

# **NHS** Children's Acute Transport Service



## Clinical Guidelines

# Burns Management

### Document Control Information

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## Burns

In the UK there are burns centres (PICU level care) and burns units or facilities (HDU or ward care).

There are currently 8 regional paediatric burn centres in the UK, St Andrew's Burn Centre, Broomfield Hospital (Chelmsford) is the Paediatric Burn Centre for London and the South-East of England's Burn Network (LSEBN).

The burns ITU will take intubated children (> 6 months / 6 Kg) and those requiring cardiovascular support.

Children < 6 months / 6 Kg will be referred to Birmingham, Bristol or Manchester Paediatric Burn Centres. It is not a paediatric trauma or neurosurgical centre therefore paediatric burn patients requiring these specialities will require transfer to an alternate PICU.

If the child requires a burns unit or facility these are based at Chelsea and Westminster, Stoke Mandeville and Queen Victoria Hospitals within the LSEBN. See referral guideline below.

*LSEBN absolute Criteria for referral and transfer to a Paediatric Burns Centre:*

- a) Burn  $\geq$  30% TBSA
- b) Burn  $\geq$  20% TBSA Full thickness
- c) Burn  $\geq$  15% TBSA in <1 year old
- d) Burn + inhalation injury or need to ventilate
- e) Burn + Major trauma
- f) Burn + requirement for inotropic support
- g) Burn + requirement for renal support
- h) Burn + base deficit >6 and deteriorating
- i) Burn + O<sub>2</sub> Requirement >FiO<sub>2</sub> of 50%

Also consider referral for medical / non burn skin loss conditions (TENS/SJS/SSSS) that require intensive care level support. To refer patients to St Andrew's burns centre call 01245 516037.

### **1. Assessment: manage as 'Trauma Call'**

Ask about:

- Mechanism
  - Scald (hot fluid splash or immersion, type of fluid, time immersed)

- Flame (flash flame vs true flame, explosion/blast, enclosed or open space, need for extrication from scene, unconscious at scene, other casualties/fatalities)
- Chemical (what chemical, acid/alkali, length of exposure)
- Electrical (low vs high voltage)
- Time of burn
- Estimated burn area and which body regions involved
- Airway compromise - stridor, facial swelling
- History of inhalation of smoke/hot gases
  - Carbon Monoxide level
- First aid measures and treatment given
- Types of dressings applied
- Other injuries (full secondary survey)

## 2. Immediate management

The immediate management of burns patients should be similar to management of trauma (ABCDE approach).

- 2.1 Consider intubation for airway protection or inhalation injury.
- 2.2 Consider cervical spine immobilization.
- 2.3 100% O<sub>2</sub> should be given to all patients. Aim for saturations of >95%. Obtain formal co-oximetry as soon as possible to exclude CO poisoning (normal carboxyhaemoglobin level 0-5%). If level raised continue 100% O<sub>2</sub> until level <10%.
- 2.4 If metabolic acidosis, coma or cardiovascular instability with no clear cause consider the possibility of poisoning ie Cyanide. Treat based on clinical picture and surrogate markers (lactate >7, reduced arteriovenous oxygen gradient <10%, elevated anion gap acidosis) with hydroxocobalamin (Cyanokit), dose 70 mg/kg over 15 minutes (max 5g), can be given twice (max total 140 mg/kg or 10g).
- 2.5 A 12-lead ECG and continuous ECG monitoring is mandatory for all electrical burns. Consider other tissue damage even though the entry and exit wounds may be small.
- 2.6 Burn surface area should be estimated using the charts shown below, simple erythema is not included in the estimation.
- 2.7 2 large bore intravenous lines or intraosseous if necessary, insert through burnt tissue if necessary
- 2.8 Treat shock with fluid boluses. After initial fluid resuscitation, replacement fluid should be calculated **from the time of burn**. This is based on the Parkland formula:

## 4ml x weight (kg) x % burn

- For burns  $\geq 20\%$  this is added to the 24 hour maintenance fluids calculated as normal (1<sup>st</sup> 10 kg: 4mls/kg/h, 2<sup>nd</sup> 10 kg: 2mls/kg/h and then 1 ml/kg/h to a maximum of 100mls/hr).
- Half is given over the first 8 hours, the other half over 16 hours.
- Hartmann's solution is recommended.
- Aim urine output  $\geq 0.5$ ml/kg/hour.
- Titrate fluids up or down according to frequent clinical assessment and urine output (UO).
- If inadequate UO, check catheter, double infusion rate, reassess at 1 hour, if still low consider re-evaluating size and severity of burn and need for increased volume of fluid.

### Parkland Formula

4ml of Hartmann's Solution X weight in Kg X TBSA burned. 50% given in 1<sup>st</sup> 8 hours from time of injury, remaining 50% given over next 16hrs

Calculation:

$$4\text{mls X Kg X \% Burn} = \frac{\quad}{2} = \text{mls to be given in first 8 hours}$$

- 2.9 Shock / profound hypovolaemia is not a normal initial response to a burn. If present look for sources of blood loss (head, chest, abdomen, pelvis, long bones) or causes for cardiac dysfunction (cyanide poisoning, pneumothorax).
- 2.10 Perform a secondary survey and treat any other injuries. If decreased GCS – why? (hypoxia, head injury, poisoning). If possibility of head injury perform CT brain at local hospital prior to transfer as a paediatric neurosurgical centre may be a more appropriate destination.
- 2.11 Catheterise all burns  $\geq 20\%$ , consider for burns 10-19% or if cardiovascular instability. Aim for urine output of  $>0.5$  ml/kg/hr (2-4ml/kg/hr in rhabdomyolysis, especially with burns secondary to electrocution)
- 2.12 Consider limb escharotomy if circumferential deep dermal/full thickness extremity burns causing decreased limb perfusion
- 2.13 Eye care: In all children who are sedated, paralysed or who have a periorbital burn or swelling
- Close the eye (if not closed): geliperm and tape
  - Provide tear film/lubrication: simple eye ointment 2-4 hourly
- 2.14 Prophylactic antibiotics and steroids are not recommended unless specific indication (escharotomy)

- 2.15 Cover the burn with cling film and keep the child warm (**NB** avoid circumferential dressings)
- 2.16 Analgesia including enteral paracetamol, intravenous opiates and ketamine as indicated. Typical doses of IV morphine are 80 mcg/kg for <1 year old, and 100 mcg/kg for >1 year old children. Titrate dose to pain, and level of sedation
- 2.17 Consider non-accidental injury, document pattern of burns or other injuries

### 3. Indications for intubation

3.1 Intubation is highly recommended for:

- **Airway burns:** suggested if burned in enclosed space, stridor, burns to face, lips, tongue, mouth, pharynx or nasal mucosa, singed nasal hairs, soot in sputum, nose and mouth
- **Inhalational injury:** suggested if burned in an enclosed space, dyspnoea, hypoxaemia (SpO<sub>2</sub> <94% in room air), increased CO level
- **A large burn area:** for which high levels of analgesia will be required
- **Reduced conscious level:** GCS<8 or fluctuating level of consciousness

**A decision not to intubate in the presence of any of the above must be discussed with the CATS consultant.**

3.2 If intubation is indicated:

- It should not be delayed for the arrival of the CATS team
- It should be performed by or under the supervision of a senior anaesthetist. *The procedure is urgent as massive swelling may occur making airway management extremely difficult*
- Beware of hypovolaemia and give fluid prior to intubation drugs
- Intubate with cuffed tube orally
- **DO NOT CUT THE ENDOTRACHEAL TUBE:** it will ride out of the mouth as the face swells. Tube ties should be used and checked regularly.
- Suxamethonium is safe until 24 hours post burn (risk of hyperkalaemia after 24hrs).

