

Guidelines in Burn Management

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Contents

CONTENTS	1
CLASSIFICATION OF BURNS	3
Table 1 – Classification of burns	3
FIRST AID	4
HISTORY & DOCUMENTATION	4
ACUTE MANAGEMENT OF BURN INJURY	5
Airway	5
Breathing	5
Circulation	6
Disability and Exposure	6
Estimation of % TBSA burnt	6
Fluid Resuscitation	7
BURNS MANAGEMENT & DRESSINGS	8
Initial treatment	8
Superficial Burns	8
Partial Thickness (Superficial and Deep) Burns	8
Full thickness Burns	8
Electrical Burns	8
Chemical Burns	9
Table 2 – Treatment regime for HFL burns	9
Friction Burns	10
Change of dressings instructions	10
Table 3 – Wound management	11
FACIAL BURNS	12
BURNS IN CHILDREN	12
AT HOME CARE / CARE AFTER PROCEDURE	12
KEY POINTS TO REMEMBER	13
SCAR MANAGEMENT	13

<u>WHEN TO REFER TO BURN UNIT</u>	<u>14</u>
<u>REFERENCES</u>	<u>15</u>
<u>ANNEX 1 – FLOW CHART</u>	<u>17</u>
<u>ANNEX 2 – LUND & BROWDER CHART</u>	<u>19</u>
<u>ANNEX 3 – PRODUCT EXAMPLES</u>	<u>21</u>

Classification of Burns

Depth	Cause	Appearance	Pain Sensation
Superficial (Epidermal)	Sunburn, flash, minor scald	Dry, erythema, brisk capillary return	Painful
Superficial Partial Thickness (Superficial dermal)	Scald	Moist, red, blisters, brisk capillary return	Painful
Deep partial thickness (Deep dermal)	Scald, minor flame contact	Moist, white slough, red mottled, sluggish capillary return	Dull Ache
Full thickness	Flame or severe scald	White charred appearance, no capillary return	Painless

Table 1 – Classification of burns

The cause of the burn can give an indication of its depth:

- Flash Burns: usually superficial burns
- Scalds: usually superficial or superficial partial thickness
- Flame, contact or chemical burns: deep partial thickness or full thickness
- Electrical burns: often Full thickness with or without deep tissue involvement

First Aid

- **Cool** the affected area immediately, with running water (4 - 8°C), for 20 minutes
- **Running water** is the preferred method of cooling burns. If a cloth is used it must be soaked frequently in cool water (free of any chemical additives)
- Ocular burns, especially if chemical in nature, need to be washed out with non-caustic fluid at the site of injury and throughout transportation to hospital
- **DO NOT apply ice.** This can cause further damage
- Apply **plastic wrap (cling-film)** to the burn after cooling. It aids in analgesia and limits heat loss and evaporation
- Chemical burns need to be treated with copious volumes of water (running water for more than 30 minutes)
- **Immediate analgesia** should be given

History & Documentation

- Type of burn
- Mechanism of injury
 - Duration of exposure / contact
 - Open-air / enclosed space
 - Associated injuries
- Time of burn
- Percentage Total Body Surface Area burnt (% TBSA)
 - Lund & Browder chart
- Burn depth
- First aid treatment given
- Past medical and drug history
- Tetanus status

Acute Management of Burn injury

FLOW CHART (Annex 1)

Airway

Assess for presence of:

- Black sputum or soot particles in mouth or around the nose
 - Singed nasal hairs
 - Stridor, dyspnoea
 - Hoarseness or change in voice
 - Facial or oropharyngeal swelling
 - Circumferential full thickness burns in the neck
- Protect the cervical spine with midline immobilisation if associated trauma.
 - If the patient is unstable or has signs and symptoms of airway compromise, an urgent review by an anaesthetist may be necessary with a view to intubate. Delay may lead to airway oedema and greater difficulty in airway management.
 - Any child with oropharyngeal burns and/or significant neck burns must be considered for intubation, even if the airway is not yet compromised; early involvement of senior anaesthetist required.
 - All stable patients with facial burns involving the nasal or oral cavities, but without airway compromise, will warrant an ENT Review for upper airway assessment

