First aid and emergency management of adult burns

2023 Practice Guidelines

Central Adelaide Local Health Network

Royal Adelaide Hospital | Burns Unit

Government of South Australia

Health
Central Adelaide
Local Health Network

The Royal Adelaide Hospital first aid emergency management of adult burns 2023 Practice Guidelines has been created consistent with the Australian and New Zealand Burns Association (ANZBA) Emergency Management of Severe Burns (EMSB).

It is highly recommended that all practitioners treating burn injury attend EMSB.

The EMSB Course teaches how to recognise, assess, stabilise and transfer the severely burnt patient.

Relevant clinical skills are demonstrated and important topics are explained in more detail in group discussions. Life-like case simulations are then used to consolidate and integrate the course material.

The course is aimed at health professionals who may find themselves caring for person with an acute severe burn injury. It supplements existing clinical knowledge in trauma management with the specific aspects and challenges associated with a burn injury.

It is highly recommended that all practitioners treating burn injury attend this course. More information can be found here:

EMSB - ANZBA: Australian & New Zealand Burn Association

Contents

Resources available through RAH Burns Service

Burns assessment team

- A full medical/nursing team is available as an adjunct to MedSTAR in multiple burn casualty situations.
- A nurse specialist is available for situations where immediate up-skilling of staff in burn dressing management is required.

Staff education

The Burns Team can provide education sessions tailored to your needs. Current options include:

- An annual Burns Education Day with education sessions aimed primarily at nursing and allied health staff, with breakout sessions for therapy groups, operating room staff etc.
- All day education sessions in regional settings primarily aimed at nursing and emergency services.
- Evening sessions for GPs/practice nurses – normally run the night before the above all day session.
- Burns Link Nursing and Link Therapist program which incorporates both online and in person training to eligible staff in rural/regional South Australia.

Clinical services

- Provide advice for the following:
    - Acute burn management
    - Scar management
    - Wound management
    - Psychosocial issues and concerns
    - Occupational therapy
    - Telehealth services
- Review of scarring/contractures to provide advice and assistance.
- Burns Nurse-led outpatient clinic (for minor wound management M-F 8am-3pm).

RAH – criteria for Burn Unit referral

(Including telephone consultations and patient transfers for persons aged 16 years and over)

1. Burns greater than 10% of total body surface area (TBSA)
2. Burns of special areas – face, hands, major joints, feet and genitalia
3. Full thickness burns
4. Electrical burns – to allow for full assessment
5. Chemical burns – to allow for full assessment
6. Circumferential burns of limbs or chest
7. Burns at the extremes of age (children and elderly)
8. Burn injury in patients with a pre-existing medical disorder (or other disability) which could complicate management, prolong recovery, or increase risk of mortality
9. Burns with associated inhalation injury
10. Any burn patient with concomitant trauma
11. Any patient with pre-existing psychiatric disorder that may compromise management
12. Burns in pregnancy
13. **Any other burn that the referring department is not happy about or confident to send home.**

These criteria are based on the Australian and New Zealand Burn Association guidelines for Burn Unit referral.

How to refer to the RAH Burns Unit

Patients may be referred to the Adult Burns Service by a variety of sources including:

- General practitioners
- Specialists
- Internal clinics
- Emergency Departments
- Medical officers within the hospital
- Private rooms
- Other hospitals
- Other agreed health care professionals as per the hospital guidelines.

Burns referrals will be triaged by the Burns Consultant, Burns Fellow, Burns Clinical Practice Consultant/Nurse Practitioner/Clinical Service Coordinator/Senior Registered Nurse.

Burns On Call phone number: 0435 051 631

Burns Unit Ward phone number: 08 7074 5076

CALHN RAH Burns Unit editable referral form – click here

General first aid

(See appendix A)

D- Danger
- Ensure your own safety and wear appropriate personal protective equipment

- Stop the burning process

- Cool the wound

A- Airway (protect the cervical spine)

B- Breathing (add oxygen)

C- Circulation (add haemorrhage control)

Minor burn

- Irrigation with cool running water for 20 minutes
- Keep non-burn area warm
- Cover with non-adherent dressing
- Seek medical advice

Major burn

- **Do not delay transfer**
- Contact the Burns Unit for advice re. appropriate cooling techniques
- Cool water treatment to burn for up to 20 minutes
- Wrap loosely in cling wrap and clean dry linen (do not cling wrap the face or chemical burns)
- Keep patient warm to prevent hypothermia
- Transport patient to closest hospital (rural) or to the RAH (metropolitan)
- If transfer is delayed for any reason (>4hours), refer to 'Primary burn wound care guidelines – Adults' (Appendix K) and Escharotomy (Appendix D)
- Do not hesitate to contact Burns Unit for clarification if required

Ice should never be used for burn wound cooling – it causes vasoconstriction leading to further burn tissue damage and systemic hypothermia.

First aid – burn type specific

Flame burns (see Appendix A)

- For flame burns instruct the person to ‘stop, cover, drop and roll’ – extinguish flames with a blanket
- Remove the heat source (PPE) as soon as safe
- Apply cool running water to the burn until the burned skin feels cool (20mins)
- Resuscitation (if necessary)
- Remove non-adherent clothing and potentially constricting jewellery

Scalds (see Appendix A)

- Remove all soaked clothing instantly – every second counts as clothing soaked in hot water retains heat
- A scald is deepest:
  - where the clothing is thicker
  - where the liquid is held in a natural fold of the skin
  - where the clothing is compressed in the natural creases of the body
- Immediately cool the burn with cool running water for 20 minutes

Chemical (see Appendix B)

- First aid givers must be wearing protective clothing before beginning treatment
- Remove all contaminated clothing immediately – treat as hazardous material and handle appropriately
- Powdered agents should be brushed from the skin with care
- There are circumstances where irrigation with water is contraindicated. These situations include exposure to elemental sodium, elemental potassium, elemental lithium, phenols and dry lime. Areas affected by elemental compounds should be covered with mineral oil and any fragments removed with forceps and placed in mineral oil
- Areas of contact should be irrigated with copious amounts of tepid/ lukewarm running water (this is decontamination not cooling). **Avoid washing chemical over unaffected skin.** Remove footwear to avoid retention of the chemical in the shoes
- Patients should NOT be placed in a bath as the chemicals may be spread to unaffected areas
- Chemical eye injuries require continuous irrigation until ophthalmological review is available – always ensure that the unaffected eye is uppermost when irrigating to avoid contamination

The use of Hydrogels in first aid for chemical burn injury is contraindicated – see Appendix J.

Bitumen (see Appendix B)

- Immediately drench with cool water until the bitumen has lost all of its heat
- Leave bitumen intact unless it is compromising the airway or circulation

Electrical (Low voltage see Appendix C, high voltage see Appendix C2)

- **Turn off the source of electricity – mains power, power point or generator**
- Remove patient from electricity source, remembering your own safety
- **Ensure C-spine protection is in place** – this is of particular importance as fractures of the spine may occur following the violent muscular contractions that occur during the conduction of electrical current through the body
- **Cervical spine protection** is mandatory
- **ECG**

Emergency management

First aid (see Appendix A)

Airway management (see Appendix L Lower airway and Appendix M upper airway)

- Introduce cervical spine protection
- Assess for signs of inhalation injury. Endotracheal intubation is advisable early if signs of inhalation injury are present
- Administer oxygen to all patients with a major burn

Circulatory management

- Burns >20% should be given formal intravenous fluid resuscitation as per the Modified Parkland Formula (see Appendix H)
- Insert two large bore (16G) peripheral cannulae (through damaged tissue if necessary)

Insert naso-enteric tube

- For patients with burns >20%

Pain relief

- Introduce small doses of IV morphine, titrated to pain and sedation scores
- Intramuscular, subcutaneous and oral analgesics are absorbed unreliably in burn injury due to fluid shifts and GI stasis

Urinary catheter

- All patients receiving intravenous fluid resuscitation should have a urinary catheter inserted

Assess capillary return and neurovascular perfusion regularly

- Circumferential extremity burns may obstruct venous return and capillary flow to a level resulting in muscle ischemia and necrosis
- Elevate limbs
- Contact Burns Unit urgently for advice re management
- Escharotomy may be necessary (see Appendix D)