### 4. Management following intubation

4.1 To ventilate, use:

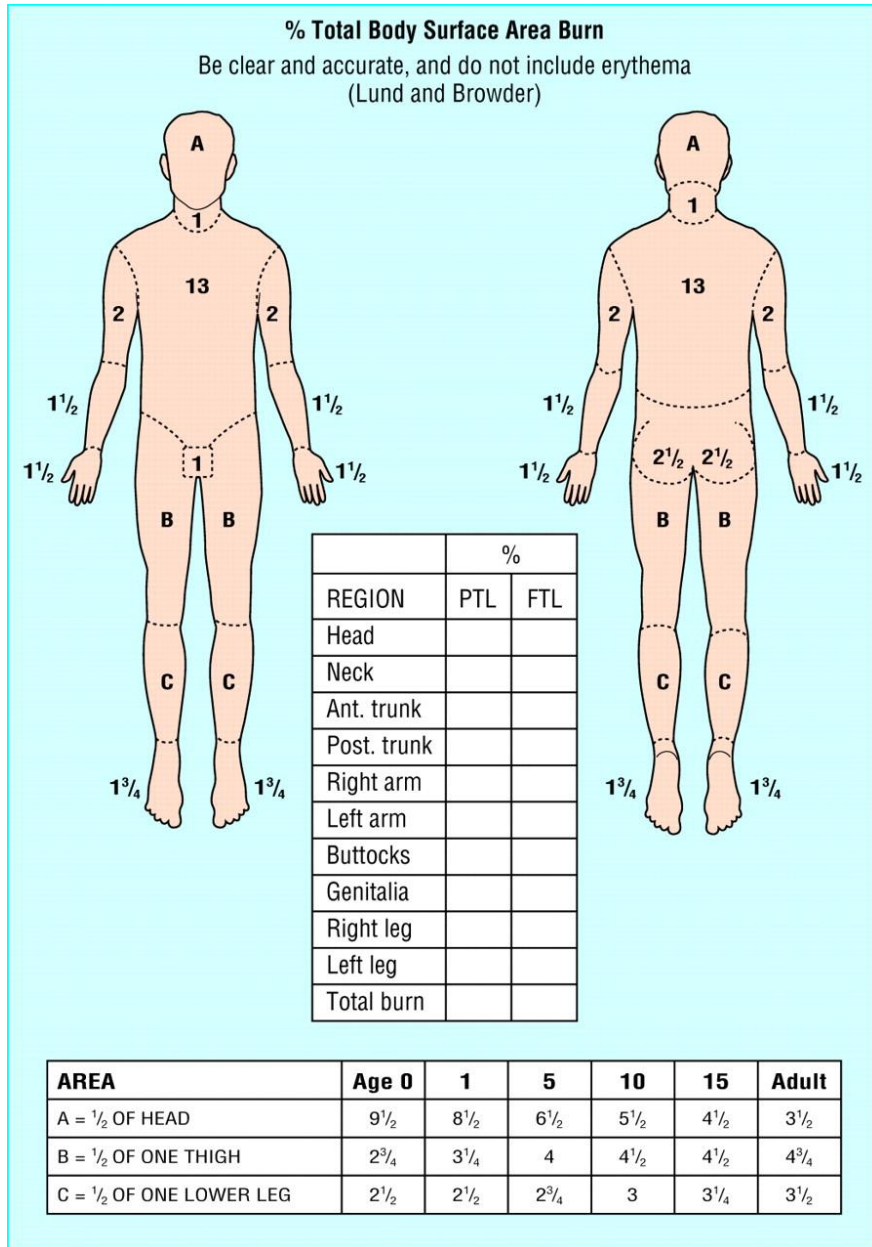
- 100% O<sub>2</sub> until CO <10%

- A pressure limited permissive hypercarbia approach unless evidence of a head injury
  - PIP <35 and PEEP of at least 5 Salbutamol nebulisers may improve ventilation
- 4.2 Remember chest injury/ tamponade from chest wall burns (particularly if circumferential) may necessitate use of high airway pressures and early chest escharotomy.
- 4.3 Analgesia, sedation and paralysis: morphine, midazolam and vecuronium infusions, plus ketamine if necessary.
- 4.4 Examine CXR for signs of pneumonitis and ARDS.
- 4.5 Place nasogastric (or orogastric if nasogastric contraindicated) tube if not already placed.