Breathing

- Exclude full thickness circumferential burns of the thorax. These may cause restriction of chest wall movement with inability to expand the chest for adequate breathing / ventilation.
- Full thickness chest burns may require escharotomies to permit chest expansion. Discuss with Plastic Surgeon on call.
- Apply high flow oxygen via non-rebreather mask (up to 15 L/min).
- Assess for other chest trauma e.g. diaphragmatic injury, flail chest or pneumothorax

Circulation

Look for early evidence of circulatory deficit:

- Tachycardia (heart rate >90)
- Tachypnoea (Respiratory rate >20)
- Reduced level of consciousness
- Prolonged capillary refill time (>2 sec)
- Cold peripheries
- Exclude circumferential full thickness burns / eschars in limbs and digits. Check for signs of impaired peripheral perfusion. If escharotomies are needed discuss with plastic surgeons on call. **ALWAYS ELEVATE** the affected limb(s).
- High voltage electrical limb burns may require early fasciotomy, seek plastic surgical opinion early as there may be extensive tissue damage without obvious external signs.

Disability and Exposure

- Look carefully for signs of head injury.
- Check and document GCS and pupil size.
- With obtunded patients exclude
 - o Poisoning e.g. CO, cyanide
 - o Other drugs such as alcohol or illicit substances.
 - o Other potential sites of trauma and bleeding
- Core temperature should be measured and maintained above 36°C.
- Give Tetanus vaccine / booster if indicated

Estimation of % TBSA burnt

Use the **Lund & Browder chart** (*Annex 2*) to calculate percentage burn. **AREAS OF ERYTHEMA SHOULD NOT BE INCLUDED.**

For a rough estimate the palm of **the patient's hand** is equal to 1% burn

Other charts are available to calculate % TBSA burnt such as Wallace's rule of Nines, however, the Lund & Browder Chart is the method of choice.

Fluid Resuscitation

PARKLAND FORMULA must be used to calculate the amount of fluids necessary and the rate at which they are given

IV fluids should be started if partial thickness burns are:

- **≥ 10% in children (< 12years of age)**
- **≥ 15% in adults**

IV access +/- maintenance fluids if full thickness burns are:

- **≥ 5%**

Parkland formula for burns resuscitation within the first 24 hours:

Total fluid = 4ml x BSA Burnt (%) x body weight (kg)

50% given within first 8 hours **FROM TIME OF INJURY**

50% given within next 16 hours

Patients receiving IV fluids should be catheterized for thorough, input-output charting

Aim for a urine output of:

0.5 - 1mls/kg/hour in an adult

1ml/kg/hour in a child

2-4mls/kg/hour infant (<1 year)

Burns Management & Dressings

Initial treatment

- Burst & drain blisters
- Chlorhexidine wash

Superficial Burns

- No dressing needed
- Apply emollient cream 2-3 times daily (*Annex 3*)
- For soothing, anti-irritating & anti-inflammatory effect one can use thermal spring water 2-3times daily.

Partial Thickness (Superficial and Deep) Burns

First 12-24 hours

- Apply a gel / ringer-based dressing (*Annex 3*) to keep burn moist and to avoid obscuring burn depth

Next 3 days

- Silver or Honey-based dressing (*Annex 3*)

Thereafter

- Emollient / honey-based dressing if needed (*Annex 3*)

Non-adherent dressing followed by Gauze & Adhesive / Gauze, wadding & bandage should be applied in addition to the above

- NO ANTIBIOTICS NEEDED.

Full thickness Burns

Apply gel / ringer-based dressing (*Annex 3*) & refer to Plastic Surgery team for review.

