological status
- E. Exposure and Environmental Control
- F. Fluid resuscitation proportional to burn size

4.1 Airway

- Oxygen should be administered (for suspected smoke inhalation or carbon monoxide poisoning).
- There may be pre-existing airway obstruction (e.g. asthma, enlarged adenoids, tonsils and/or tracheomalacia). The lower airway is narrower in children than in adults; swelling of respiratory tract or accumulation of secretions may seriously impair respiratory function.
- Smoke inhalation may cause bronchospasm.
- Endotracheal intubation is indicated if an airway burn is suspected. If the face is burned the tube may be fixed with cotton tape tied over the ears.^{6,10,11}

4.1.1 INHALATION BURNS

History of the burn injury will suggest the type of inhalation injury. Signs to indicate possible inhalation include:

- Burns to face, mouth, neck, pharynx
- Soot in the sputum
- Tracheal tug, use of accessory muscles
- Inspiratory stridor
- Productive cough
- Respiratory difficulty.

A. Airway injury above the larynx

Caused by inhalation of steam or hot gases. In children this type of injury is usually associated with a scald injury. Soft tissue oedema results in airway obstruction.

This is the most common inhalation injury seen in children. Stridor and respiratory distress indicate inhalation injury. If airway obstruction is detected intubation should be performed immediately. Paediatric Intensive Care Unit medical staff should be consulted.

B. Airway injury below the larynx

Resulting from inhalation of:

- Combustible products - carbon, nitrogen, sulphur and phosphorous.
- Chemical compounds - carbon monoxide, ammonia, caustic cleaning products.

C. Systemic Intoxication Injuries

Follows absorption of carbon monoxide, hydrogen cyanide, ammonia, hydrofluoric acid and phosgene.

Consider early intubation if any concerns regarding airway or breathing. Early ICU /anaesthetic consult if concerned.^{10, 11}

4.1.2 FACIAL AND NECK BURNS

Face: Severe oedema occurs very quickly consider early intubation

- Stain eyes with Fluorescein 2% drops to detect any corneal damage. Rinse thoroughly with normal saline to prevent corneal irritation.
- T.D.S eye toilets with chloramphenicol ointment applied whilst eyes are closed
- Clean face and neck B.D. with saline and gauze. Apply White Soft Paraffin ointment T.D.S. and PRN to keep moist
- Apply a thin layer of white soft paraffin or lanolin to burnt lips.
- Wash hair daily
- Observe for signs of airway involvement due to smoke/steam inhalation or swallowing of hot fluids

Neck: Extend the neck with a bolster under the shoulders to maximise air entry.

Ears: Avoid pressure on the ears by putting a foam doughnut under the head.

4.2 Breathing

- The chest should be exposed to ensure that chest expansion is adequate and equal. Look for respiratory recession, tracheal tug, excessive use of abdominal muscles, and the rate of the respirations ⁶.
- Circumferential burns to the chest may restrict breathing and impair gaseous exchange. An escharotomy may be required in circumferential burns that compromise breathing.
- Carbon monoxide poisoning should be ruled out by measuring the HbCO₂ level. An arterial blood gas should be obtained to determine the carboxyhaemoglobin level. High flow oxygen should be administered via a non-rebreather mask at 100% ¹¹.
- Check for additional injuries that may have occurred when the patient sustained a burn injury (e.g. pneumothorax, haemothorax, tension pneumothorax or a flail chest) ¹¹.

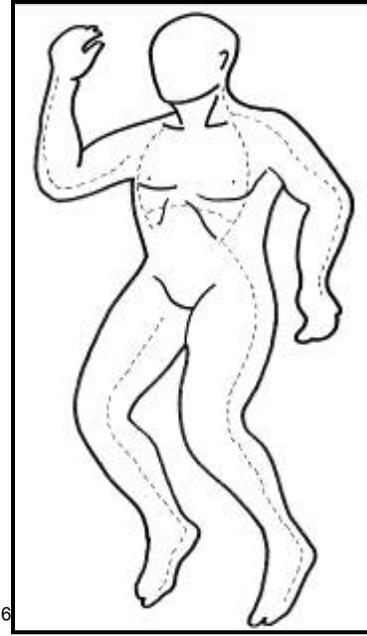
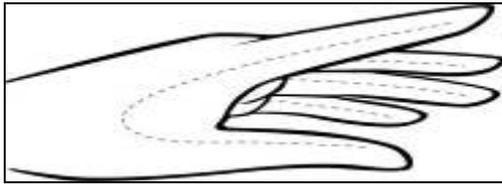
4.3 Circulation with Haemorrhage control

- Check the pulse - is it strong or weak?
- Capillary blanch test - normal return is two seconds. Longer indicates hypovolaemia or need for escharotomy on that limb; check another limb.
- Stop bleeding with direct pressure.
- Pallor occurs with 30% loss of blood volume.
- Mental obtundation occurs with loss of 50% of blood volume ⁶.