Assess effectiveness of ventilation

- Circumferential chest burns may restrict ventilatory excursion and a chest escharotomy may be necessary. Contact Burns Consultant through RAH switchboard for advice, (08) 7074 0000

Emotional support

- Severe burns often occur under stressful circumstances and cause distress to patients, friends and relatives. Reassurance and good communication are the most important tools at this time. Local support services should be accessed for ongoing support
- The Burns Unit social worker or clinical psychologist may be contacted through the Burns Unit for advice and assistance
- Emergency service personnel and hospital staff may also require support and local critical incident response protocols should be initiated if appropriate
- The Burns Unit social worker or clinical psychologist may be contacted through the Burns Unit for advice and assistance

Initial laboratory investigations

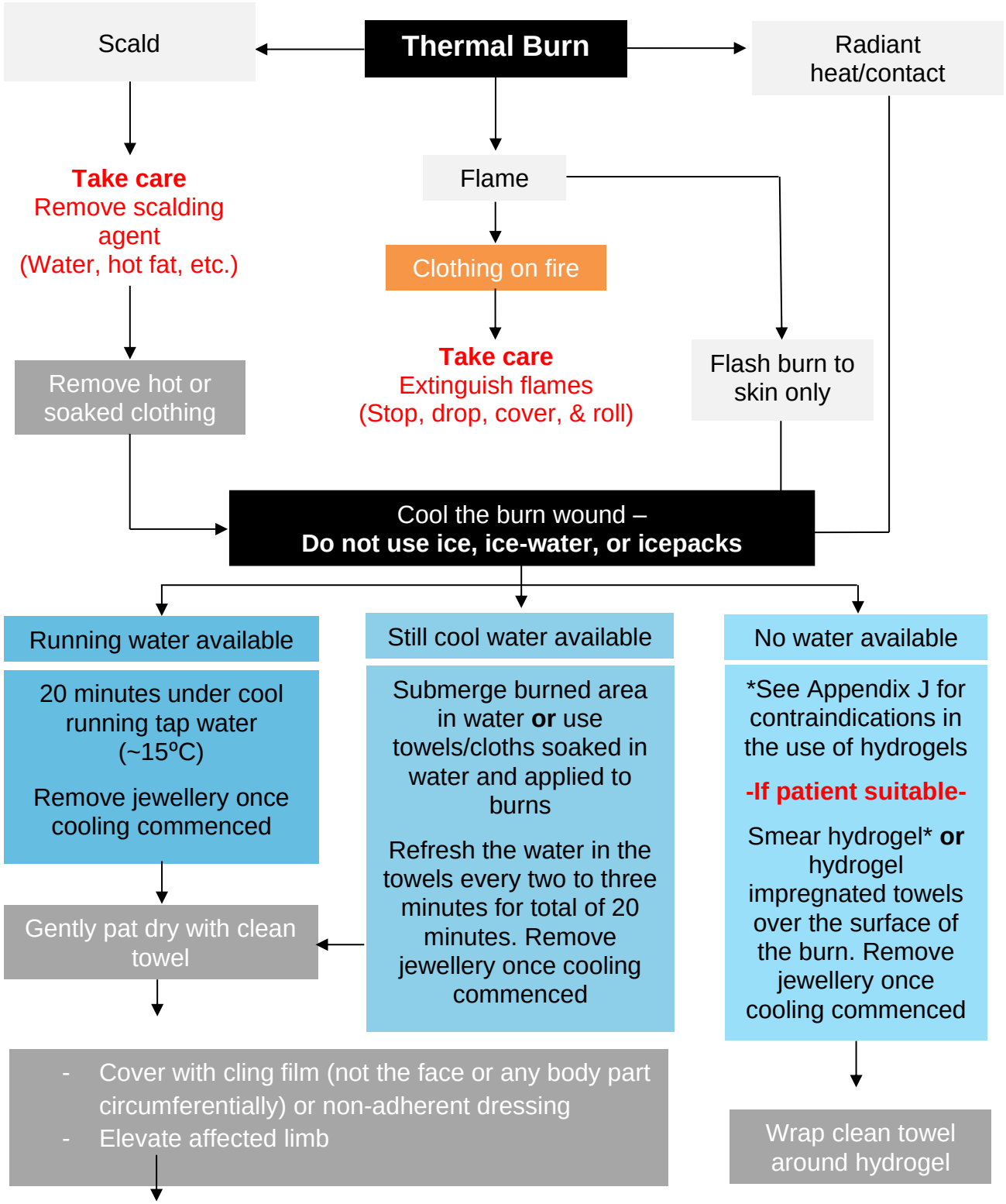
- The following investigations should be undertaken following a burns presentation:
  - Baseline Hb
  - Electrolytes including blood glucose
  - Urinalysis
  - Trauma series x-rays

Tetanus immunisation

- Burns are a tetanus-prone wound
- Follow the Australian Immunisation Handbook guidelines outlining tetanus immunisation:

  The Australian Immunisation Handbook (health.gov.au)

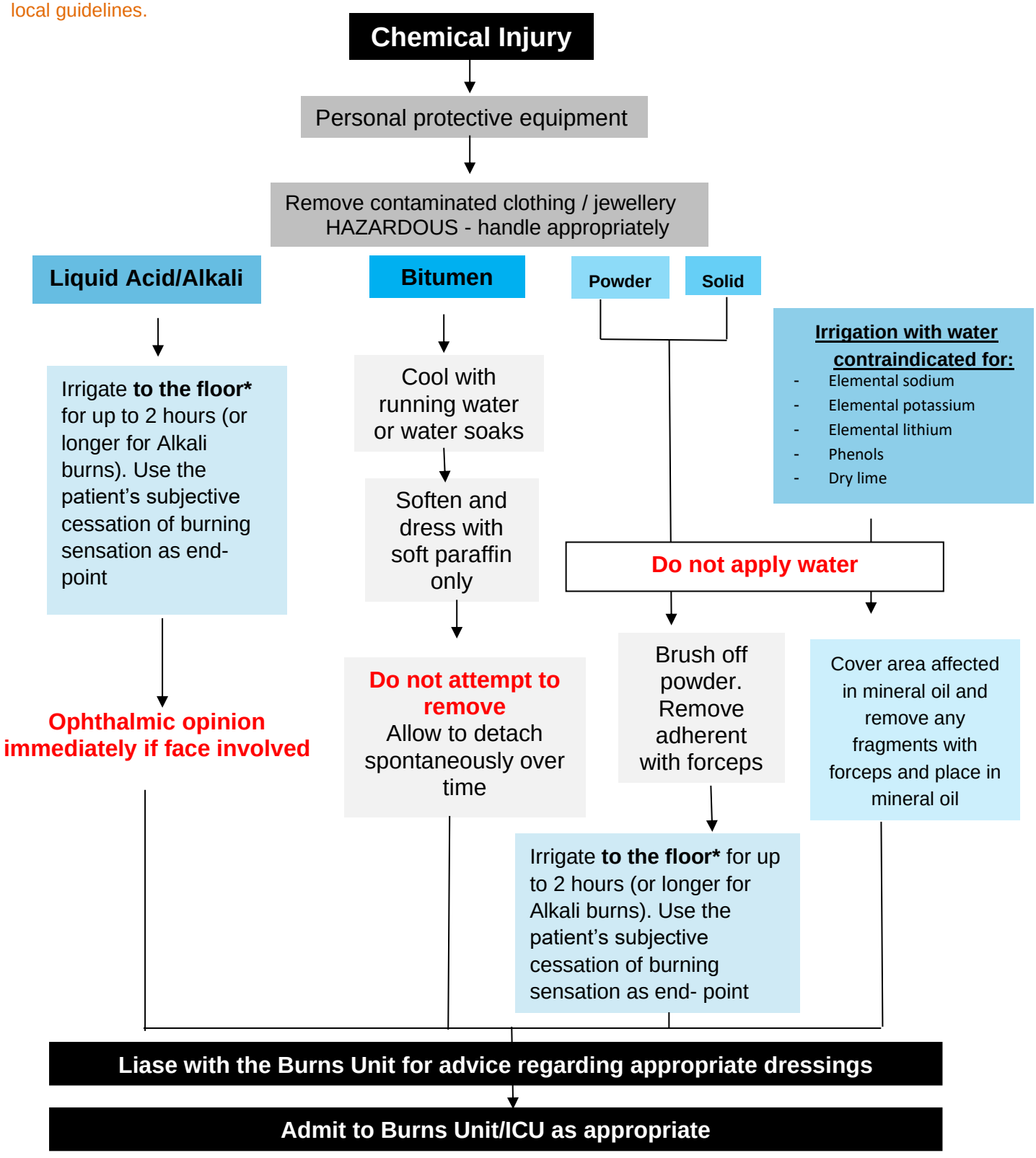
Appendix A – Community first aid protocol for thermal injury



Appendix B – Emergency Department protocol for the management of cutaneous chemical injuries

Specialist advice for common and rare mechanisms of chemical injury should be sought from the RAH Burns Unit

A chelating agent, DiphoterineR, has been used as a first aid for both acid and alkali burns. If available, follow local guidelines.