## 5. Transport considerations

- 5.1 Consider cervical spine and spinal immobilisation in all patients (as per current guidelines)
- 5.2 Maintain circulation: maintenance fluid, extra boluses, inotropic support and vasopressors as needed. Dynamic changes in cardiovascular status will need frequent monitoring and adjustment of fluid and inotropes.
- 5.3 Watch peripheral pulses for limb ischaemia especially distal to circumferential burns.
- 5.4 Monitor temperature and use blankets to keep patient warm (space blankets are obsolete). Do not transfer with cold soaks.
- 5.5 Take advice from burn centre as to appropriate dressing for burn (usually cling film).
- 5.6 Monitor: haematocrit, glucose, electrolytes (remember risk of acute renal failure in rhabdomyolysis in large burns, trauma or electrocution).
- 5.7 Inform team at receiving hospital of likely ETA and need for early bronchoscopy or surgical intervention.
- 5.8 LSEBN has a teleded system for sharing burn images with the receiving burn centre / unit. This is set up and available in all hospitals (<https://www.trips.nhs.uk>) and can be of use if uncertainty re level of care needed / need to intubate etc.

## Lund and Browder Chart for Surface Area Calculation



# CHILDREN'S BURN REFERRAL GUIDELINES

LONDON & SOUTH EAST OF ENGLAND BURN NETWORK (LSEBN) – Version 2 (November 2010)

- ### REFERRAL CRITERIA FOR SPECIALISED BURN SERVICE
- Consider if >1% Total Body Surface Area (TBSA) Partial Thickness (PT) burn
  - All deep dermal and full thickness (FT), circumferential burns and burns involving the face, hands, soles of feet, perineum
  - All burns associated with smoke inhalation, electrical shock or trauma
  - Severe metabolic disturbance
  - Children with burn wound infection
  - All children 'unwell' with a burn (see below)
  - Unhealed burns after 2 weeks
  - Neonatal burns of any size
  - All children with burns and child protection concerns
  - Progressive non burn skin loss condition (TENS, SSSS)
  - Any other case that causes concern

### MEETS CRITERIA FOR REFERRAL TO SPECIALISED BURN SERVICE

CALL LOCAL BURN SERVICE

St Andrews Centre, Broomfield Hospital (Chelmsford)	01245 516037
Chelsea & Westminster Hospital (London)	0203 3152500
Queen Victoria Hospital (East Grinstead)	01342 414469
Stoke Mandeville Hospital (Aylesbury)	01296 315040
National Burn Bed Bureau	01384 215576
Children's Acute Transport Service (CATS)	0800 0850003

### GIVE FLUID / FAST AS BELOW

AGE	BURN SIZE (TBSA)	FLUID
LESS THAN (9) 3Y2 OLD	< 10% TBSA FT or PT BURNS	• Feed as Normal
	≥ 10% TBSA BUT < 20% TBSA FT or PT BURNS	• Feed as Normal • IV fluid resuscitation according to Parkland Formula only • Do not give IV Maintenance Fluid
	≥ 20% TBSA FT or PT BURNS	• Keep NBM • IV fluid resuscitation according to Parkland Formula • Give IV Maintenance Fluids
OLDER THAN (P) 3Y2 OLD	< 10% TBSA FT or PT BURNS	• Keep NBM • Consider giving IV Maintenance Fluids
	≥ 10% TBSA FT or PT BURNS	• Keep NBM • IV fluid resuscitation according to Parkland Formula only • Do not give IV Maintenance Fluid

### UNWELL: Toxic Shock Syndrome / Burns Sepsis Syndrome – ANY OF:

• Temperature > 38°C	• Not eating or drinking
• Rash	• Tachycardia/tachypnoea
• Diarrhoea and vomiting	• Hypotension
• General malaise	

