

NHS Children's Acute Transport Service



Clinical Guidelines

Burns Management

Document Control Information

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Applicable to	All CATS employees		



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 (ABCDEF approach):

- 2.1 Consider intubation for airway protection or inhalation injury
- 2.2 Consider cervical spine immobilisation
- 2.3 100% O₂ should be given to all patients initially. 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% O₂ until level <10%
- 2.4 If metabolic acidosis, coma or cardiovascular instability with no clear cause consider the possibility of poisoning i.e cyanide. Treat with hydroxocobalamin (Cyanokit) - dose 70 mg/kg over 15 minutes (max 5g)
 - lactate >7
 - reduced arteriovenous oxygen gradient <10%
 - elevated anion gap acidosisHydroxycobalamin 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, 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
 - 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)
 - 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
- 2.9 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)
- 2.10 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)
- 2.11 Perform a secondary survey and treat any other injuries. If decreased GCS – why? (hypoxia, head injury (consider cervical spine), 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
- 2.12 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
- 2.17 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
- 2.18 Consider non-accidental injury, document pattern of burns or other injuries

3. Indications for intubation

3.1 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 (SpO₂ <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 resuscitation pre and peri administration of intubation drugs
- 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)

4. Management following intubation

- 4.1 To ventilate, use:
 - 100% O₂ until CO <10%
 - A pressure limited permissive hypercarbia approach unless evidence of a head injury
 - 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 Regular ETT suctioning may be required
- 4.4 Analgesia, sedation and paralysis: morphine, midazolam and vecuronium infusions, plus ketamine if necessary
- 4.5 Examine CXR for signs of pneumonitis and ARDS
- 4.6 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 and vasoactive drugs as needed, dynamic changes in cardiovascular status will need frequent monitoring and adjustment of fluid and inotropes
- 5.3 Monitor 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 arrival time and need for early bronchoscopy or surgical intervention

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).

St Andrew's Burn ITU will admit:

- Intubated children (> 6 months / 6 Kg)
- Patients requiring cardiovascular support.

St Andrew's Burn ITU will not admit:

- Children < 6 months / 6 Kg (referral to Birmingham, Bristol or Manchester Paediatric Burn Centres)
- Paediatric burn patients requiring paediatric trauma or neurosurgical input.
- Paediatric patients with inhalational injury *without* cutaneous injury.

The regional burns unit or facilities are based at Chelsea and Westminster and Stoke Mandeville Hospitals within the LSEBN. See referral guideline below.

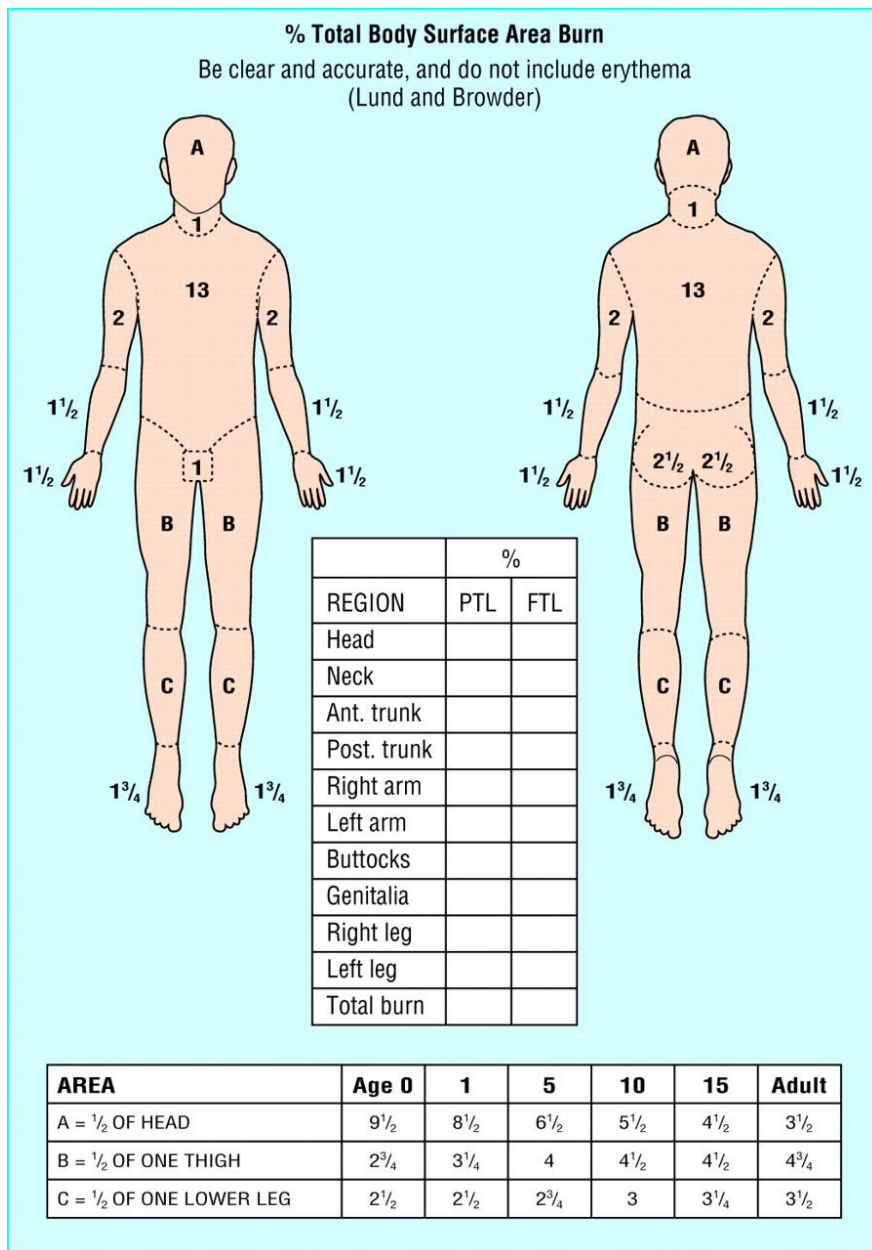
LSEBN absolute Criteria for referral and transfer to a Paediatric Burns Centre:

- 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 + O₂ requirement >FiO₂ 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.

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



Burn Referral Guidelines: Criteria for Referral

Adults and children with the following Injuries should be discussed with the local Burn Service

Cause

- Inhalation injury
- Deep dermal and full thickness
- Electrical
- Chemical
- Burns with trauma

Affected Area

- Face, hands, genitals, feet, joints, scalp, ears
- Circumferential

Size

- >1% Total Body Surface Area [TBSA] in children
- >3% TBSA in adults

Age

- Neonates (<28 days old)


Wound

- Not healed within 2 weeks
- Infected

DISCUSS

- Suspected non accidental injury, mental health history or self-harm
- Progressive non burn skin loss conditions (TENS, SSSS, Necrotising Fasciitis)
- Significant co-morbidity (eg diabetes) or immunocompromised patients
- Friction burns with full thickness skin loss
- Cold burns with full thickness skin loss
- Older people (60+)
- Children "unwell" with a burn (see below) *
- Any other case that causes concern

CONTACT DETAILS

 www.trips.nhs.uk

St Andrews Burns Service
Broomfield Hospital (Chelmsford)
Adults/Children **01245 516037**


Chelsea & Westminster Hospital (London)
Adults **02033152500**
Children **02033153706**

Stoke Mandeville Hospital (Aylesbury)
Adults and Children **01296 315040**


*** Toxic Shock Syndrome / Burns Sepsis Syndrome**
Seek early advice from local Burn Service
Consider treating with fluid resuscitation, IV antibiotics +/- FFP

MEDICAL EMERGENCY

Any patient
Any size burn
Any of these symptoms
=
Risk of Toxic Shock Syndrome



- Temperature > 38°C
- Rash
- Diarrhoea and vomiting
- General malaise
- Not eating or drinking
- Tachycardia/tachypnoea
- Hypotension
- Reduced urine output













If in doubt, seek early advice from local Burn Service

Telephone support and advice on initial care of any patient with a burn injury is available at all times