4.3.1 ESCHAROTOMIES/FASCIOTOMIES

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 escharotomies/fasciotomies may be required if retrieval is delayed. These are usually performed under anaesthetic.
- If deep burns involve the chest and abdomen, diaphragmatic movement may be restricted. A chest escharotomy may be indicated. **Refer to the Women's and Children's Hospital for advice regarding escharotomies if indicated.**



4.4 Disability: Neurological Status

- Establish level of consciousness
- Examine the pupillary response to light. Response should be brisk and equal.
- Be aware that hypoxaemia and shock can cause restlessness and decreased level of consciousness⁶.

4.5 Exposure with Environmental Control

- Remove all clothing and jewellery
- **Keep the patient warm**⁶.

4.6 Fluid Resuscitation

- The goal of fluid resuscitation is to perfuse the vital organs without overloading the circulatory system and causing cardiac and respiratory complications. Burn shock is similar to hypovolaemia.
- If there is evidence of burn shock such as low urine output then Hartmann's (Compound Sodium Lactate) solution must be given immediately and rapidly until haemodynamically stable (Parkland Formula).
- Burns that are greater than 15% should have 2 large bore, peripheral intravenous lines inserted preferably through unburned tissue and blood for full blood count, electrolytes, coagulations, amylase and carboxyhaemoglobin. The Australian and New Zealand Burn Association recommend the Parkland Formula for assessing the fluid requirements.

3-4ml of Hartmann's Solution/kg/%burned

**First half of the calculated fluid is given in the first eight hours
Second half is given in the next sixteen hours.**

+ Maintenance for children

- Area burned is estimated by using the Lund and Browder chart (see pg 3 of **Paediatric Burns Assessment Form**).

Minor burns also require an increase in fluid intake. This should be calculated and recorded accurately.

4.6.1 Monitoring Fluid Resuscitation

- The fluid formula using Hartmann's solution is a guide to fluid volume requirements and clinical assessment should determine necessary modification. Resuscitation should be modified according to clinical response.

For example:

- Urine output
- Pulse rate, arterial blood pressure
- Peripheral colour and temperature
- Hb and haematocrit
- Electrolytes
- Central venous pressure if CVC insitu.

Urine output is the most accurate indicator of adequate resuscitation.

Output should be at least: 0.5ml/kg/hr for children <2 years

1 ml/kg/hr for children >2 years^{12, 14}

Signs of under hydration:

- Oliguria
- Poor peripheral colour and return
- Restlessness and confusion
- Vomiting

Signs of over hydration:

- Excessive urine output
- Generalised oedema
- Pulmonary oedema
- Increased blood pressure.

4.6.2 Fluid Resuscitation in Electrical injury

- Electrical injury requires diligent fluid resuscitation. Tissue injury, particularly muscle damage from an electrical injury creates the release of myoglobin and haemoglobin. These hemochromogens colour the urine to be red in appearance. Treatment of pigmented urine must occur promptly to minimise the risk of acute renal failure. This is achieved with the administration of intravenous fluids, diuresis and alkalisiation of the urine. In the patient with an electrical burn, urine output is maintained at 2ml/kg/hour in children ^{15, 18}.

5. SECONDARY SURVEY

In management off burn victim, the extend and the emotional impact of the nature of injury should not prevent the treating team from managing the victim as per usual trauma protocol, and therefore a normal secondary survey is indicated as most burn victims have suffered a physical trauma as a result of their injury. Specifically:

X-ray

Lateral cervical spine
Chest
Pelvis

Access

For fluid resuscitation
Blood tests as required

Log roll

In consideration of possible spinal injury

Nasogastric tube

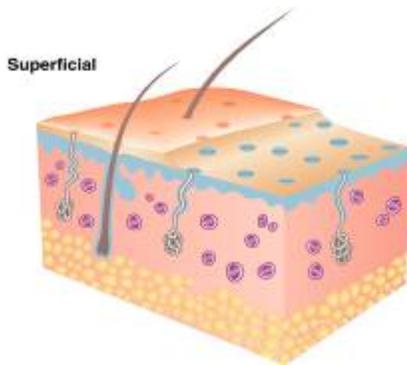
For gastric emptying/gastric feeds of >15% TBSA

6. GUIDELINES FOR MANAGEMENT OF PAEDIATRIC BURNS

6.1 Burn wound description

6.1.1 Superficial Burn

- Epidermis and upper part of dermal papillae only are involved.
- Burn may appear bright pink or red in colour.
- Skin blanches on pressure.
- Blisters may or may not be present.
- Burn is painful and sensitive.
- Healing occurs in 7-10 days with no scarring.