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

Appendix C – Emergency Department protocol for electrical burns (low voltage = A/C <1000V)

All electrical injuries should be discussed with the burns consultant on call (08) 7074 5076

Low voltage is anything below 1000 volts. This includes single-phase household electrical supply in Aus and NZ – 240V alternating current (AC) at 50 cycles/second.

Three phase power (commonly 415 volts) is often present at industrial power supplies.

Direct current (DC) circuits: Used in car batteries, the electroplating industry, electrolyte purification and electrocautery, rooftop solar panels.

	Skin	Deep Tissue	Cardiac arrhythmias
Low Voltage (>1000v)	Contact point wounds	Mostly at site of contact point wounds	Immediate cardiac arrest or transient ECG changes possible

- Remove hot clothing and jewellery
- Standard primary survey and full trauma clearance

→ Exclude concomitant bone fracture/joint dislocation and thoracolumbar bony injury (even in the presence of longstanding history of joint pain)

Examine for contact wounds (especially scalp, hands & feet) →

Compartment Syndrome suspected?

- Monitor limbs hourly – assess capillary refill, skin colour and sensation

(Increased tension in compartment, pain on passive stretching, decreased peripheral sensation, prolonged capillary refill)

Immediately contact Burns Registrar/Consultant for fasciotomy and admission

12 lead ECG →

Full (documented) neurological exam- peripheral and spinal nerves

- Cardiac monitoring only required if history of cardiac arrest, LOC, ECG abnormalities on admission or pre-existing heart disease
- Admit to cardiac monitored bed for 24hrs
- Repeat cardiac enzymes every six hours

- Estimate burn depth and TBSA
- Record on Lund and Browder chart
- Fluid resuscitate if > 20% TBSA

→ **Contact the Burns Unit and Registrar re: admission**

Wrap loosely in cling film (not facial burns) or temporary dressing

Appendix C2 – Emergency Department protocol for electrical burns (High voltage = A/C >1000V)

All electrical injuries should be discussed with the burns consultant on call (08) 7074 5076

High voltage alternating current (AC) is most commonly encountered in high tension transmission cables, power stations and substations.

High voltage direct current (DC) is utilised in urban railway electrification systems and becoming common with electric cars.

Lightning is an ultra-short DC that involves extremely high voltages and large amounts of current flow and can produce its own peculiar injury pattern either from direct strike or indirect local area effects.

	Skin	Deep Tissue	Cardiac arrhythmias
High Voltage (>1000v)	Flashover burn Full thickness contact point wounds	Extensive muscle damage Rhabdomyolysis Compartment syndrome	Transthoracic current may cause delayed arrythmias and myocardial damage.
Lightning	Contact point wounds Superficial or dermal flashover burns ('Lichtenberg figures')	Eardrum perforation and corneal damage	Respiratory arrest - needs prolonged CPR.

- Remove hot clothing and jewellery
- Standard primary survey and full trauma clearance

→ Exclude concomitant bone fracture/joint dislocation and thoracolumbar bony injury (even in the presence of longstanding history of joint pain)

Examine for contact wounds (especially scalp, hands & feet)

→
- **Compartment Syndrome suspected?**
- Monitor limbs hourly- palpate, assess capillary refill, skin colour and sensation

(Increased tension in compartment, pain on passive stretching, decreased peripheral sensation, prolonged capillary refill)

Immediately contact Burns Registrar/Consultant for fasciotomy and admission

Urine Output

→
- **IV Fluids** (Irrespective of cutaneous burn TBSA %)
- **Catheterise** to assess the adequacy of fluid resus and identify the presence of haemochromogens/pigments associated with rhabdomyolysis.
  - Output should be 1-2 ml/kg/hr
- Consider mannitol 12g/L administer fluid and urine alkalinisation

12 lead ECG

→
- Admit to cardiac monitor bed for 24hrs
- Repeat cardiac enzymes every six hours

Full (documented) neurological exam- peripheral and spinal nerves

- Estimate burn depth and TBSA
- Record on Lund and Browder chart
- Fluid resuscitate if > 20% TBSA

→ **Contact the Burns Unit and Registrar re: admission**

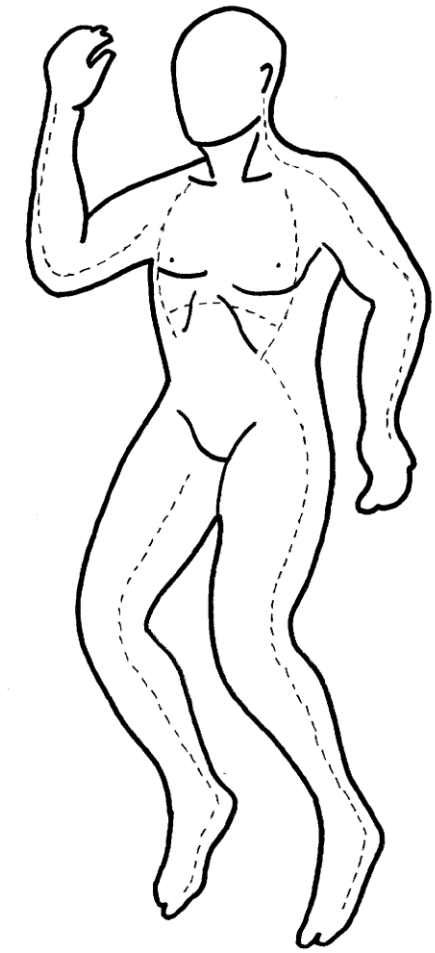
Wrap loosely in cling film (not facial burns) or temporary dressing

Appendix D – Escharotomy

In the presence of **any** circumferential burn, advice should be sought from the Burns Unit or Burns Registrar on (08) 7074 5076. If the circumferential burn is **deep** or **full thickness** please contact the Burns Consultant (contact through RAH switchboard (08) 7074 0000).

An escharotomy should be considered when there is a circumferential deep dermal or full thickness burn injury (dry wound) and where:

- Delay in transfer to the tertiary Burns Unit is expected
- There is evidence of circulatory compromise indicated by an extended capillary refill time compared to non-burned or non-circumferential burned limb.



Escharotomy is designed to divide inelastic burned skin and the incision does **not** need to be extended deeply into the underlying fat.

