The Dudley Group NHS
NHS Foundation Trust

# RUSSELLS HALL HOSPITAL EMERGENCY DEPARTMENT

# CLINICAL GUIDELINE
# BURN INJURY

This guideline describes the management of burn injuries in the Emergency Department (ED) at Russells Hall Hospital. A detailed description of burn pathophysiology and further management are beyond the scope of the guideline but further information can be found in the 'ABC of Burns' series, available as downloads from **http://www.bmj.com/**

# Contents
**(click to go to page)**

# Major Burn – Acute Management Flowchart

**Assess ABCDE**
**Remember cervical spine control**

**Assess for other injuries – deal with problems which require more urgent treatment first**

↓

**Obtain adequate IV access**
**FBC,U&E,glucose,G&S,clotting,CK**
**ANALGESIA - titrate IV morphine as necessary (intranasal diamorphine useful in children)**
**Start IV fluids**
**Measure core temp. and maintain >36°C**

↓

**Assess BSA, type and depth of burn**

↓

**IF ANY OF THE FOLLOWING:**

- **Child with any burn greater than 2% TBSA**
- **Adult with any burn greater than 3% TBSA**
- **Full thickness burn**
- **Inhalational injury**
- **Special areas***
- **Chemical / electrical burns**
- **High pressure steam injury**
- **Hydrofluoric acid burn**
- **Potentially complex burn****

BSA=Burn Surface Area

TBSA=Total Body Surface Area

***Special Areas**

- **Face**
- **Hand**
- **Perineum or genitals**
- **Feet**
- **Flexures (particularly neck or axilla)**
- **Burn over joint which may affect mobility or function**

****Complex Burn**

- **2° to ionising radiation**
- **Suspicion of NAI**
- **Coexisting diseases**
- **Pregnancy**
- **Extremes of age**
- **Circumferential dermal or full thickness burns**
- **Associated major trauma**
- **Cold injuries**

**YES**

- **Apply suitable dressing (clingfilm if for transfer)**
- **Manage fluid requirements and consider tetanus prophylaxis**
- **Ensure analgesia adequate**
- **Discuss with Regional Burns Centre at UHB or BCH**

**NO**

- **Apply suitable dressing**
- **Consider tetanus prophylaxis**
- **Arrange TTO analgesia**
- **Arrange 24hr review in ED clinic**

## Airway and Breathing

**Always remember to protect the cervical spine until clinically cleared.**

Loss of airway patency in a burns patient can occur suddenly and without warning, particularly in children. Airway management may be complex due to oedema or associated facial and neck injuries. It is therefore essential to consider the condition of the airway for any burns patient, even if apparently minor. **Consult a senior anaesthetist at an early stage** if there are any doubts or concerns.

The history is very important and should take into account the type of burn and exposure to hot gases or liquids, flame or smoke. Get a verbal history as early as possible as the patient will not be able to help once they are intubated. Prolonged exposure or exposure in an enclosed space are red flags for a likely inhalational injury.

Physical signs that may indicate an inhalational burn injury include:

- Burns to face, neck or upper torso
- Singed nasal hair
- Carbonaceous sputum or soot particles in oropharynx
- **Change in voice with hoarseness or harsh cough**
- **Dyspnoea, stridor**
- **Erythema or swelling of oropharynx on direct visualisation**

The last three indicate the need for urgent senior anaesthetic assessment and prompt intubation. Delay will lead inevitably to progressive airway oedema and greater difficulty in airway management. If intubation is required use an uncut ETT to allow for facial oedema.

All patients with an inhalational injury or other major burns must receive high-flow oxygen via a Hudson mask with reservoir bag. Regular monitoring of respiratory rate, blood pressure, ECG and $SaO_2$ must be initiated. In addition, CXR, ABG analysis and COHb level are **mandatory** in any patient with an inhalational injury or major burn.

The presence of an elevated lactate, cardiac arrhythmias, reduced GCS and reduced arterial-venous oxygen saturation difference may indicate cyanide poisoning.

Escharotomy may be necessary in patients with circumferential chest burns. Discuss with the surgical team on-call and Regional Burns Centre (RBC).