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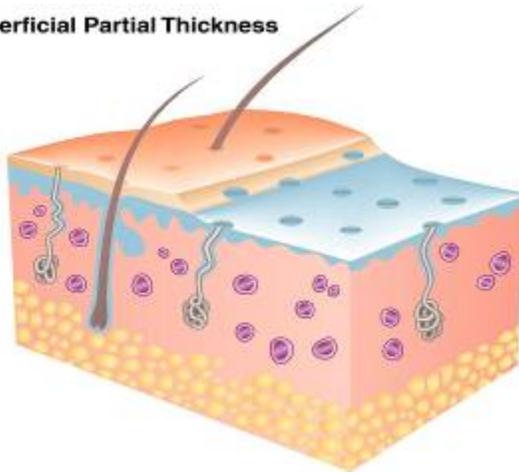
Women's and Children's Hospital, Burns Database 2007

6.1.2 Partial Thickness Burn

A Superficial Partial Thickness

- Epidermis is lost with varying degrees of dermis.
- The damage can range from superficial to deep dermal.
- Burn is usually coloured pink and white.
- May or may not blanch on pressure.
- Variable degrees of reduced sensation may be present.
- Epithelial cells are present in hair follicles and sweat glands.
- Results in regeneration and spread.
- Healing occurs in 14 days.
- Some depigmentation of scar may occur.
- May require skin grafting.

Superficial Partial Thickness

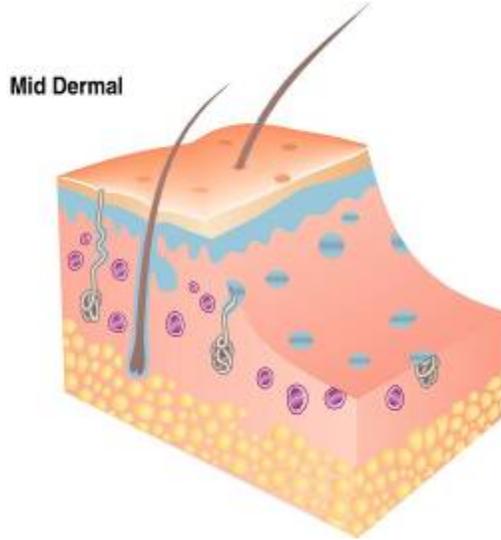


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B Mid Dermal



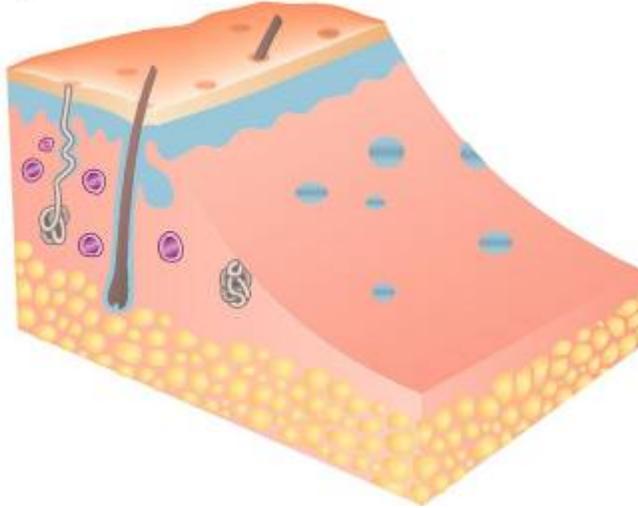
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C Deep Dermal

Deep Dermal



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Women's and Children's Hospital Burns Database 2007

6.1.3 Full Thickness Burn

- Both epidermis and dermis are destroyed.
- Burn appears white and does not blanch, it can also be brown, cherry red or black.
- Sensation is absent.
- Spontaneous healing is not possible.
- Inelastic.

Full Thickness



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Women's and Children's Hospital Burns Database 2007

6.2 Methods of burn depth assessment⁶

	Superficial	Partial Thickness	Full Thickness
		Mid Dermal	Deep Dermal
Appearance	Pink small blister	Red-white large blisters	Red & mottled Blisters
Sensation	Painful	Sensation intact	Dulled sensation
Capillary refill	Returns after compression	Varies with depth	Absent
Spontaneous healing	5-7 days	7-10 days	14-21 days skin substitute
			Waxy colour, leathery, charred
			Anaesthetic
			Absent
			Requires grafting

6.3 Infection control

6.3.1 Screening

- Patients admitted to the WCH should have a set of screening swabs taken on admission and sent to the laboratory marked "MRSA Screen". Swabs should be taken from the nose, groin and wound/s (if uncovered).

6.3.2 Staff

- Limit the number of staff entering the room, non essential staff (including students) must be kept to a minimum.
- Any staff member that enters the room must decontaminate their hands (ie via hand washing with soap and water or via the use of alcohol hand gel).
- Staff that have contact with the patient should wear a long sleeve gown and gloves, these should be disposed before exiting the room.
- Gloves must be changed and hands washed when gloves become contaminated with the patients' secretions or excretions before contact with another site.
- Staff must decontaminate their hands before exiting the room.
- Hand Hygiene to be conducted according to CYWHS procedure: Hand Hygiene and Hand Care

6.3.3 Visitors

- Visitors should be restricted to 2 at a time, discourage young children from visiting.
- Visitors should decontaminate their hands on entering and exiting the room.
- Visitors should wear gloves and a gown to cover their clothing when visiting if they will have direct contact with the patient.
- Visitors with infectious diseases (including colds) should not visit the patient.