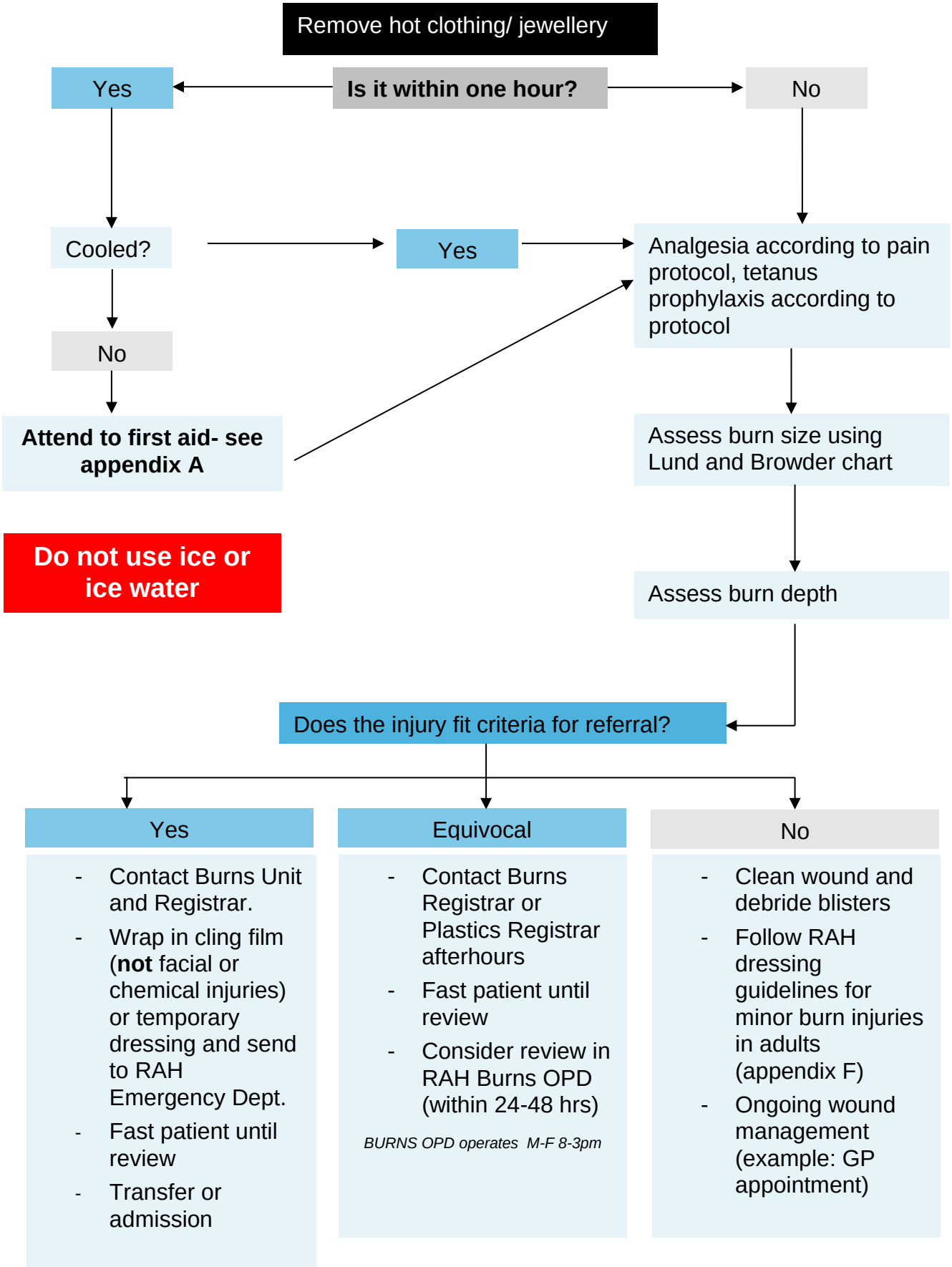
This procedure is essential, but has the potential for considerable damage to underlying structures. These include:

- common peroneal nerve at the outside of the knee (over neck of Fibula)
- radial nerve at the wrist (superficial branch)
- ulnar nerve at the elbow
- cephalic vein at the wrist
- great saphenous vein and nerve at ankle

Equipment required

- Local anaesthetic infiltration with Adrenaline (if patient awake)
- Povidone Iodine (Betadine) skin preparation
- Cutting monopolar diathermy with either needle or spatula (set equally to cutting/ coagulation). A normal scalpel may be used in the absence of this but more bleeding should be expected
- Bipolar diathermy for haemostasis
- Kaltostat™ for dressing escharotomy wound. Cover with antibacterial dressing and bandage then elevate limb

Appendix E – Management of minor thermal burns



Appendix F – Dressing guidelines for minor burn injuries in adults

Please refer to RAH Criteria for Burn Unit referral (including telephone consultations and patient transfers)

Aims of burn wound dressings

- Promote healing
- Prevent desiccation of the wound
- Prevent or treat infection
- Patient comfort – pain, exudate, odour management
- Ease of management for patient and staff
- Allow normal movement

Initial burn wound care

- Remove restrictive jewellery (i.e. rings) as soon as possible
- Administer pain relief – superficial and partial thickness burns are very painful
- Complete burns first aid if patient has not had appropriate/ complete first aid
- Wash affected area with antiseptic sponge e.g. Medisponge
- Shave any body hair from burn wound and allow for at least a 2.5cm margin surrounding burn site (do not shave eyebrows)
- Debride blisters and remove all loose burned tissue
- Assess wound depth by pressing on wound bed and looking for presence of capillary refill according to the protocol for burn depth assessment (Appendix I)
- Use the appropriate dressing based on the wound depth, site and likelihood of infection
- Elevate the limbs to reduce oedema formation

Superficial burns – unblistered (erythema, sunburn or healed burns)

- Wash with non-perfumed soap and dry well
- Apply moisturising cream. This may need to be done this several times a day
- Advise patient regarding the use of sun-block agents
    - **physical** – hats and long sleeved shirts
    - **chemical** – SPF factor 30+

Important note

Partial thickness burns due to ‘dirty/organic’ liquids (petrol, chemicals, ‘cooking’ water, sauces, hot oil, water from a car radiator, etc.) frequently become infected, resulting in burn wound depth progression requiring surgical intervention, and even grafting.

It is prudent to treat these with a topical anti-bacterial (silver-containing) dressing. Systemic antibiotics are usually only used when there has been organisms identified in conjunction with a clinical picture of a wound infection.

Superficial burns/clean partial thickness burns

- It is advised to use a silver-based dressing such as Acticoat™
- Alternative dressing options for a clean superficial wound, such as a hot water scald, include Mepliex™ or Mepliex Ag™ however these dressings and procedures should be followed to allow patients to shower (such as plastic bag wrapping).
- Wounds should be reviewed within 3 days of initial consult.

Contaminated/infected partial thickness burns and small full thickness burns (e.g. less than size of a 20 cent piece)

Three day Acticoat™

- Apply Acticoat™ directly to wound, secure with Hypafix™.
- Patient instructed to keep dressing activated by dampening under tap at home once a day or when dressing starts to feel too dry.
- For some patients, it can cause a stinging or burning sensation on application. This can be minimised by resting the product after activation with water for a couple of minutes before application.

Facial Burns (Appendix N)

- Ophthalmic review (within 12 hours)
- Male patients will need to shave one or twice daily, depending on rate of beard growth.
- Daily hair washes are required.
- Clean facial burns with normal saline using aseptic technique every six hours (increase frequency if dry). Debride the blisters and remove crusts. Pay particular attention to eye and ear care
- Apply sterile soft paraffin to raw areas every four hours after cleaning
- Apply moisturising cream to healed areas
- Advise patient to stay out of sunny and dusty conditions

Oedema

- Swelling to the burned area can be reduced by elevation
- Patients with burns to the face and neck are best nursed sitting up (~45 ^{o} at the hip)

Considerations for hospital admission

- Pain will not be adequately controlled with oral analgesia
- Infection – cellulitis of burn wound requiring intravenous antibiotics
- Bed rest with lower limb(s) elevated is required
- If patients live alone or have inadequate support at home
- Any circumstances that may result in a patient having an inability to cope with own dressing care
- Transport difficulties the patient may face – e.g. getting to appointments for dressing changes