Electrical Burns

- The following investigations must be taken for such injuries:
 - o ECG
 - o CK (Creatine kinase)
 - o Urine myoglobin

Chemical Burns

- **COPIOUS WOUND IRRIGATION** for 30mins
- Cover burns with mineral oil (e.g. Paraffin Oil) if elemental metals suspected e.g. lithium, sodium, potassium and magnesium. **DO NOT** irrigate with water
- pH monitoring (with litmus paper) & hourly running water for 10 mins
- Irrigation of ocular burns should continue in hospital with 0.9% normal saline until the pH of the ocular surface has normalized to a range of 7.0 - 7.2 (use narrow-range pH test strips at 15- to 30-minute intervals)
- Use topical anaesthetic eye-drops (Oxybuprocaine) if the patient is in pain
- **Hydrofluoric acid (HFL) burns**
Wear surgical sterile gloves prior to mixing of antidotes and make sure they are worn throughout the procedure

Recommended regime for topical, inhalation or ocular HFL exposure:

	Skin Burns	Inhalation	Eye Exposure* *All patients need to be seen by an Ophthalmologist
Agents needed	<ol style="list-style-type: none"> 1. 10mls (1 vial) Calcium Gluconate 10% 2. 30mls K-Y Gel® 3. Sterile mixing bowl* 4. Sterile mixers <p>*100mls sterile urine bottles can be used</p>	<ol style="list-style-type: none"> 1. 1 vial of 10mls Calcium Gluconate 10% 2. 3 vials of 10mls 0.9% normal saline 3. 5mls syringes 	<ol style="list-style-type: none"> 1. 1L Normal Saline 0.9% (NS) 2. Drip set
Preparation	<ul style="list-style-type: none"> • Withdraw 30mls K-Y Gel® in a 50 or 60mls syringe • Transfer into sterile mixing bowl* • Add 10mls Calcium Gluconate 10% • Stir rapidly with sterile mixers <p>Consistency becomes gel like with time</p>	<ul style="list-style-type: none"> • Withdraw 1ml Calcium Gluconate 10% in the syringe • Withdraw up to 4mls with 0.9% normal saline 	<ul style="list-style-type: none"> • Attach the drip set to the NS bag
Application Chemical	<ul style="list-style-type: none"> • Apply gel until pain/redness disappears (or more definitive care is given depending on patient's symptoms) • Gel must be washed off with saline and reapplied hourly for 2-6 hours depending on patient's symptoms 	<ul style="list-style-type: none"> • Add the 4mls prepared solution to nebuliser cup • Administer with 100% Oxygen (oxygen driven nebulisation) at 5 litres/minute 	<ul style="list-style-type: none"> • Flush eyes for minimum of 15 minutes
Remarks	Pain should subside within 30-40 minutes	Repeat nebulised Calcium Gluconate every 4 hours	Remove any contact lenses if possible, prior to the flush

Table 2 – Treatment regime for HFL burns

Friction Burns

- Removal of grit & debris with copious saline washout

Change of dressings instructions

- Dressing may be soaked with saline to ease removal and reduce pain
- Dressings should be changed every 2-3 days initially
 - o Daily change of dressings may delay the healing process and should only be carried out if dressings are soiled or wounds are heavily infected

Burn Type	Wound Management		Dressings
	Superficial burns (Erythema)	Partial / full thickness burns	
Contact / Flame Burns	No dressing needed Emollient* twice daily	Puncture & drain any blisters Chlorhexidine Washout	Gel / Ringer-based dressing* first 24 hours (if available) Silver or Honey-based dressing* first 3 days Emollient* or Honey Gel* thereafter if needed Cover with Non-adherent dressing* Gauze* & Self-adhesive tape* / Gauze, wadding* & bandage*
Radiation		Chlorhexidine Washout Remove grit	
Friction		ECG, CK, Urine Myoglobin Assess for entry & exit wounds Chlorhexidine Washout Escharotomies if needed	
Electrical		Copious saline wound irrigation Hourly pH monitoring & saline washout HFL acid burns Ca gluconate regime: Withdraw 40mls K-Y Gel® in a 50 or 60mls syringe. Transfer into sterile container. Add 10mls Calcium Gluconate 10%. Stir rapidly with sterile mixers until consistency becomes gel-like. Apply every hour until pain settles (Refer to table 2) Elemental metal burns (lithium, sodium, potassium and magnesium) DO NOT IRRIGATE WITH WATER if suspected. Treat with mineral oils (e.g. Paraffin Oil)	
Chemical	Copious wound irrigation Hourly washout with saline Emollient* after washout		

