

INTRODUCTION

Burns arise in a number of accident situations, and may have a variety of accompanying injuries or pre-existing medical problems associated with the burn injury. Scalds, flame or thermal burns, chemical and electrical burns will all produce a different burn pattern, and inhalation of smoke or toxic chemicals from the fire may cause serious accompanying complications.

A number of burn cases will also be seriously injured following falls from a height in fires, or injuries sustained as a result of road traffic collision where a vehicle ignites after an accident.

Explosions will often induce flash burns, and other serious injuries due to the effect of the blast wave or flying debris.

Inhalation of superheated smoke, steam or gases in a fire, will induce major airway swelling and respiratory obstruction. This is especially important in children, where inhalation of steam, even from a kettle has been known to cause rapid fatal airway obstruction.

Preceding long term illness, especially chronic bronchitis and emphysema, will seriously worsen the outcome from airway burns.

Remember that a burn injury may be preceded by a medical condition causing a collapse (e.g. elderly patient with a stroke collapsing against a radiator).

Burns can be very painful and treatment of pain is important (*refer to pain management guideline*).

ASSESSMENT

Ensure safety of yourself the patient and the scene.

Stop the burning process

Assess and correct deficits with:

- **AIRWAY**
- **BREATHING**
- **CIRCULATION**
- **DISABILITY** (mini neurological examination)

Specifically assess:

- assess airway for signs of burns which include:
 - **soot** in the nasal and mouth cavities
 - **cough** and hoarseness
 - coughing up **blackened** sputum

- **difficulty** with breathing and swallowing
- **blistering** around the mouth and tongue
- **scorched** hair, eyebrows or facial hair.
- assess breathing for rate, depth and any breathing difficulty.
- evaluate whether patient has any **TIME CRITICAL features**. These may include:
 - any major ABCD problems
 - any signs of airway burns, soot or oedema around the mouth and nose
 - history of hot air or gas inhalation; these patients may initially appear well but can deteriorate very rapidly
 - any evidence of circumferential (completely encircling) burns of the chest, neck, limb
 - any significant facial burns
 - burns >25% body surface area (BSA) in adults
 - presence of other major injuries.
- if any of these features are present, **IF POSSIBLE CORRECT A AND B PROBLEMS then initiate TRANSFER to nearest suitable receiving hospital with a Hospital Alert Message.**
- any patient who has a high risk history or is starting to develop respiratory problems should be immediately transported to hospital as they can deteriorate very rapidly and need complex airway intervention.

Assessment of burn severity using a method with which you are familiar.¹

- Wallace's Rule of Nines or the Lund and Browder chart
- Half burnt/half not burnt approach to give burn area of:
 - >50%
 - 25-50%
 - 12.5-25%
 - <12.5%.

Use all of the burn area, including reddening, do not try to differentiate between levels of burn (first, second, third degree etc).

Only a rough estimate is required, an accurate measure is not possible in the early stages.

En-route continue patient **MANAGEMENT** (see *below*).

If patient is non-time critical, perform a more thorough patient assessment with a brief secondary survey.

It is **IMPORTANT** to **document the TIME the burn occurred**, as is the time and volume of **ALL** infusions, as all subsequent fluid therapy is calculated from the time of the burn onwards.

In **ELECTRICAL** burns it is important to search for **entry and exit sites**. Assess ECG rhythm. The extent of burn damage in electrical burns is often impossible to assess fully at the time of injury.

In **SCALDS**, the **skin contact time and temperature** of the burning fluid determines the depth of the burn. Scalds with boiling water are frequently of extremely short duration as the water flows off the skin rapidly. Record the type of clothing, e.g. wool retains the hot water. Those resulting from hot fat and other liquids that remain on the skin may cause significantly deeper and more serious burns. Also the **time to cold water and removal of clothing** is of significant impact and should be included in pre-arrival advice from Control.

In **CHEMICAL** burns, it is vital to note the **nature of the chemical**. Alkalis in particular may cause deep, penetrating burns, sometimes with little initial discomfort. Certain chemicals such as phenol or hydrofluoric acid can cause poisoning by absorption through the skin and therefore must be irrigated with **COPIOUS**² amounts of water.