Also look for evidence of other chest injuries e.g. flail chest, pneumothorax.

## Circulation and Fluid Management

Look for clinical evidence of a circulatory deficit. This may be indicated by:

- **Tachycardia**
- **Tachypnoea**
- **Reduced level of consciousness**
- **Prolonged central capillary refill time**
- **Cool peripheries**

Circumferential limb burns may cause distal vascular compromise. The absence of peripheral pulses or a cool, pale limb warrant urgent discussion with the surgical team on-call and the Regional Burns Centre.

Fluid losses from burn injury must be replaced to maintain homoeostasis. Burns covering more than 15% of TBSA in adults and more than 10% in children necessitate formal fluid resuscitation. Large-bore IV access should be through unburnt skin where possible. BM should always be checked at the time of obtaining access. Take blood for FBC, U&E, glucose, clotting profile, G&S and CK.

The most commonly used resuscitation formula is the **Parkland formula** which calculates the amount of fluid required in the first 24 hours. Colloids have no advantage over crystalloids in maintaining circulatory volume; in Britain Hartmann's solution is most commonly used. Children require maintenance fluid in addition to this. The starting point for fluid resuscitation is the time of injury, not the time of admission. Any fluid already given should be deducted from the calculated requirement.

**Parkland formula for burns resuscitation**

Total fluid requirement in 24 hours = 4ml x BSA(%) x body weight (kg)
50% given in first 8 hours
50% given in next 16 hours

Patients with burns requiring fluid resuscitation should be catheterised and urine output measured hourly. This will guide fluid administration and desirable end points are:

**Urine output: 0.5-1.0 ml/kg/hour in adults**
**Urine output: 1.0-1.5 ml/kg/hour in children (2-4 ml/kg/hr in infants)**

Remember to check urinary βhCG in women of childbearing age.

Children receive maintenance fluid (0.45% saline + 5% dextrose) in addition, at a rate of:

4ml/kg/hr for first 10kg of body weight plus
2ml/kg/hr for second 10kg of body weight plus
1ml/kg/hr for each kg over 20kg of body weight

## Disability and Exposure

Always check and document GCS and pupil size. Look carefully for signs of head injury.

With an obtunded patient, always bear in mind poisoning e.g. CO, cyanide or the effect of other drugs such as alcohol or illicit substances.

Core temperature should be measured and maintained above 36°C.

## Assessment of Burn Surface Area (BSA)

The extent of a burn is usually expressed as the proportion of the body surface area which is involved in an injury, the burn surface area (BSA). In extensive burns, the whole of the patient (including the back) must be examined. Remember that burns patients, especially children, may get cold quickly so patients should be covered and warmed as necessary.

When calculating burn area, do not include erythema. During assessment, the environment should be kept warm, and small segments of skin exposed sequentially to reduce heat loss. Clinical assessment of burn surface area is often inaccurate but there are several systems in use to improve the accuracy of measurement.

- **Wallace's Rule of Nines is quick to use and can be used to estimate the area of medium to large burns in adults but is less suitable for children.**
  - Arm — 9%
  - Head — 9%
  - Neck — 1%
  - Leg — 18%
  - Posterior trunk – 18%
  - Anterior trunk – 18%

- **The Lund and Browder chart is more accurate, and can be used in children as it takes into account the person's age, and the different proportions of the head and legs in growing children.**

**For small or scattered burns, or for assessing the amount of unburnt skin in very extensive burns, the person's palmar surface (including fingers) can be used as a guide. It is equivalent to around 0.8% of the person's total body surface area.**

# Assessment of Burn Type and Depth

## Classification of depth of burns

| Depth of burn | Layers of skin affected | Examination findings |
|---|---|---|
| Superficial epidermal | The epidermis is affected, but the dermis is intact | Skin is red and painful, but not blistered. |
| Partial thickness — superficial dermal | The epidermis and upper layers of dermis are involved | The skin is pale pink and painful with blistering. |
| Partial thickness — deep dermal | The epidermis, upper and deeper layers of dermis are involved | The skin appears dry or moist, blotchy and red, and may be painful or painless. There may be blisters. |
| Full thickness | The burn extends through all the layers of skin to subcutaneous tissues | The skin is dry and white, brown, or black in colour, with no blisters. It may be described as leathery or waxy. It is painless. |

Always consider the cause of the burn (e.g. flame, scald or contact with a hot object). Ask whether the burn is painful and examine the skin for colour change and the presence of blisters (N.B. leave blisters intact unless large enough to interfere with dressings). Absence of sensation indicates a deep burn.