Table 3 – Wound management

* Refer to Annex 3 for examples

Facial Burns

- If the eyes are involved lots of cool water needs to be applied and ophthalmic review is needed.
- Wash the face twice daily to keep burns clean
- Repairing emollients (*Annex 3*) are a good option to apply over facial burns. They are safe, gentle and soothing. They can be applied using a cotton swab or clean towel. Reapply twice a day.

Burns in Children

Always consider Non-Accidental Injury (NAI) in any child that presents with a burn

The following features indicate possible NAI:

- Unexplained delay in presentation
- Inconsistent history
- Multiple presentations
- Prior abuse or high-risk environment
- Immersion type of burn pattern
- Cigarette burns
- Scalds to genitalia or buttocks
- Mirror image injury
- Other signs of abuse

At home care / care after procedure

- **KEEP DRESSINGS ON. KEEP DRESSINGS DRY.** It is normal for dressings to ooze. A moderate amount of leakage especially in the first few days is normal.
- Adequate pain relief
- Overheating can make the itching worse, so wounds should be kept cool. Emollients (*Annex 3*) or antihistamines may help. (e.g. Piriton®/Atarax® for adults; Zyrtec®/Neoclarityn® for pediatric patients)
- Analgesia, such as paracetamol, is indicated and should be given an hour prior to dressing changes especially in children. This may also be supplemented with other analgesia for adults; Ibuprofen for pediatric patients
- If the dressing comes off go to the nearest health center to have new dressings re-applied
- Maintain adequate hydration and follow a well-balanced diet
- In the first 3-4 weeks following reconstructive surgery (skin grafting, flaps or application of dermal regeneration templates), Change of dressings should be carried out at the Plastic Surgery & Burns Unit

Key points to remember

- Keep burn dressings as dry as possible
- The new skin will take 7-10 days to heal if the burn injury is not deep
- Seek medical advice if:
 - o Any areas have not healed completely within 2 weeks (These wounds may need surgical intervention)
 - o Any new discharge is oozing from the burn or if there is a bad smell
 - o Any fever, chills or rigors
- Once the burn has healed always apply sun block on it before going out

Scar Management

- Apply **sunblock** over the scar especially if in an exposed area. This should be applied all year round not only in summer
- **Firm, circular motion massage** of the scars, with an emollient or silicone ointment, is necessary 2-3 times daily for 2 mins. Scar quality is improved, hypersensitivity is reduced and the scar is softened. This will reduce the risk of scar contractures (*Annex 3*).
- For burn scar pruritus antihistamine may be prescribed
- Scar thickening and scar contractures may be avoided by the long-term use of custom-made **pressure garments** (*Annex 3*). The agents need to be contacted directly for patients to be measured up prior to purchasing.
- Silicone ointment or sheets should be used preferentially for hypertrophic and Keloid scars in addition to the above advice (*Annex 3*).
- Neuromodulator drugs such as Tricyclic Antidepressants, Gabapentin or Pregabalin may also be considered in patients with neuropathic pain and/or Complex Regional Pain Syndrome.
- Patients with unstable scars or severe scar contractures limiting range of movement are best referred to the Plastic Surgery team. Such patients may benefit from scar excision and reconstruction using dermal regeneration templates followed by further skin grafting. Tissue expansion and flap reconstruction may also be required in certain cases.