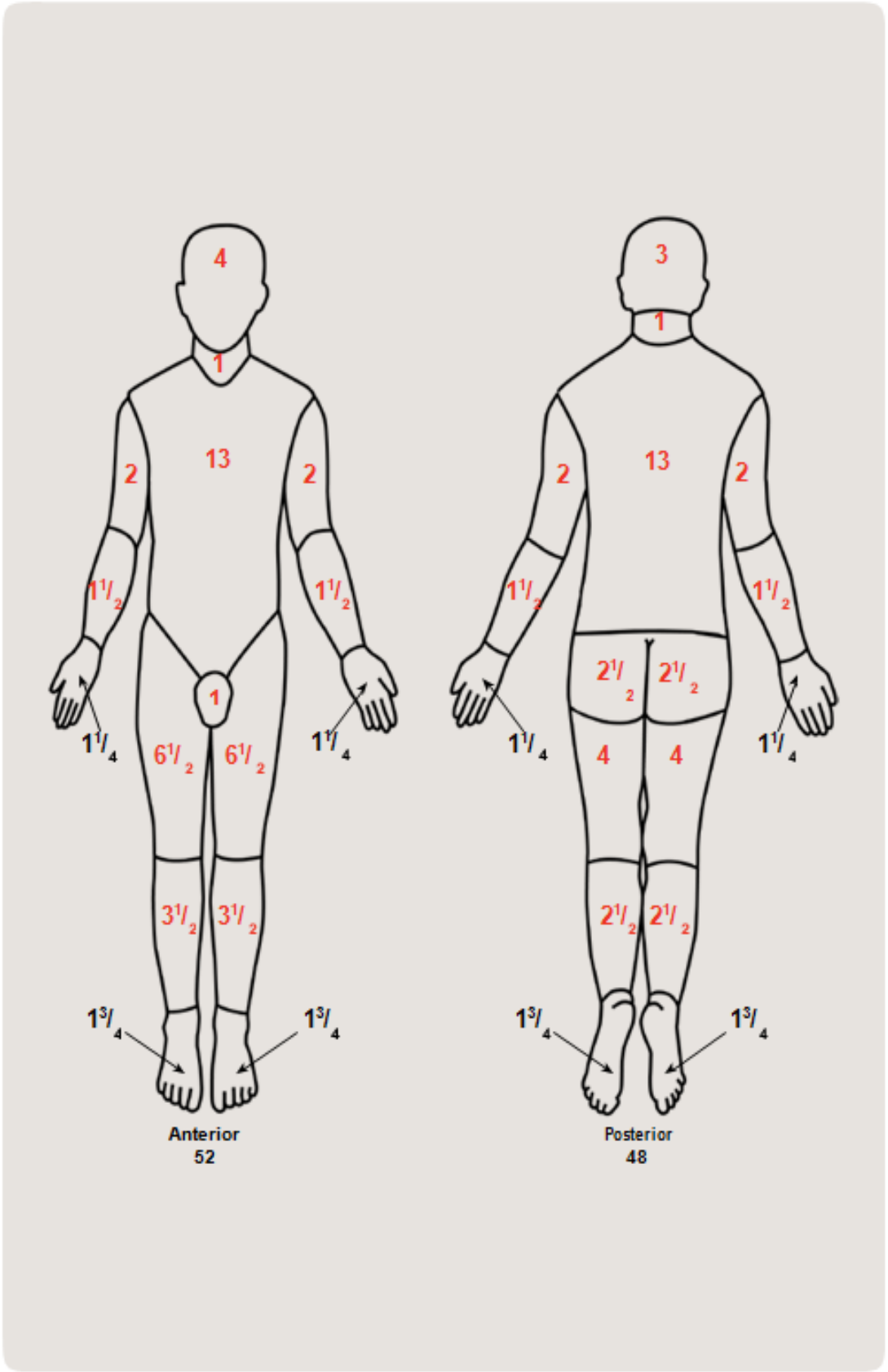
Management of foot Burns (see Appendix O)

Consider who will be responsible for ongoing burn wound management.

Appropriate follow up includes:

- GP/Practice nurse
- Community Nurses
- Burns Outpatient clinic

Appendix G – Modified Lund and Browder chart (adult)



Appendix H – Royal Adelaide Hospital Modified Parkland resuscitation protocol for adults with >20% Total Burn Surface Area

- Assess total burns surface area (TBSA) using the Lund and Browder chart
- Assess patient body weight as accurately as possible (in kilograms)

Resuscitation Fluid for the First 24 Hours Post Burn

Resuscitation fluid (in mls) for the first 24 hours after the burn injury =

3ml x Kg body weight x %TBSA

This is given as Hartmann's (Ringer's Lactate) Solution

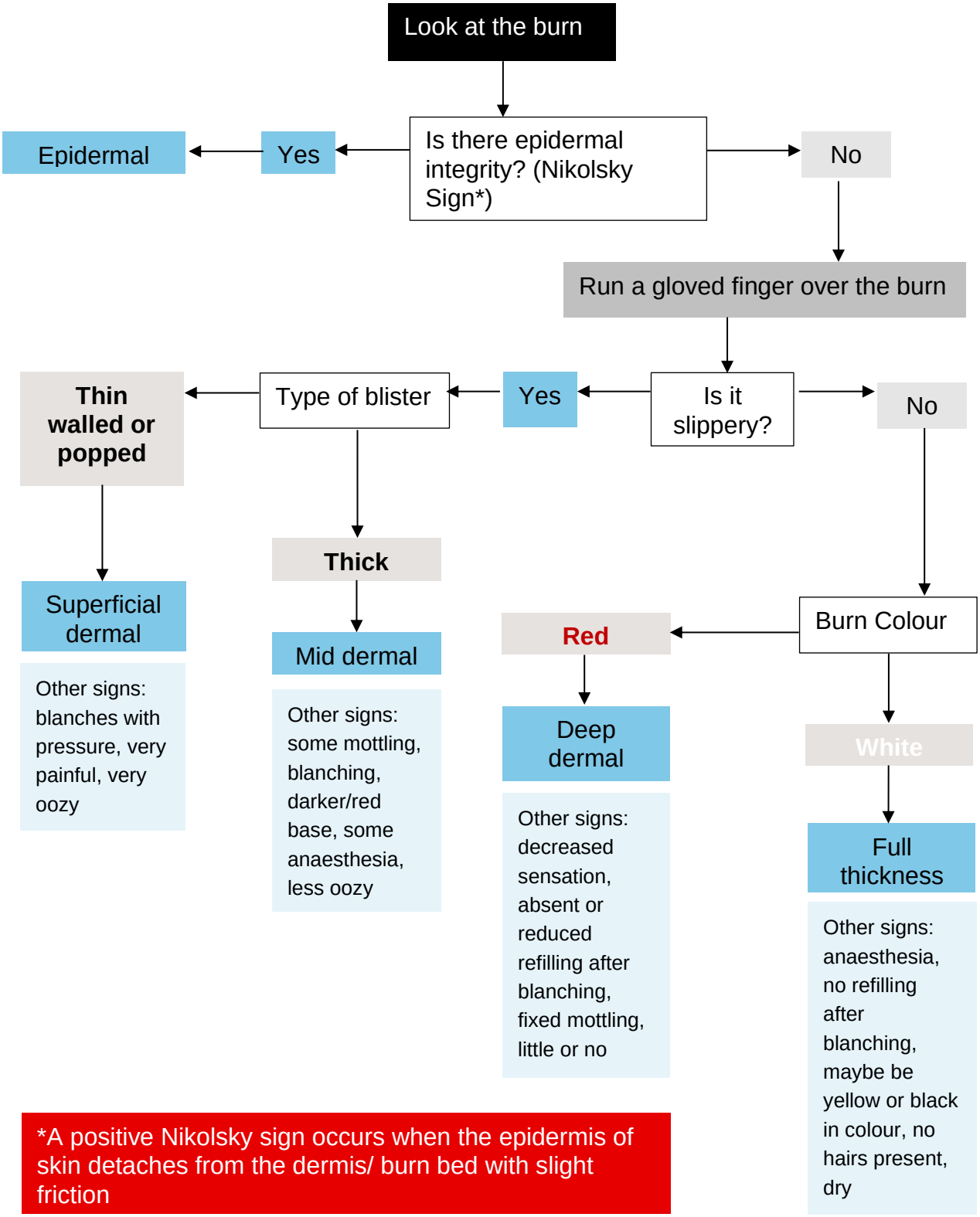
- Give half of calculated volume in the first 8 hours after the injury
  Give the second half over the next 16 hours
- Adjust fluid input to achieve urine output of 0.5-1ml/kg/hr.
- Normal saline can be used if Hartmann's solution isn't available (dangerous electrolyte imbalances will result if large volumes are administered!)
- **Timing begins at the time of burn, not at the time of arrival to hospital**

- Maintenance fluid is not required in adults
- Second 24 hours fluid requirement is Albumex 4% via the formula:

  Total (mls) = 0.5ml x weight kg x % TBSA

- The patient may need no further intravenous fluid
- The urine output should be measured **each hour** and the Medical Officer notified if patient is not meeting desired output
- Venous blood should be sent for Hb, PCV and Serum Electrolytes on admission and 6-hourly until transfer
- Monitoring
- Indwelling catheter – mandatory
- Nasogastric tube – mandatory

Appendix I – Protocol for burn depth assessment



Appendix J – Protocol for the use of Hydrogel cooling products in burn injury first aid

Evidence indicates that the cooling function of Hydrogel dressing products is not as effective as cool running water.