6.3.4 Transfers to other Departments

- Transfers should be minimised, where practicable procedures should be conducted in the patient's room. If this is unavoidable the receiving department must be informed of the transfer prior to transferring. The patient should not be placed in a communal waiting area.

6.3.5 The Patient's Room

- Patients with extensive burns (ie > 15 %) and / or those with a multi-resistant organism should be allocated a single room
- If the patient is in a positive pressure room the door must remain closed
- Ensure that all unnecessary equipment and furniture are removed from the room, avoid over cluttering the room to facilitate appropriate cleaning
- Equipment in the room must, where possible, be dedicated for use with that patient. The patient should have their own dedicated stethoscope, blood pressure cuff.
- Ensure all equipment that is brought in and taken out of the patient's room is thoroughly cleaned / reprocessed adequately
- Mattress covers have been implicated in outbreaks in Burns Units, covers on mattresses should be inspected between patients and mattresses with damaged covers should not be used for subsequent patients.
- Keep charts and notes and other paper work outside of the room to reduce the risk of contamination
- Avoid fresh flowers or plants being placed in the room as they can serve as a reservoir for bacteria and / or fungal spores
- A sign should be placed on the patient's door indicating that the patient is on protective precautions (sign to be developed by Infection Control Unit)
- Non-washable toys and cloth objects should be restricted (refer to the CYWHS Procedure: "Toy use within the healthcare setting")

6.3.6 Patients with Multi-resistant organisms (MROs), including MRSA

- Patients with MROs should be managed as per the CYWHS Procedure: "Management of patients colonised or infected with multi-resistant organisms (MROs)"
- Patients with MROs should not be admitted to positive pressure rooms (ie room 7 and 8 on Newland Ward, Room 5 in PICU)

References

CYWHS Procedure, 2007. Management of patients colonised or infected with multi-resistant organisms (MROs)

CYWHS Procedure, 2007. Toy use within the healthcare setting

CYWHS Procedure 2009 Hand Hygiene and Hand Care PR2006_056

Mayhall, G. 2004. Nosocomial Burn Wound Infections, in Hospital Epidemiology and Infection Control (Third Edition), Lippincott Williams and Wilkins, Philadelphia

Weber, J. et al, Infection Control in Burn Patients www.worldburn.org/documents/infectioncontrol.pdf, accessed 29/10/07

6.4 Medication for paediatric burn patients >15% TBSA

6.4.1 Vitamins

Multivitamins	0-3 years	Pentavite infant 0.45ml daily
	Over 3 years	Pentavite mixture 5 ml daily
Iron supplement	0-30kg	2.5mg/kg (0.4ml/kg) daily Ferroliquid (6mg elemental iron/ml)
	Over 30kg	Ferrogradumet 1 tablet (105mg) daily
Ascorbic Acid	<2 years 250mg daily ½ tablet crushed >2 years 500mg daily 1 tablet crushed	
Zinc	Zinc Sulphate 1mg/kg/day (of elemental zinc) in 1-3 divided doses	

Note: if these patients are on enteral feeds they may receive large doses of zinc from their feeds. Check the need for supplemental doses of zinc with the dietitian before prescribing.

6.4.2 Antibiotics

- **Used ONLY if positive wound culture or clinical infection is detected and NOT used as prophylaxis.**
- **Should be discussed with Infectious Diseases if:**
 - recurrent
 - does not resolve
 - multi-organisms involved.

6.4.3 Analgesia for paediatric burn patients

General Information:

Analgesics should never be given by the intramuscular (IM) route.

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

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

Full details of all pain management methods and protocols are contained in the Women's and Children's Hospital [Intranet – Pain Management Guidelines](#)

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

Major Burns > 15%:

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

- Most children are managed with intravenous morphine infusions or Patient Controlled Analgesia (PCA) **and regular paracetamol (15mg/kg QID)**
- Contact the Acute Pain Service for opioid infusions or PCA
- Consult with the WCH Pain Service to determine drug doses for infants under 1 year of age
- If standard doses of morphine do not provide adequate analgesia for pain, early introduction of a **low dose ketamine infusion** may improve analgesia without the side effects that can result from escalating opioid doses. Contact the WCH Pain Service or Duty Anaesthetist.
- In PICU a **midazolam infusion** may also be required. This will be prescribed and managed by PICU medical staff
- Please liaise with the WCH Pain Service if, at any time, analgesia is sub-optimal.