Approved by LSEBN CGG on December 2015



<h1>Initial Management of Severe Burns</h1> <p>For burn injuries in adults >15% TBSA and children >10% TBSA or those that meet the LSEBN Burn Referral Criteria, consider early consultation with the local Burn Service</p> <p>Assess the following points with respect to burn injury as part of standard ATLS protocol</p>		 London and South East of England Burn Network
AIRWAY 	<ul style="list-style-type: none"> <input type="checkbox"/> Suspect Inhalation Injury: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> respiratory distress (dyspnoea, stridor, wheeze) <input checked="" type="checkbox"/> voice changes <input checked="" type="checkbox"/> signs of upper airway oedema <input checked="" type="checkbox"/> deep facial burns <input checked="" type="checkbox"/> sooty sputum <input checked="" type="checkbox"/> history of burn in enclosed space <input type="checkbox"/> Seek review by senior anaesthetist <input type="checkbox"/> Consider need for early intubation (do not cut tube) <input type="checkbox"/> Sit upright all patients with facial burns 	CONTACT DETAILS  www.trips.nhs.uk St Andrews Burns Service Broomfield Hospital (Chelmsford) Adults/Children 01245 516037 Chelsea & Westminster Hospital (London) Adults 02033152500 Children 02033153706 Stoke Mandeville Hospital (Aylesbury) Adults and Children 01296 315040
BREATHING 	<ul style="list-style-type: none"> <input type="checkbox"/> Suspect smoke inhalation injury if raised COHb level <input type="checkbox"/> Administer 100% FIO₂ if carbon monoxide injury suspected <input type="checkbox"/> Establish baseline ABG's and SaO₂ (goal >95%) <input type="checkbox"/> Discuss with local Burn Service need for escharotomy in circumferential burns on chest/torso/neck 	
CIRCULATION 	<ul style="list-style-type: none"> <input type="checkbox"/> Insert 2 large bore peripheral IV lines in unburned skin, if able <input type="checkbox"/> Take baseline bloods (U&E, FBC, LFT, CRP, Amylase, CK, X-Match, Drug/Tox) <input type="checkbox"/> Discuss with local Burn Service need for escharotomy in circumferential burns to limb/digit: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Assess perfusion distal to burn <input checked="" type="checkbox"/> Elevate limbs 	
DISABILITY 	<ul style="list-style-type: none"> <input type="checkbox"/> Assess pain score <input type="checkbox"/> Administer IV opiate analgesia according to patient's needs 	
EXPOSURE 	<ul style="list-style-type: none"> <input type="checkbox"/> Remove: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Hydrogel dressings <input checked="" type="checkbox"/> Loose clothing/jewellery/nappies proximal to burn injury. Leave any adherent clothing. <input type="checkbox"/> Cool: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Wounds for 20 mins (with running water or wet compress if possible) <input type="checkbox"/> Clean: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> With Normal Saline or Tap H₂O <input type="checkbox"/> Assess: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Extent of burn (%TBSA) using Lund & Browder chart. Do not include erythema in %TBSA estimation. <input checked="" type="checkbox"/> Depth of burn <input checked="" type="checkbox"/> Send photos via TRIPS www.trips.nhs.uk <input type="checkbox"/> Cover: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> With loose longitudinal strips of Cling Film. Do not apply Cling Film to face. <input checked="" type="checkbox"/> Chemical injuries must be fully decontaminated <input checked="" type="checkbox"/> Implement active warming measures to prevent heat loss 	
FLUIDS 	<ul style="list-style-type: none"> <input type="checkbox"/> Assess patient's weight <input type="checkbox"/> Use Parkland formula to estimate fluid resuscitation requirements from time of injury: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> 4mls/kg/% burn, half over the first 8 hrs, rest over next 16 hrs <input checked="" type="checkbox"/> Administer warmed Hartmann's <input type="checkbox"/> Additional maintenance fluid may be appropriate and can be discussed with the accepting Burn Service <input type="checkbox"/> Adjust formula if delay between time of injury & presentation <input type="checkbox"/> Insert urinary catheter and titrate fluids to urine output: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Adults: 0.5 – 1ml/kg/hr <input checked="" type="checkbox"/> Children <30kgs: 1ml/kg/hr <input checked="" type="checkbox"/> Electrical: 1-2ml/kg/hr <input type="checkbox"/> Maintain accurate fluid balance chart 	
OTHER 	<ul style="list-style-type: none"> <input type="checkbox"/> Discuss with local Burn Service: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Tetanus status <input checked="" type="checkbox"/> Nasogastric tube <input checked="" type="checkbox"/> Antibiotics (routine prophylaxis not required) <input checked="" type="checkbox"/> Nil by mouth <input checked="" type="checkbox"/> Safeguarding concerns 	
REFER 	<ul style="list-style-type: none"> <input type="checkbox"/> Complete LSEBN Burns Transfer Information and send via TRIPS/fax to local Burn Service <input type="checkbox"/> LSEBN guideline documents are available via TRIPS Help & Information on www.trips.nhs.uk <input type="checkbox"/> Refer patient by calling the local Burn Service <input type="checkbox"/> Make transfer arrangements. Keep warm. Sit head up. <input type="checkbox"/> Telephone support and advice on care of any patient with a burn injury is available at all times 	

Adapted with permission from the Victorian Burn Service and Trauma Victoria

Approved by LSEBN CGG on December 2015

Children's Acute Transport Service provides paediatric intensive care retrieval for Great Ormond Street, The Royal Brompton and St Mary's NHS Trusts. Funded and accountable to the North Thames Paediatric Intensive Care Commissioning Group through Great Ormond Street NHS Trust.