If no clean water available, application of Hydrogel may be useful as an analgesic but should be replaced by water as soon as available if within 3 hours of injury.

Patients with extensive burn wounds (>20% TBSA in adults or >10% TBSA in children) are at increased risk of hypothermia

Hydrogels, or any wet dressing, can also be associated with the development of hypothermia if exposed to the air and left in place for prolonged periods, particularly in the elderly or children with larger burns and **SHOULD BE AVOIDED**

ANZBA Consensus Statement- First aid and the use of Hydrogels, Aug 2021

Burn Assessment

- Cause of burn
- First aid (type and length)
- Age of patient
- % total body surface area (TBSA)
- Depth of burn injury
- Immediate risk to circulation/ventilation
- Need for transfer to the RAH Burns Unit/ICU

→

- **Chemical and cold injury burns**
- **Elderly**
- **TBSA >20% adults**
- **Children >10%**

Do not use.

Cool as per Appendix A of contact the Burns Unit for advice

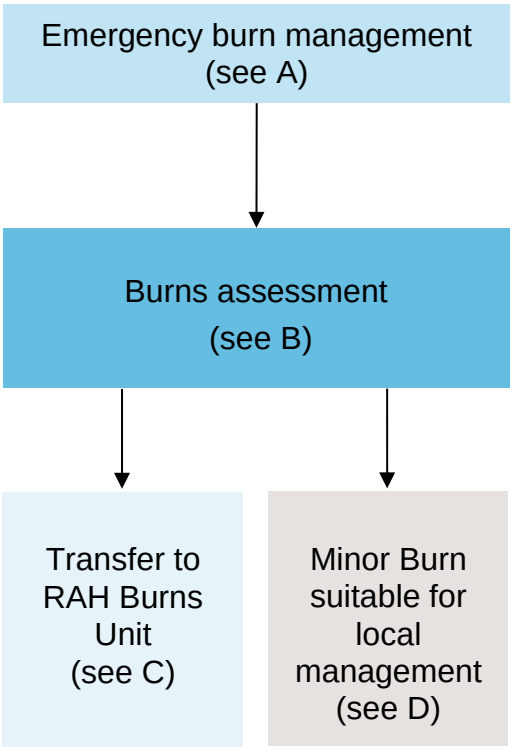
08 70745076

Suitable patient?

↓

- Use hydrogel dressing as per manufacturers guidelines
- Keep patient warm, warm non burned areas using heated blankets and warmed environments
- Monitor patient closely for hypothermia
- Remove hydrogel product immediately if hypothermia develops

Appendix K – Primary burn wound care guidelines - adults



A. Emergency Management
Refer RAH first aid and emergency management guidelines

B. Burn Assessment

- Cause of burn
- First aid (type & length)
- Depth
- % total body surface area (TBSA)
- Site of burn
- Immediate risk to circulation/ ventilation
- Need for transfer/ consultation* to RAH Burns Unit

C. Transfer to RAH Burns Unit
Anticipated time to arrival at RAH
<1 hour

- Face- wet soaks
- Other burn areas- cling film

1-4 hours

- Face- wet soaks
- Other burn areas- cling film

4-24 hours

- Face- soft paraffin
- Other burn areas- Jelonet ™, Bactigras ™ or Inadine ™

>24 hours

- Face- soft paraffin
- Other burn areas- Jelonet ™, Bactigras ™ or Inadine ™
- Acticoat™ following discussion with receiving clinician (temporary skin staining arising from Acticoat™ application may make future burn assessment / Biobrane application difficult).

For any chemical injuries please contact the Burns Registrar through RAH switchboard (08) 7074 0000 for advice

D. Minor Burn for local management
Follow RAH dressing guidelines for minor burn management – Appendix F

Appendix L – Lower airway injury

0 Hours

Time of Injury

Low risk

- ‘Flash’ or short contact with thermal agent
- No confinement in smoke filled room
- Scald injury
- Contact burn
- Normal speech
- Normal appearance on bronchoscope below the cords

High risk

- History of prolong confinement in smoke filled environment i.e. house, or car fire, including under car bonnet
- Significant facial burns
- History of unconsciousness or obtundation
- Raised carboxyhaemoglobin
- Hypoxia
- Respiratory difficulty (tachypnoea ,dyspnoea, increased use of accessory muscles and increased work of breathing)
- Sooty or productive sputum
- Confusion, obtundation, unconsciousness
- Wheezing or added sounds on auscultation
- Abnormal findings below the cords

Low Risk- Treatment

- Oxygen
- Trauma clearance ASAP
- Elevate head 45^0 once C-spine is clear
- Chest x-ray
- Notify Burns Registrar

Observations

- Continuous SaO_2
- Continuous visual obs
- 15 min airway obs

Placement: Burns Unit

High Risk- Treatment

- Oxygen
- Trauma clearance ASAP
- Elevate head 45^0 once C-spine is clear
- Chest x-ray
- Intubation (long term if required)
- ABGs
- Nebulised adrenaline
- Bronchoscopy/ review survival status

Observations

- Continuous SaO_2
- Continuous visual obs15 min airway obs

Placement: HDU/ ICU

>12 hours

No deterioration in condition

- Oxygen
- Continuous SaO_2
- 1/ 24 observations

Placement: Burns Unit

Deterioration in condition

- CODE BLUE
- Contact Duty Anaesthetist
- Intubate
- ICU transfer

>24 hours

No deterioration in patient

- Continuous SaO2
- 4/24 observations

Placement: Burns Unit

First aid and emergency management of adult burns, 2023 Practice Guidelines

Appendix M – Upper airway injury

0 Hours

Time of Injury

Low risk

- History of 'flash' or short contact with agent such as gas/petrol explosion characterised by superficial face burn or erythema, with some singeing of facial hair/nostril hair
- Normal voice at initial examination

High risk

- Burns to mouth, nose and pharynx
- Steam inhalation
- Intra oral burns or blisters
- Hoarse voice
- Inspiratory stridor
- ? hx of burn in confined space

Low Risk- Treatment

- Oxygen
- Trauma clearance ASAP
- Elevate head 45^0 once C-spine is clear
- Chest x-ray
- Notify Burns Registrar

Observations

- Continuous SaO_2
- Continuous visual obs
- 15 min airway obs

Placement: Burns Unit

High Risk- Treatment

- Oxygen
- Trauma clearance ASAP
- Elevate head 45^0 once C-spine is clear
- Chest x-ray
- Intubation (short term if required)
- ABGs
- Nebulised adrenaline

Observations

- Continuous SaO_2
- Continuous visual obs
- 15 min airway obs

Placement: HDU/ ICU

.>12 hours

No deterioration in condition

- Oxygen
- Continuous SaO_2
- 1/ 24 observations

Placement: Burns Unit

Deterioration in condition

- CODE BLUE
- Contact Duty Anaesthetist
- Intubate
- ICU transfer

>24 hours

No deterioration in patient

- Continuous SaO2
- 4/24 observations

Placement: Burns Unit

Appendix N – Management of facial burns

Initial care (may be done in theatre/technical suite)

- All non-viable tissue should be gently removed by picking and washing with gauze. Beard, moustache and sideburn hair will have been shaved completely and scalp hair similarly shaved away from the burn edge. Soft paraffin is applied. **Do not apply Flamazine- risk of corneal ulceration.**

Ongoing care (on ward, aseptic technique)