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

Transition to oral analgesia

The aim is to provide:-

- 1) Background analgesia using continuous slow release agents eg MSContin[®] or Tramadol SR
- 2) Breakthrough analgesia using an immediate acting medication eg. Oxycodone, tramadol

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

Oral background:

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

- If the child has required high doses of IV opioids then larger doses may be needed The WCH Pain Service should be involved in the calculation of the MS Contin[®] dose required in these patients.
- MS Contin[®] is the background drug of first choice because of it's consistent mechanism of delivery. This avoids potential problems of over-sedation when combined with other sedative agents e.g. dressing analgesia or sedating antihistamines.
- Consult the Acute Pain Service if the child is under 1 year.
- Dosage adjustments are made to the slow release opioid depending on breakthrough use per 24 hours (ask for assistance with this). The WCH Pain Service will develop an opioid weaning regimen when appropriate.

Oral breakthrough:

Either:-

- **Oral Morphine (syrup): 0.2mg/kg/dose 4 hourly PRN or**
- **Oral Oxycodone (syrup or 5mg capsules)**
 - **0.2mg/kg/dose 4 hourly PRN for child over 1 year**
 - **0.1mg/kg/dose 4 hourly PRN for children less than 1 year**
- Oral morphine syrup is generally the preferred option if a nasogastric tube is to be used for administration.. If not using a nasogastric tube then oxycodone is generally considered more palatable.

Adjuvant medications:

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

Minor burns <15%:

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

All children should have:

Paracetamol: 15mg/kg/dose 6 hourly regularly

Breakthrough analgesia may comprise all or any of the following medications

**Oxycodone: 0.2mg/kg/dose 4 hourly PRN if child over 1 year
0.1mg/kg/dose 4 hourly PRN for children less than 1 year**

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

Tramadol: 1-2 mg/kg 6 hourly PRN

Minor burns may also require **MS Contin®** 0.6mg/kg/dose 12 hourly to maintain comfort and/or to facilitate regular face care. (If used for one week or less, MS Contin® can be ceased without weaning)

Post-operative management:

Please ensure the morning dose of slow release opioids is given prior to theatre even if the child is fasting

Depending on the surgery undertaken there may be an acute increase in analgesic requirements post-op e.g. after extensive grafting. This may be managed in a number of ways and requires consultation with the WCH Pain Service

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

Please Note: opioid infusions or PCA background infusions are not as a rule run simultaneously with oral opioids (MS Contin[®], methadone, morphine or oxycodone) unless specifically ordered by the WCH Pain Service, with documentation of the exception recorded in the patient record.

Dressing procedures:

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

Minor burn injuries - minimal debridement

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

- If the child is comfortable on presentation PED staff please order a dose of intranasal fentanyl which can be administered by nurses in Newland immediately prior to the dressing
- If a dose is required in PED for initial analgesia, please can PED staff order an additional dose that may be administered by the staff in Newland immediately prior to the dressing
- **Intranasal fentanyl dose is 1.5 mcg/kg**
- Children having intranasal fentanyl as the only analgesic/sedative can be treated on Newland as an outpatient occasion of service.
- Other options for very minor burns include paracetamol, ibuprofen and tramadol.

Minor burn injuries - requiring more debridement

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

- Administer **oral morphine syrup 0.5 mg/kg** on presentation
- Newland staff will assess if an anxiolytic/sedative is also required
- Children receiving morphine syrup at this concentration will require a Type C or overnight admission for their care in Newland ward

Routine oral dressing analgesia + sedation

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

- It may be adjusted in relation to specific child risk factors (refer to procedural sedation guidelines).
- Alterations may need to be made to either the analgesic or sedative component for subsequent dressings e.g. morphine dose may need to be increased or changes made to the choice of sedative on evaluation of previous sedative experience.

Medication is usually given orally 30 to 45 minutes prior to the procedure as follows:

Oral morphine syrup: 0.5mg/kg stat for children over 6 months

Plus

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

Consult with WCH Pain Service or PED Registrar when prescribing analgesia for children less than 1year (avoid sedation if possible)

Intranasal fentanyl can be used if short acting analgesia is required.

Intranasal Fentanyl 1.5 micrograms/kg. Therapeutic levels occur in 10minutes and the duration of action is 30-40 minutes.

Refer to [WCH Procedural Sedation Guidelines](#) to ensure safe practices are observed for children receiving sedation/analgesia for burn dressings

For children who experience paradoxical reactions to midazolam other options include

Diazepam 0.1mg/kg **Max dose 10mg**

Trimeprazine up to 2mg/kg **Max dose 60mg**

Temazepam 0.3mg/kg **Max dose 20mg**

Please note that while the above medications are anxiolytic, midazolam reduces patient recall of the procedure in addition to the anxiolytic activity.

Entonox[®] can be used in conjunction with oral sedation for dressing changes. This technique can be used ONLY under the supervision of accredited nursing staff, PED Medical Staff or Anaesthetists.

Other drugs (including ketamine and clonidine) and routes of administration may be used in consultation with a consultant paediatric anaesthetist.

Side Effects:

Nausea and vomiting:

Can be managed with

Tropisetron 0.1mg/kg/dose (max 2mg) IV 12 hourly PRN and/or

Droperidol 0.01-0.02 mg/kg/dose IV 8 hourly PRN (max 0.5mg) (for children over the age of 3 years)

If this is unsuccessful, the opioid analgesia should be reassessed and consideration may be given to changing the opioid or giving analgesics rectally (if child is agreeable). Consult CPC Pain Management or Duty Anaesthetist for assistance with the management of intractable vomiting.

