



Clinical Guidelines

Burns Management

Document Control Information

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Applicable to	All CATS employees		



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 secondary survey)

Immediate management

The immediate management of burns patients should follow the ABCDEF trauma approach:

- Consider intubation for airway protection or inhalation injury
- Consider cervical spine immobilisation
- 100% O₂ should be given to all patients initially. Aim for saturations of >95%. Obtain formal co-oximetry as soon as possible to exclude carbon monoxide poisoning (normal carboxyhaemoglobin level 0-5%). If level raised, continue 100% O₂ until level <10%
- If metabolic acidosis, coma or cardiovascular instability with no clear cause consider the possibility of poisoning i.e. cyanide. Treat with hydroxocobalamin (Cyanokit) (ED should have access to it) - 70 mg/kg over 15 minutes (max 5g) if:
 - lactate >7
 - reduced arteriovenous oxygen gradient <10%
 - elevated anion gap acidosis

Hydroxycobalamin can be given twice (max total 140 mg/kg or 10g)

- 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
- Burn surface area should be estimated using the charts shown below, **simple erythema is**

not included in the estimation

- 2 large bore intravenous lines or intraosseous, insert through burned tissue if necessary
- Treat **shock** with fluid boluses. Accept modest tachycardia and hypotension if lactate < 2 and urine output >0.5ml/kg/h
- After initial fluid resuscitation, replacement fluid should be calculated **from the time of burn**. This is based on the modified Brooke/Parkland formula:

2ml x weight (kg) x % burn

- For burns $\geq 20\%$ this is added to the 24-hour maintenance fluids calculated as normal
 - 1st 10 kg: 4mls/kg/h
 - 2nd 10 kg: 2mls/kg/h
 - >20 kg: 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 ≥ 0.5 ml/kg/hour
 - Titrate fluids up or down according to frequent clinical assessment and urine output (UO)
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- Catheterise all burns $\geq 20\%$ 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)
 - 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)
 - Perform a secondary survey and treat any other injuries. If decreased GCS – why? (hypoxia, head injury - consider cervical spine, poisoning). Perform a CT if clinically indicated prior to transport as transfer to a paediatric neurosurgical centre may take priority over a burns centre.
 - A limb escharotomy may be necessary if circumferential deep dermal/full thickness extremity burns causing decreased limb perfusion
 - Eye care: In all children who are sedated, muscle relaxed or who have a periorbital burn or swelling
 - Close the eye (if not closed) with tape
 - Provide tear film/lubrication: simple eye ointment 2-4 hourly
 - Prophylactic antibiotics and steroids are not recommended unless specific indication (escharotomy)
 - Cover the burn with cling film and keep the child warm (avoid circumferential dressings)

- Analgesia including enteral paracetamol, intravenous opiates and ketamine as indicated
- Titrate dose to pain, and level of sedation. Typical doses of IV morphine
 - 80 mcg/kg for <1 year old
 - 100 mcg/kg for >1 year old children
- Consider non-accidental injury, document pattern of burns or other injuries

Indications for intubation

Intubation is 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 ($\text{SpO}_2 < 94\%$ in room air), increased carbon monoxide 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.

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*
- Be prepared for cardiovascular instability and fluid resuscitate as above
- Intubate orally with cuffed tube
- **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)

Management following intubation

To ventilate, use:

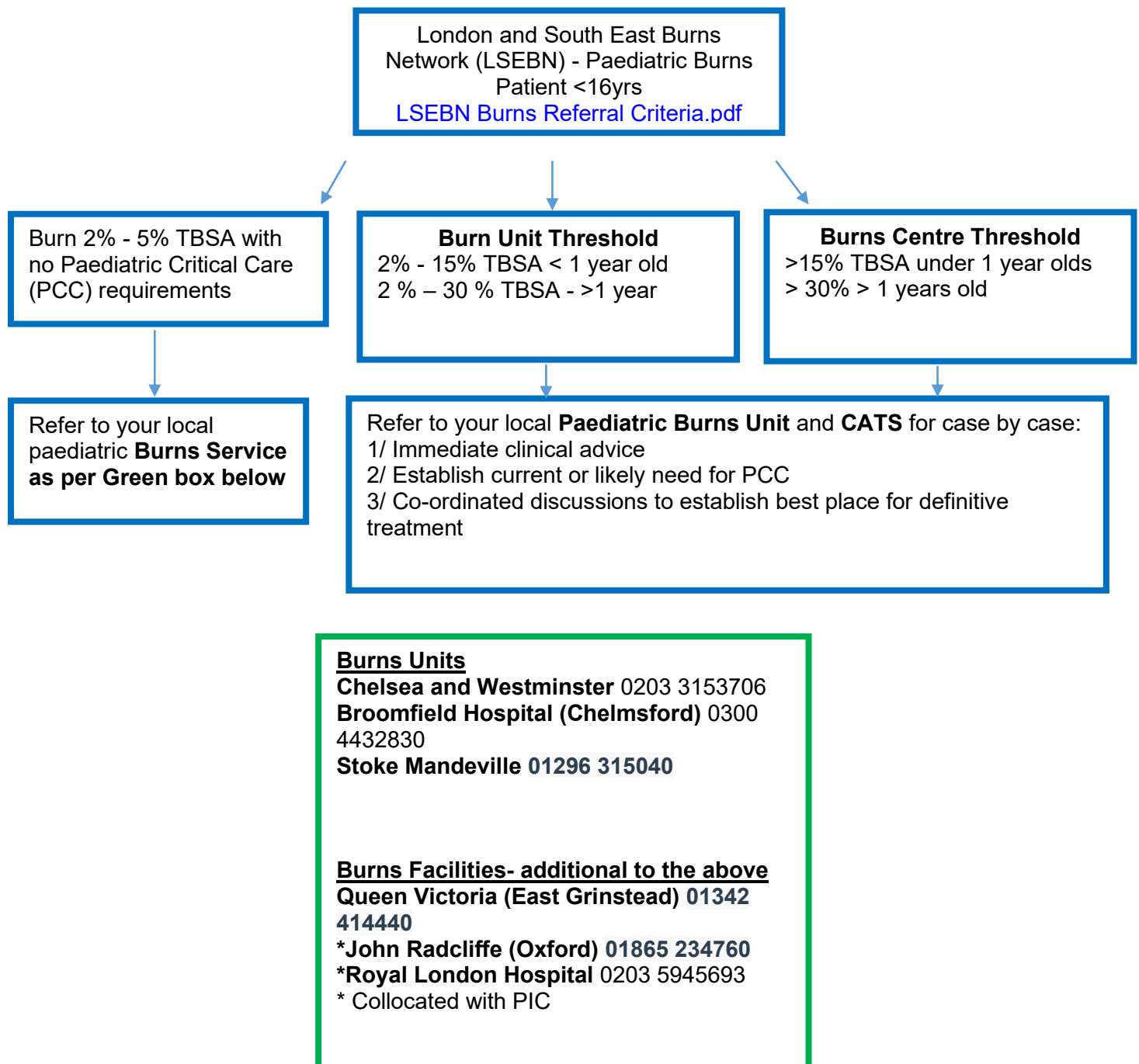
- 100% O₂ until carbon monoxide level <10%
- A pressure limited, permissive hypercarbia approach unless evidence of a head injury

- Salbutamol nebulisers may improve ventilation
- Remember chest injury/ tamponade from chest wall burns (particularly if circumferential) may necessitate use of high airway pressures and early chest escharotomy
- Regular ETT suctioning may be required
- Analgesia, sedation and muscle relaxant: morphine, midazolam and vecuronium infusions, plus ketamine if necessary
- Examine CXR for signs of pneumonitis and ARDS
- Place nasogastric (or orogastric if nasogastric contraindicated) tube, if not already placed

Transport considerations

- Consider cervical spine and spinal immobilisation in all patients (as per current guidance)
- Maintain circulation: maintenance fluid, extra boluses and vasoactive drugs as needed, dynamic changes in cardiovascular status will need frequent monitoring
- Monitor peripheral pulses for limb ischaemia especially distal to circumferential burns
- Monitor temperature and use blankets to keep patient warm, do not transfer with cold soaks
- Take advice from burn centre as to appropriate dressing for burn (usually cling film)
- Monitor: haematocrit, glucose, electrolytes (remember risk of acute renal failure in rhabdomyolysis in large burns, trauma or electrocution)
- Inform team at receiving hospital of likely arrival time and need for early bronchoscopy or surgical intervention

In the UK paediatric burns are looked after in burns centres (PICU level care) and burns units or facilities (HDU or ward care).