Seek advice from local Burn Service and consider treating with fluid resuscitation, IV antibiotics +/- FFP

### GENERAL INFORMATION

#### IV Access

All children with Burns ≥ 10% but <30% Total Body Surface Area (TBSA) should have one well secured IV cannula

All children with burns ≥ 30% TBSA should have 2 well secured IV cannulae  
Consider Central Access if Patient Unstable

#### IV Resuscitation Fluids

All children with Burns ≥ 10% TBSA will receive fluid according to the Parkland Formula:-  
4 ml/Kg/% burn over 24 hrs from the time of injury given ½ in the 1<sup>st</sup> 8 hrs & ½ in the 2<sup>nd</sup> 16 hrs given as Hartmann's fluid

#### IV Maintenance Fluids

100 ml/Kg over 24 hrs for 1<sup>st</sup> 10 Kg.  
Plus 50 ml/Kg over 24 hrs for 2<sup>nd</sup> 10 Kg  
Plus 20 ml/Kg over 24 hrs for each additional Kg  
Give as 0.45% Sodium Chloride and 5% Glucose solution

#### Fluid Balance

All children receiving IV Fluids should have fluid balance documented on the LSEBN Transfer Document (located on the LSEBN Website)

#### Catheterisation

All children with burns ≥ 20% TBSA should have an appropriate size catheter.  
Consider catheter if burn 10-19% TBSA  
Consider for all perineal burns

### Suspected Smoke Inhalation or Airway Compromise

Give oxygen and seek anaesthetic review

#### NOTE: Referral Criteria for Specialised Burn Centre

Burn ≥ 30% TBSA (Consider CATS Transfer)  
Burn ≥ 20% TBSA Full Thickness (FT)  
Burn ≥ 15% TBSA in ≤ 1 year old  
Burn + Inhalation injury or need to ventilate  
Burn + Major Trauma  
Burn + requirement for inotropic support  
Burn + requirement for renal support  
Burn + base deficit >6 and deteriorating  
Burn + O<sub>2</sub> Requirement > FIO<sub>2</sub> of 50%

#### For cases that do not meet the criteria for referral:

Continue local care – give advice to observe for signs of Toxic Shock Syndrome (Refer to 'Unwell')

Discharge when wound healed with advice to moisturise and protect from sun until skin loses pink colour

LSEBN Published November 2010  
www.cats.nhs.uk





**LONDON & SOUTH EAST OF ENGLAND BURN NETWORK (LSEBN) – Version 1 - MAY 2012**  
**SUPPLEMENTARY INFANT BURN ACCEPTANCE GUIDELINES**  
 FOR USE ONLY BY THE SPECIALISED BURN PROVIDERS WITHIN THE LSEBN NETWORK

**INFANT UNDER 6 MONTHS OF AGE or UNDER 6KG?**

**YES**

**NO**  
 SEE LSEBN CHILDREN'S REFERRAL GUIDELINES Version 2 (November 2010)

**REQUIRES VENTILATION ?**

**YES**  
 Infant requires VENTILATION

**NO**  
 Infant does not require ventilation  
**REFER TO TABLE BELOW**

**YES WITH NO BURN**

**YES WITH BURN OF ANY SIZE**

Advise the referring Doctor to refer directly to local PICU with support from burn outreach from local burn service

Unless the burn is very small and can be managed with out-reach support at the local PICU, the burns consultant should advise the referring Doctor to refer directly to a Paediatric Burn Centre with a collocated PICU. Advise the referring Doctor to contact the burn bed bureau 01384 215576 and refer to the paediatric burn centre at either: Birmingham Manchester or Bristol

TBSA	Age 0 to 6 months
+ 20% Centre Level Care	Advise to refer to Paediatric Burn Centre with co-located PICU Birmingham, Manchester or Bristol
10 – 19% Unit Level Care	Advise to refer to Chelsea & Westminster
1 – 9 % Unit level care	Unless the burn is very small and can be managed at local service, refer to Chelsea & Westminster