Itching:

Itch may occur as a side effect of IV Opioids – usually confined to face and chest, or as a response to healing epithelial cells in the area of the burn injury.

If the itch is thought to be a response to opioid analgesia, the use of multimodal analgesia to reduce overall opioid requirement or a change of opioid may be effective.

Non-sedating antihistamines provide a safer option for children on other sedating medications. Cetirizine should be tried as a first option, especially for daytime use.

Oral cetirizine.

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

* Please note change from weight to age dose guidelines

Trimeprazine 0.25 mg/kg/dose PO 6-8 hrly prn up to 1 mg/kg at night for sleeping.-

Caution is always required if trimeprazine is administered in conjunction with other sedating medications.

It is preferable to start with a low dose and increase slowly in the absence of oversedation.

Ranitidine (the H₂ agonist), given regularly has some effect on burn itch:

Ranitidine 15mg/ml

1-6 months	1mg/kg twice daily
6 months to 3 years	2-4mg twice daily
3-12 years	2-4mg/kg (max. 150mg) twice daily

Contacts:

Clinical Practice Consultant - Pain Management – pager 4302

Out of hours - Duty Anaesthetist – Direct Dial 50217

6.5 Frequently used burn dressings

Dressing	Type of Burn	Suitable Use	Dressing Change
Acticoat	Partial/Full thickness	<ul style="list-style-type: none"> All areas of the body, not in the perineum Colonised but not infected burns Non-infected burns 	3-7 days
Mepilex AG (Hypafix to secure edges)	Partial/Full thickness	<ul style="list-style-type: none"> All areas of the body, not in the perineum Colonised but not infected burns Non-infected burns 	4-7 days
Aquacel-Ag	Superficial/ Partial thickness	<ul style="list-style-type: none"> All areas of the body but not over joints or in the perineum. Colonised but not infected burns. Non-infected burns 	Until dressing separates from wound. Do not take dressing off unless infected.
Hydrocolloids: Duoderm Comfeel (hypafix to secure edges)	Superficial/Partial Thickness	<ul style="list-style-type: none"> Flat surfaces Not suitable for: infected burns 	Up to 7 days or sooner if there is excessive exudate or loss of dressing.
Silver Sulphadiazine	Full thickness/infected/contaminated burns	<ul style="list-style-type: none"> ALL areas of the body except the face. 	Change daily Admission may be necessary.
Hypafix		<ul style="list-style-type: none"> Dressing fixation Graft fixation Scar management To secure other dressings 	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 as a day or as necessary. Admission is usually indicated.
Topical antibiotic ointment e.g. mupriocin (Bactroban)	Face, perineum, or any other are that may be infected	All areas of the body	Twice a day or prescribed.

Facial burns

*Best dressing for face burns is white soft paraffin - **do not use SSD as it can cause corneal ulceration.***

PERIANAL 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 Chux 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.

6.6 COMPLICATIONS

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.

6.6.1 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.

Immunisation and tetanus status needs to be reviewed and updated.

Enteral feeding should be commenced as soon as possible after burn injury to promote normal gut function and to decrease the potential for bacterial translocation across the gastric mucosa.¹⁷

6.6.2 Toxic shock

- Toxic shock is a *clinical diagnosis* ¹⁸
 - **Pyrexia $\geq 39^{\circ}$ C**
 - **Rash**
 - **Shock**
 - **Diarrhoea, vomiting or both**
 - **Irritability**
 - **Lymphopaenia**
- Caused by bacterial superantigens which are produced by *staphylococcus aureus* and *streptococcus sp.* ¹⁹
- Superantigens bind directly to T cells stimulating them to produce massive amounts of inflammatory cytokines e.g. TNF α , IL-1, IL-6 ²⁰
- Causes capillary leakage, hypotension and can lead to shock and death
- Enhances patient susceptibility to gram negative infections ²¹
- 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 ²²
- Usually manifests 2-4 days after the burn injury ²³
- Often occurs in small burns (< 10% TBSA) so be aware of outpatient presenting to ED, clinic or phone call from concerned parent
- Burn often appears “clean” ²⁴
- Patient often deteriorates rapidly
- Once shock develops mortality can be as high as 50% ²⁵
- Differential diagnosis includes burn sepsis, Kawasaki disease, toxic epidermal necrolysis, or any other infection.