Also consider referral for medical / non burn skin loss conditions (TENS/SJS/SSSS) that require intensive care level support.

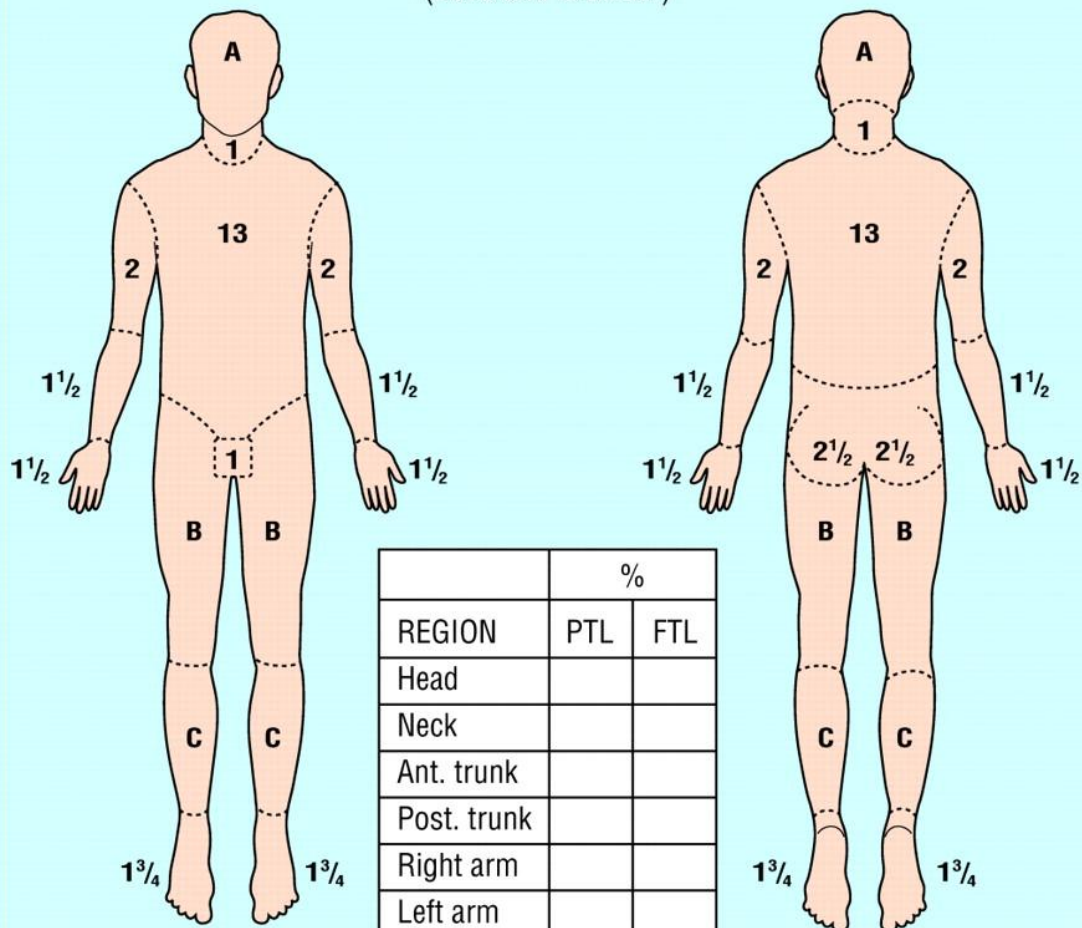
LSEBN has a telemedicine system for sharing burn images with the receiving burn centre / unit. This is set up and available in all hospitals (<https://www.trips.nhs.uk>) and can be of use if uncertainty regarding level of care needed / need to intubate etc



Lund and Browder Chart for Surface Area Calculation

% Total Body Surface Area Burn

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



AREA	Age 0	1	5	10	15	Adult
A = 1/2 OF HEAD	9 1/2	8 1/2	6 1/2	5 1/2	4 1/2	3 1/2
B = 1/2 OF ONE THIGH	2 3/4	3 1/4	4	4 1/2	4 1/2	4 3/4
C = 1/2 OF ONE LOWER LEG	2 1/2	2 1/2	2 3/4	3	3 1/4	3 1/2