The cause of the burn may help to give an indication of its depth:

- Flash burns are usually superficial epidermal
- Scalds are usually superficial or superficial dermal
- Flame burns are usually deep dermal or full thickness
- Contact burns are likely to be deep dermal or full thickness
- Chemical and electrical injuries are often full thickness

Knowing burn depth helps determine therapy and predicts healing time and potential for complications such as infection or excessive scarring. Refer for specialist assessment if the burn wound depth is uncertain (even experienced burn surgeons usually determine burn depth clinically with 60%–75% accuracy).

**Remember to consider NAI in any child who presents with a burn.**

## Burns Dressings

For larger burns and if a burn requires referral to the RBC then clingfilm is a suitable dressing as it is transparent, effectively sterile and does not adhere to the wound.

For other burns, cover the burn with a non-adherent dressing. **Mepitel** is a non-adherent dressing suitable for the initial covering of minor burns and scalds. Apply a non-fibrous secondary absorbent dressing such as a dressing pad, and secure well with a light-weight conforming bandage or a tubular gauze bandage. Fingers should be dressed individually and the hand elevated.

Paraffin gauze dressings such as **Jelonet** are relatively inexpensive and frequently used to dress burns, however they may stick to the wound making dressing changes painful. If used, apply sufficient paraffin gauze, and change the dressing frequently (daily) to prevent it drying out.

Polyfax ointment may be used for the initial cover of minor facial burns but otherwise do not apply antimicrobial creams such as silver sulfadiazine (Flamazine) to burns.

Do not use antimicrobial-impregnated dressings.

Avoid using other creams or ointments.

## Referral to Regional Burns Centre

The National Network for Burn Care and Midlands Burn Care Network have established referral guidelines to the Regional Burns Centres at University Hospital Birmingham and Birmingham Children's Hospital. These are complex (and can be viewed on the MBCN website) but a summary of referral criteria can be found on the Burns Management Flowchart on page 3. It may be difficult to decide whether a particular patient requires referral; if you are not sure then discuss the case with a senior ED doctor or directly with the Regional Burns Centre.

Complex burns should not be brought back to the ED clinic. If a burn fails to heal after two weeks or if scarring is unsatisfactory refer to the Regional Burns Centre.

Transfer of burns patients should only be undertaken by ambulance crews with the experience necessary to manage ongoing fluid resuscitation, analgesia, thermal regulation and monitoring.

Patients should be transferred with all necessary documentation which should include:

- Copy of electronic notes
- Completed Lund and Browder chart indicating areas and depths of burn
- Details of fluid requirements, administration and urine output
- Any available test results e.g. bloods, CXR, ECG, ABG
- Details of any other injuries noted during assessment in ED.

## Further Reading

1) Midlands Burn Care Network: http://www.midlandsburnnetwork.nhs.uk/Default.aspx
2) National Network for Burn Care: http://www.specialisedservices.nhs.uk/burncare/
3) 'ABC of Burns' – Peter Dziewulski and Shehan Hettiaratchy
4) http://www.britishburnassociation.org/
5) NHS Clinical Knowledge Summaries: http://www.cks.nhs.uk/burns_and_scalds