Treatment

- Aggressive management of hypovolaemic shock with fluid resuscitation and haemodynamic monitoring in Intensive Care / High Dependency
 - Inspection of wounds, debridement of necrotic material, change of dressings
 - Blood, wound and other cultures for microscopy and sensitivity
 - Antibiotics: *Flucloxacillin 50mg/kg up to 2g IV, 6 hourly PLUS
Lincomycin 15mg/kg up to 1.2g IV 8 hourly*
- OR**
- *Vancomycin 25mg/kg IV 12 hourly PLUS
Lincomycin 15mg/kg up to 1.2g IV 8 hourly*
 - Passive immunisation of antibodies to staphylococcal and streptococcal superantigens e.g. fresh frozen plasma, IV immunoglobulin. ²⁶

Protocol for a child with a burn and temperature $>38^{\circ}$

For medical and nursing staff on the ward and in the Emergency Department

1. Admit patient
2. Call Burns Registrar for urgent patient review

Examine child

Signs of toxic shock

- Vomiting + diarrhoea
- Rash of any type
- Mucosal hyperaemia
- Tachycardia
- Tachypnoea
- Capillary refill > 3 seconds
- Irritability/drowsiness
- Poor feeding
- Disinterest in surroundings/parents

Laboratory Results

- Low WBC (esp lymphopaenia)
- Hyponatraemia

Child is well

Look for focus of infection

Eg Jelco sites, urine, respiratory tract, stools, burn cellulitis, meningism

Blood cultures and swabs of burn for URGENT Gram stain (& culture), CBE, EUC

Further septic screen as indicated

Dressing change to inspect wound and apply silver based dressing if not already done

Discuss with Infectious Diseases if indication for antibiotics

If clinically deteriorates

Or evidence of toxic shock is apparent

*follow protocol per **child is unwell***

REVIEW FREQUENTLY

Child is unwell

MET call or inform **PED Consultant** immediately

IV access, bloods for CBE, EUC, LFT, coags, G&S
Sodium chloride 0.9% bolus 20mls/kg
Urinary catheter if low/no urine output
Commence fluid balance chart

Swab burn URGENT Gram stain (& culture), blood cultures

Dressing change inspect wound and apply silver based product after wound decontamination

Discuss with Burns Registrar, Fellow or Consultant

Discuss with Infectious Diseases regarding IV antibiotics e.g.
*Flucloxacillin 50mg/kg up to 2g IV, 6 hourly PLUS
Lincomycin 15mg/kg up to 1.2g IV 8 hourly*

Or

*Vancomycin 25mg/kg up to 1g IV 12 hourly PLUS
Lincomycin 15mg/kg up to 1.2g IV 8 hourly*

If toxic shock likely

10mls/kg IV Fresh Frozen Plasma

Aggressive fluid management – aim for 40mls/kg of IV fluid in the first hour

Watch sodium level

Avoid inotropes if possible

REVIEW FREQUENTLY

7. SPECIFIC NEEDS OF PAEDIATRIC BURN PATIENT

7.1 NUTRITION

Nasogastric tube for burns >15% Total Body Surface Area

Nutrition support is an important component of the overall medical management of paediatric burn patients. The aim of nutritional support is to:

- Promote optimal wound healing and recovery from burn injury;
- Decrease the risk of metabolic complications associated with feeding; and
- Provide nutrients to promote normal growth and development.

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

In particular, it is important that the child receives adequate amounts of protein and energy to meet their nutritional requirements for both wound healing and growth. A child with a burn injury may require twice the energy and protein compared to a healthy child of the same age. Requirements for Vitamins A, C and B group, and iron, zinc and copper are also increased and supplements should be given to burns greater than 15% TBSA. Supplementation is prescribed by the medical team.

Common nutritional issues for children admitted to hospital with burns

Children with burn injuries often have limited intake despite their increased nutritional needs. They often struggle to meet their requirements for a variety of reasons including:

- Pain and effect on appetite
- Sedation/medications and effect on appetite
- Disruptions to normal feeding patterns and frequent periods of fasting
- Amount of time asleep
- Change to environment / unfamiliar environment
- Unable to use mouth/hands to eat normally due to a burn injury
- Fussy eating.

Standard protocol for ALL burns patients

All patients admitted under the burns unit are to receive:

Nutrition Information pamphlet

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

High-energy snacks

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

Indications for referral to the dietitian

Referral to a dietitian for assessment would be recommended for:

- Burn \geq 10% TBSA
- Burn to child <1 year
- Burn to area that affects oral intake (e.g. hands, mouth).

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

Oral intake

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

Enteral Feeding

- Children with burn injuries >10-15% commonly struggle to meet their requirements without the use of enteral feeding.
- Enteral feeding is indicated in the following groups of patients:
 - Burns <15% TBSA with an inability to meet requirements via oral intake alone
 - Burns >15% TBSA enteral feeding should be commenced as early as possible.
- If enteral feeding is indicated it should be commenced within the first 24-48 hours of burn injury to optimize nutritional support / nutritional status for wound healing and decrease the risk of feeding complications.

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

Monitoring

- Regular weight checks and accurate food record charts are important tools for the nutritional monitoring of children with burns. **Children should be weighed twice weekly** using the same scales and without wet dressings wherever possible. All children should be weighed on arrival to the ward where possible.
- **Regular weighs are the main tool used to establish if children are receiving the nutrition they need for wound healing and growth.**^{27,28,29,30,31}

7.2 PSYCHOSOCIAL ISSUES

Mandatory Notification

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

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

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

- delay in seeking help
- different accounts of history of injury over time
- injury inconsistent with history or with the development 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.