When to refer to burn unit

- All full thickness burns.
- Partial Thickness burns:
 - o 10% of TBSA in <12 or >65 years of age
 - o 15% of TBSA in >12 years of age.
- All burns to face, ears, eyes, hands, feet, genitalia, perineum or a major joint, even if less than 10% (excluding areas of erythema).
- Circumferential burns.
- Chemical burns.
- Electrical burns. Extensive tissue damage can occur to underlying structures.
- Burns associated with significant fractures or other major injury.
- All inhalation or airway burns.
- Burns in children under the age of 12 months.
- Any burn where there is doubt about the treatment

Patients should be referred to Plastic Surgery by calling the team member on call as well as sending an e-mail with the full history and referral ticket on:

plasticsurgeryreferrals.mdh@gov.mt

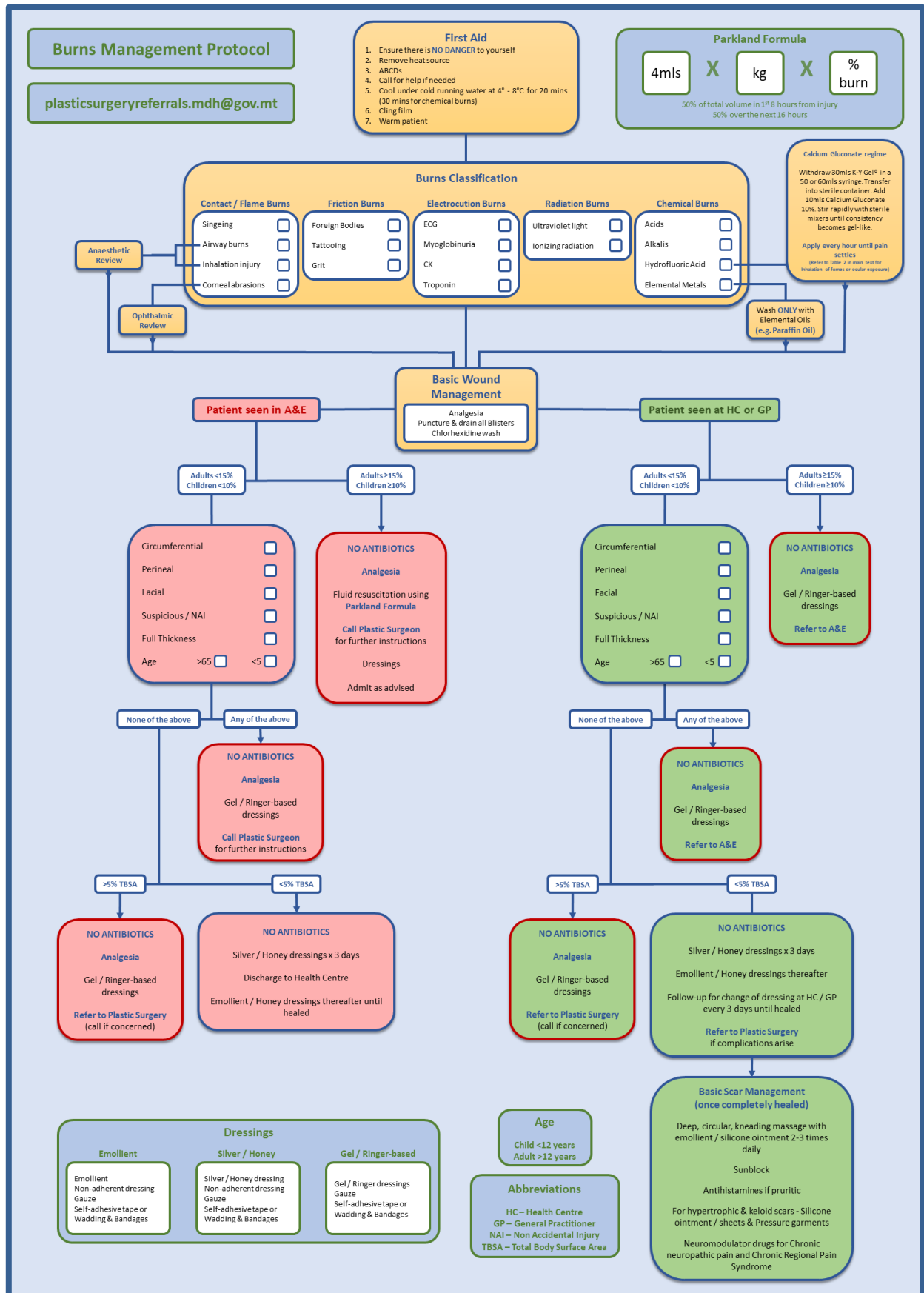
Patients should be transferred to the burns unit with dressings, as advised, and with the following documentation and investigations:

1. Copy of old notes
2. Completed Lund and Browder chart indicating areas and depths of burn
3. Details of fluid requirements, administration and urine output
4. The following bloods must be taken: CBC, Renal profile, CRP, ABG's including lactate, total protein & albumin, calcium & phosphate, glucose.
5. ECG and a Chest X-ray must also be taken if indicated
6. Details of any other injuries noted during the assessment at A&E

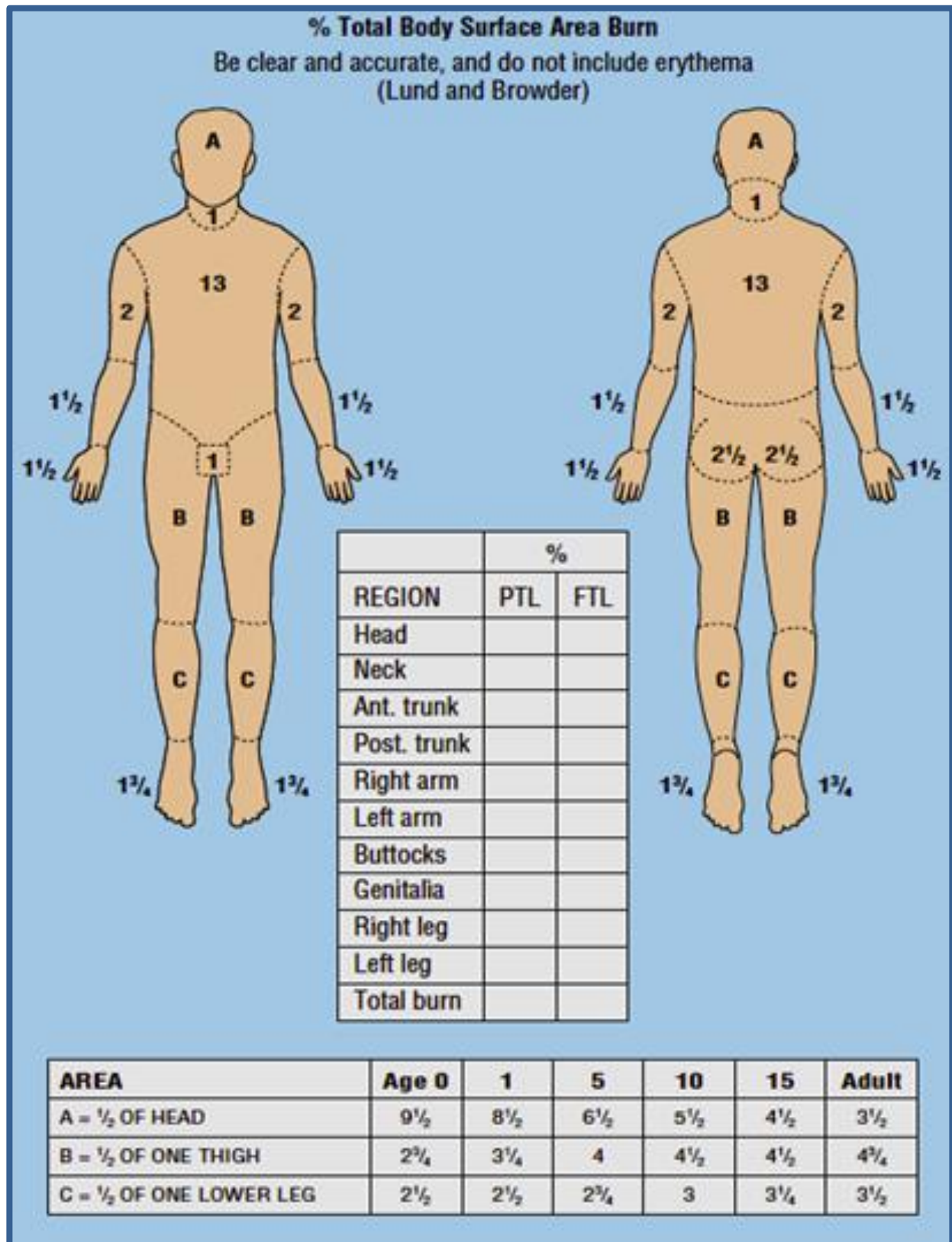
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2. "Management of Burns" World Health Organization, Surgical Care at the district hospital 2003
3. N Stockdale "Clinical Guideline Burn injury" Russells Hall Hospital Emergency Department, August 2014
4. "Burns/Management of burn wounds" The royal Children's Hospital Melbourne
5. "National Burn Care referral guidance" National Network for Burn Care NHS, 2012 Feb
6. "European Practice Guidelines for Burn care" European Burns Association; 2015 version 3
7. "European Standards", British Burn Association Standards
8. Robert D Cox "Chemical Burns treatment and Management" Medscape, 2015 Oct