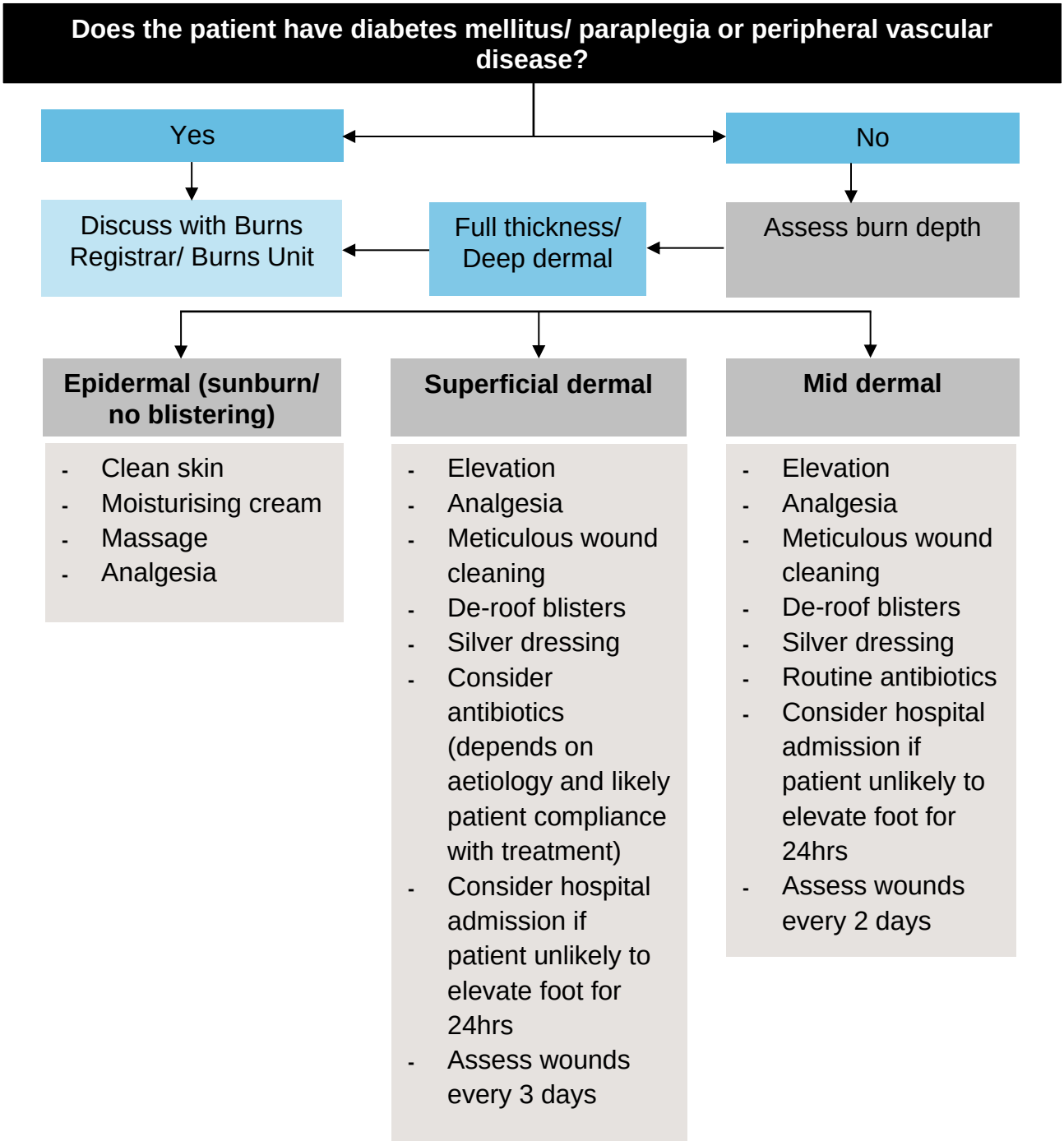
- Performed **6-hourly** with eye care (increase frequency if dry). Gentle cleaning and removal of existing paraffin and any newly declaring non-viable tissue. Forceps are to be avoided on the face.
  Application of a **thin** layer of white soft paraffin.
- **Performed 12-hourly** (with mouth and ear care) – male patients will undergo shaving of facial hair.
- **Performed daily** – hair washing.
- **Viral Swabbing** – Patients with facial burns (particularly those with a history of cold sores), virology swabs must be performed for Herpes Simplex Virus on days two and five **post-burn**. A positive result requires Famciclovir administration (herpes face burn infection is very painful, delays healing and leads to poorer healing and scarring).
- Patients with a strong history of HSV-1 and a facial burn should be considered for antiviral prophylaxis.

Appendix O – Management of burns to the foot

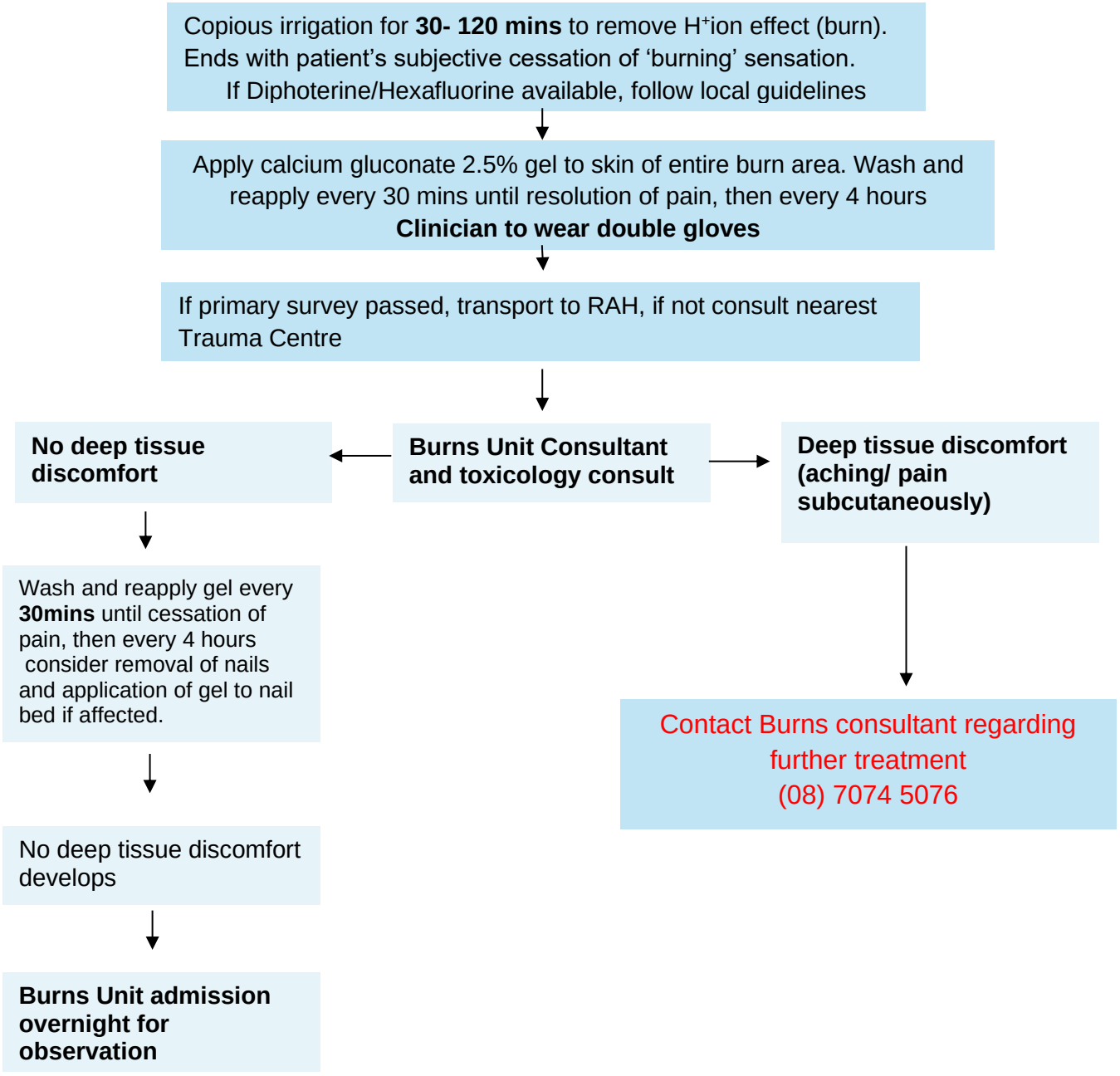
Each foot is colonised by 1,000,000,000,000 bacteria. Inadequate management of foot burns **frequently** results in serious infection. This can lead to a need for skin grafting (where spontaneous healing was expected) and even digital/other amputation.