Family issues

- When a child is burned the whole family is affected emotionally. There does not appear to be any correlation between the extent of the burn and the amount of distress suffered. Most parents seem to experience shock, guilt and anxiety.
- The psychological trauma of a burn will be exacerbated when there are other stresses on the family such as ill health, accommodation or employment issues. Lengthy hospital admissions can create unexpected financial difficulties and complicate child care for siblings. It is important to recognise that families may experience a range of grief and loss reactions including the temporary loss of normal family relationships. Although many families manage well, trauma often heightens any existing tensions.

Developmental Issues

- Severe burns and prolonged admissions have the potential to compromise development. Any child likely to have an inpatient admission of a month or more should generate a consultation with the appropriate allied health developmental team. This procedure will be implemented by the Burns Social Worker.

Talking to families about burns

- Familiarity with procedures such as skin grafts may lead us to underestimate how frightening this process can be for children and their families. Similarly, what looks like a very healthy burn scar to us may look dreadful to the child and family. Hence, choice of language is important - 'that's healing extremely well' rather than 'that looks fantastic'.
- At any time of shock, people have difficulty concentrating, remembering and even performing simple tasks. We need to keep this in mind and be ready to repeat things as necessary, use diagrams to explain treatment or procedures and provide as much information as possible in writing. We can also help by reassuring parents that the forgetfulness etc. is normal and will pass and that they should feel free to ask questions again if they can't recall the answers.

Formal Counseling

- Older children who have been burned may need specific counseling to assist them in adapting to painful procedures, changed body image and return to school. The distress of brothers and sisters of the burned child are easily forgotten. "Siblings Australia" (www.siblingsaustralia.org.au) can be helpful.
- Staff may promote the annual camp (Camp Smokey), which is provided for young people who have experienced a burn injury. Children aged from six to 16 are welcome.

Further information can be found from the following resources:

- www.changingfaces.org.uk "Changing Faces: The way you face disfigurement"
- <http://inside.cywhs.sa.gov.au> "Child-Safe Environments: Reporting Child Abuse and Neglect" eLearning Centre for Education and Training "Grief and Loss" (Note: intranet address – only available to CYWHS employees)
- <http://www.cyh.com/HealthTopics> Children Youth and Women's Health Service, Parenting and Child Health, Child and Youth Health
- "Keeping them safe: Child Protection Information Sharing Protocol" <http://inside.cywhs.sa.gov.au>
- www.siblingsaustralia.org.au "Services for Siblings of Children with Special Needs"
- Partridge, J. 1990, "Changing faces: the challenge of facial disfigurement", A Changing Faces Publication, London.

7.3 PHYSIOTHERAPY/OCCUPATIONAL THERAPY

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

7.3.1 Chest physiotherapy

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

7.3.2 Positioning

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

Head and Neck

- Elevate head of bed to 45°
- No pillows beneath the head - a bolster can be placed under the shoulders to
 - maximise air entry
 - extend the neck.
- Avoid pressure on the ears - foam doughnut ring can be used.³²

Axillae

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

Arm

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

Wrist/Hand

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

Lower Limb

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

Hips

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

Knees

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

Ankles

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

7.3.3 Range of movement

Prior to Grafting

Mainly indicated for large deep burns over joints.

Aims

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

Management

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

Precautions

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

Post Grafting

Aims

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

Upper limbs

- Positioning - The use of Hypafix® as a graft retention dressing has significantly reduced the need for splinting for graft take^{33, 34}. Positioning the body area ± bed rest depending on site of burn, age of child and TBSA burned is usually sufficient for burns to limbs. Grafts over joints are usually protected with a plaster of paris backslab post operatively and may be replaced with a thermoplastic splint a week later^{33,34}.
- Commence gentle active movement once the graft has taken.
- From Day 10 post graft take passive overpressure may be used if necessary to regain range of movement.
- Protect vascularity when limbs are dependent (if applicable to site/area of burn).
 - Tubigrip/garment
 - Gloves may be appropriate.

Lower Limbs

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

7.3.4 Mobilisation

Inspect graft

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

7.3.5 Scar management

- **All burns that take longer than 10 days to heal or retain a florid appearance have the potential for hypertrophy especially within 6 -8 weeks of healing and are treated in accordance with the appearance of the scar.**
- Once dressings are no longer required, healed burns should be moisturised and gently massaged.
- Healed burns at risk of hypertrophy are reviewed regularly and assessed for signs of early scarring which would indicate need for scar management.
- Scar Management is tailored to the individual patient according to their site of burn, age and response to treatment and is continued until scar maturation, ie pale, soft and flat.^{35,36,37}
- Common scar management treatments include:
 - Various silicone gels
 - Pressure garments
 - Elastomer putty

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