Annex 1 – Flow Chart



Annex 2 – Lund & Browder Chart



Annex 3 – Product Examples

Bandages

Eurosoft®
Roltasoft®

Emollients

Atoderm Intensive
Lipikar Baume AP+
Medihoney® gel
Neoviderm
Sensibio forte
Xeracalm AD®
Xemose

Emollients (Repairing)

Alhydran
Bariéderm cica-cream
Cicabio
Cicabio SPF 50
Cicalfate
Cicaplast Baume B5
Cicaplast Baume SPF 50
Sebamed®

Gauze / Absorbent Dressings

Medicomp®
Resposorb® super

Gel / Ringer-based dressings

Aquacel® Extra Ag
Durafiber®
Eurocell® hydro
HydroClean® advance
Hydrogel
Medicare® Burn Gel
Medicare® Burn dressing

Garments

JobSkin®

Honey

Revamil® Gel
Medihoney®
Medihoney® apinate
Medihoney® HCS

Non-Adherent Dressings

Silicone based

Atrauman® Silicone
Cuticell® Contact
Mediflex®
Silflex

Silver based

Acticoat®
Urgotul Ag

Tulle

Allewyn®
Cuticell® Classic
Euronet
HydroTac®
Jelonet®
Meditull®

Other

Hydrosorb®
Medicel®
Medipad®
Melolin®

Non-Adherent, Anti-bacterial/Bacteriostatic Dressings

Bactigras®
HydroClean® advance
Medihoney® tulle
Revamil® dressing
Vulcosan

Self-adhesive dressings

Allewyn®
Eurofix®
Euromed®
Hypafix®
Leukomed®
Medifix®
Medipad®
Medisite®
Medporex®
Primapore®
Omniplast®
Omnifix®
Omnipore®

Silver based

Flamazine®
Silvederma®
Aquacel® Extra Ag

Silicone Sheet

Bap Scarcare
Cicacare®
ScarFX®

Silicone Ointment

Bap Scarcare Gel + SPF
Cicaplast Gel B5
Dermatix®
ScarSil®
Silderm™

Thermal Water

Avene Eau Thermale
Uriage Eau Thermale
La Roche-Posay Eau Thermale