Avoid any constrictive/abrasive footwear - loose footwear should be worn. Initial elevation for at least 24 hours is of utmost importance in preventing burn depth progression.

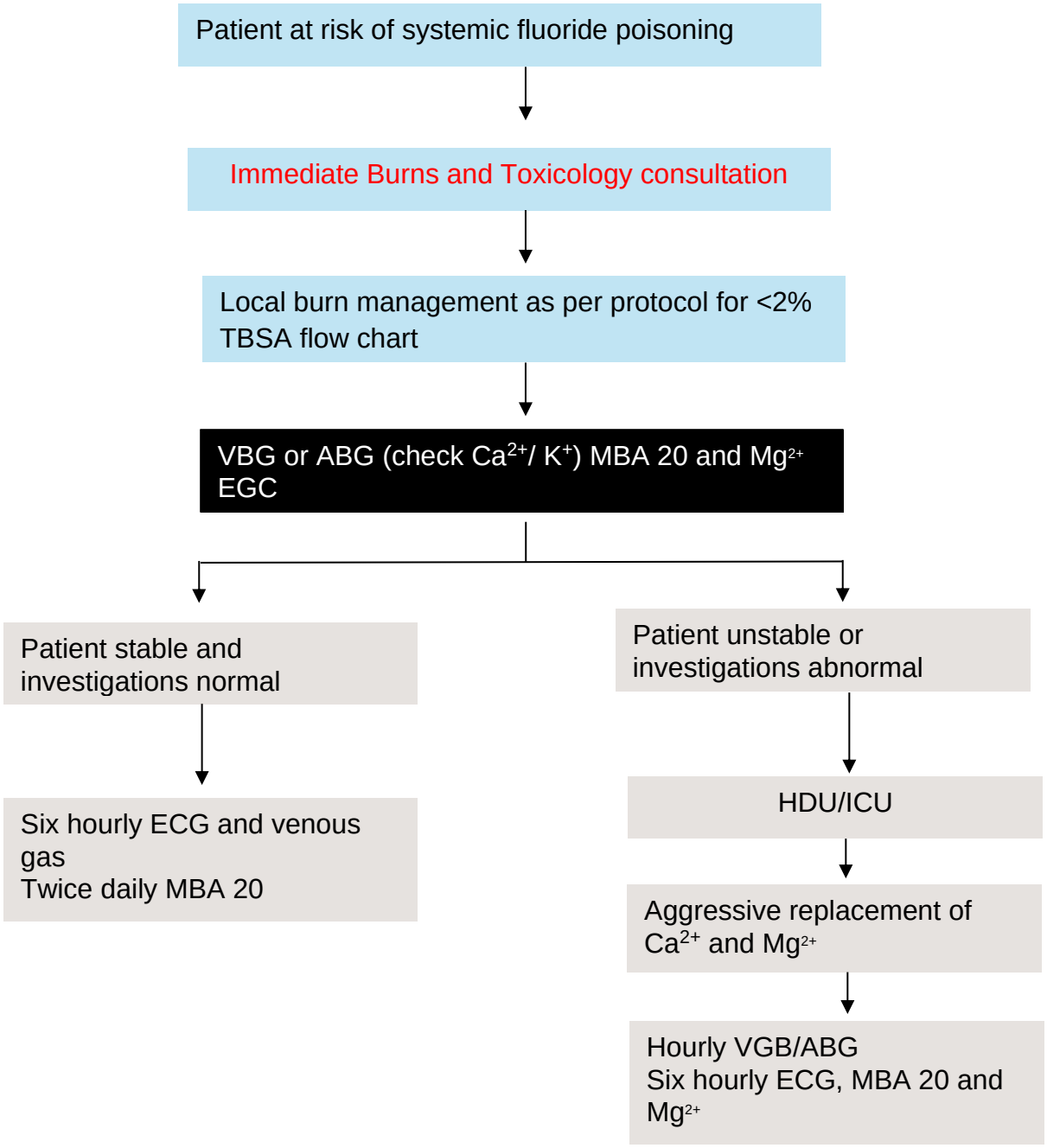
Time off work should be considered especially for those whose jobs entail standing or a hot, dusty dirty environment. As burns to the feet meet ANZBA referral criteria, consider contacting the Burns Unit/Burns Registrar for advice and how to best manage foot wounds.



Appendix P – Hydrofluoric acid burn treatment protocol (burns <2% TBSA and HF concentration <10%)



Appendix Q – Hydrofluoric acid burn treatment protocol (burns >2% TBSA and HF concentration >10%)



Appendix R – First Aid for peripheral cold injury

Peripheral cold injury	
Frost nip	Mild, completely reversible, cold injury characterised by skin pallor and numbness
'Tissue freezing injury' **Frost bite**	Below 0.5°C; tissue freezes resulting in formation of intracellular ice crystals and microvascular occlusion
Non- tissue freezing injury	Results from chronic exposure to high humidity and low temperatures, without tissue freezing (also known as chilblains or perniosis). Trench foot is caused by chronic exposure to damp environment at temperatures 1–10°C

A useful classification for predicting prognosis and risk of amputation assesses severity of frostbite according to clinical signs of distal ischaemia (pallor/cyanosis, altered sensation, cold digits and delayed capillary refill).

All potentially severe cases of frostbite should be discussed with the burns consultant on call

Administer pain relief- rewarming process can be painful →

Rapid rewarming in water heated to 37-40 ° with a mild antibacterial agent (povidone-iodine or chlorhexidine) added for at least 30 minutes until complete thawing

Massage of the affected area is contraindicated as it may cause mechanical trauma

Monitor for:
- Compartment syndrome
- Infection and ischaemia of the distal extremities, with potential tissue necrosis and subsequent tissue loss

Fasciotomy may be indicated in cases of compartment syndrome and early amputation in cases of sepsis.

Post-rewarming Management

Debridement of clear blisters to prevent thromboxane-mediated tissue injury. Dress according to Appendix F

Haemorrhagic blisters imply a deeper tissue injury- seek advice with the burns unit regarding debridement →

Elevation of affected extremity to reduce oedema

Contact the Burns unit for further advice regarding:
- Systemic Prostaglandins (Ibuprofen)
- The use of oral Penicillin to prevent wound infection because of the inactivation of the normal skin streptococcicidal properties by local tissue oedema.
- Topical application of Aloe vera (thromboxane inhibitor)
- Adjuvant therapy, including Iloprost (synthetic prostacyclin analogue)
- The use of thrombolytic agents to reduce the incidence and morbidity associated with distal extremity tissue loss including the use of tissue plasminogen activator in acute (<24 hours) cases of severe frostbite

Appendix S – Management of systemic hypothermia

Systemic hypothermia increases complications such as coagulopathy, cardiac arrhythmias and metabolic instability.

May result from environmental factors, overzealous first aid of the burn wound or the inability to keep the patient warm during transportation.

Prevention:

Where possible

- Keep areas of the body not requiring cooling covered
- Keep room temperature warm
- Cover affected areas once cooling is completed.
- Consider the use of warm blankets, external warming devices
- Warming resus fluids

Systemic hypothermia management:

Severity of Hypothermia	Temp Range °C	Symptoms and signs	Treatment
Mild	32-35°C	Tachycardia • Tachypnoea • Altered behaviour: impaired judgement • Amnesia, slurred speech • Uncontrollable shivering • Cold diuresis	Prevent further heat loss (remove wet clothing) • Measure core temperature to determine severity • External rewarming by blankets, warm air devices, radiant heat, warm room
Moderate	28-32°C	• Hypopnoea • Bradycardia, arrhythmias (< 30°C) • ECG J waves • Reduced cardiac output • CNS depression • Pupillary dilation and loss of light reflex • Hyporeflexia • Shivering ceases	Warm air devices, radiant heat • Be prepared for vasodilatation and shock from surface rewarming • Heated IV fluids • Consider measures used in severe hypothermia if external rewarming inadequate
Severe	<28°C	Apnoea, pulmonary oedema • Hypotension, VF, pulselessness • Marked myocardial depression • Coma, fixed pupils, areflexia • EEG activity decreased/absent	• Intubate and ventilate with warmed humidified oxygen • DC shock for VT arrest, consider amiodarone • Lavage (gastric, bladder, peritoneal, pleural) • Warm water bath immersion

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