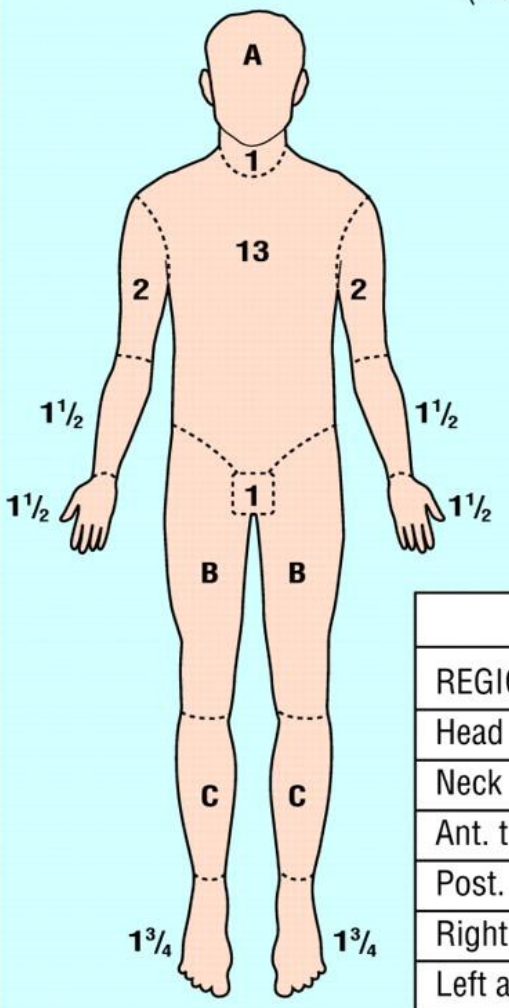
**Originator:** **Mr N. Stockdale, Consultant in Emergency Medicine, DGOH**

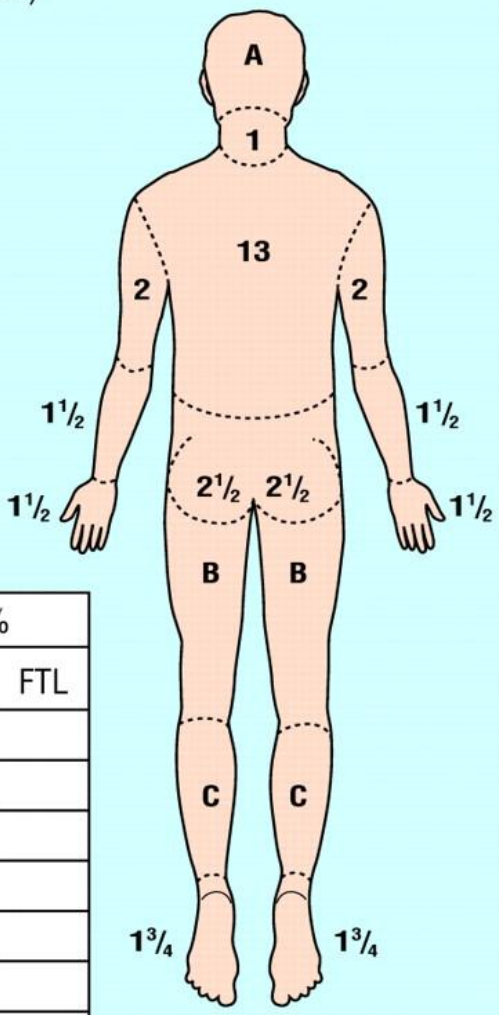
**Date:** **August 2012**
**Review date:** **August 2014**

# Appendix 1: Lund and Browder Chart

## % Total Body Surface Area Burn

Be clear and accurate, and do not include erythema
(Lund and Browder)




| | % | |
|---|---|---|
| REGION | PTL | FTL |
| Head | | |
| Neck | | |
| Ant. trunk | | |
| Post. trunk | | |
| Right arm | | |
| Left arm | | |
| Buttocks | | |
| Genitalia | | |
| Right leg | | |
| Left leg | | |
| Total burn | | |

| AREA | Age 0 | 1 | 5 | 10 | 15 | Adult |
|---|---|---|---|---|---|---|
| A = ½ OF HEAD | 9½ | 8½ | 6½ | 5½ | 4½ | 3½ |
| B = ½ OF ONE THIGH | 2¾ | 3¼ | 4 | 4½ | 4½ | 4¾ |
| C = ½ OF ONE LOWER LEG | 2½ | 2½ | 2¾ | 3 | 3¼ | 3½ |

# Appendix 2: Non-accidental Injury

**Remember to consider non-accidental injury in children (or vulnerable adults) who present with burns.**

**The following features indicate possible NAI:**

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