CIRCUMFERENTIAL (Encircling completely a limb or digit) full thickness burns, may be "limb threatening", and require early in hospital incision/release of the burn area along the length of the burnt area of the limb (escharotomy).

HISTORY

What happened? When did it happen?

What temperature (e.g. boiling water, hot fat etc.) were they exposed to and for how long? What first aid was undertaken?

Were any other injuries sustained?

Are any circumstances present that increase the risk of airway burns (confined space, prolonged exposure)?

Any evidence of co-existing or precipitating medical conditions.

MANAGEMENT

Follow Trauma Emergencies Guideline, remembering to:

- ensure **ABC's** and immobilise C-spine if any potential for neck trauma.
- intubate/assist ventilation if airway obstructed or ventilation is impaired.
- administer high concentration oxygen (O₂) via a non-rebreathing mask, using the stoma in laryngectomy and other neck breathing patients, whatever the SpO₂, as readings may be false due to carboxyhaemoglobin.

Specifically consider:

- if the patient is wheezing as a result of smoke inhalation, nebulisation with salbutamol and an O₂ flow of at least 6-8 litres per minute will frequently improve symptoms (**refer to the drug protocols for dosages and information**). It is important, wherever possible, to obtain a peak flow reading both before and after nebulisation, to assess and record its effect.
- after initial irrigation with water, cut off burning, or smouldering clothing, providing it is not adhering to the skin.
- cover the burn area with cling film, wrapping may have a constricting effect so smaller pieces are better than a circumferential sheet. Cling film provides a good dressing through which a burn can be reviewed. Infection is directly related to the number of times a burn is dressed and then uncovered to be assessed by another person.
- continue to irrigate over the cling film or gel based dressing whilst ensuring the rest of the patient is warmly wrapped. Be aware of the potential for hypothermia induced by continual irrigation. It is rare to need more than 10 minutes irrigation except for chemicals that adhere to the skin (e.g. phosphorus).
- gel based dressings should be considered only in minor (<12.5% BSA) burns due to the potential for hypothermia.
- **in alkali burns**, irrigate with water en-route to hospital, as it may take hours of irrigation to neutralise the alkali. This also applies to eyes that require copious and continual irrigation with water or saline.
- **chemical** burns should **NOT** be wrapped in cling-film but covered with wet dressings (**refer to CBRN guideline**).

- if either the burn area is >25% BSA, or the circulation is compromised by accompanying injuries, or IV analgesia may be required, then obtain IV access and commence slow infusion of crystalloid IV **EN-ROUTE TO HOSPITAL**. (see **additional information**).
- provide analgesia as required e.g. morphine if the pain is severe (**refer to the morphine drug protocol for dosages and information**). Cooling and application of dressings frequently eases pain, but care must be taken not to “over-cool” the patient as hypothermia is a risk. This is a particular risk in children. Entonox (**refer to the entonox drug protocol for administration and information**) is not appropriate in burns if > 50% O₂ is required.
- paracetamol suspension may be useful in small children with scalds (**refer to the paracetamol drug protocol for dosages and information**).

With burn cases, in addition to the usual clinical report details transmitted via radio, the following information should be transmitted:

- **extent** of burn area
- **time** of burn
- **burning agent**
- any indication of airway burns
- any evidence of burns involving the entire or majority of the circumference of the chest, neck or a limb.

ADDITIONAL INFORMATION

In some areas with specialist burns units direct admission guidelines may be in place.

Fluid Therapy

If an area of greater than 25% of the body is affected and the time from injury to hospital is likely to be in excess of an hour then fluid therapy should commence as below.

- Secure IV access in an un-burnt limb en-route to hospital, with largest bore IV cannula possible. Avoid areas where a burned area lies above the IV site, as when the burnt tissue swells, the veins will be compressed and the IV will cease to function.
- Where IV access is particularly difficult, leave this until the patient reaches hospital **DO NOT delay to obtain IV access**.

- Crystalloid should be used in the following initial doses over the first 30 minutes from time of injury:

Age	Volume
Adult	1000 ml
5-11 years	500 ml
<5 years	10 ml/kg

If the burn is complicated by other traumatic injury then standard fluid therapy should take precedence.

Non-Accidental Injury

You must always be mindful of the possibility of non-accidental injury. Ensure all documentation is comprehensive and, where possible, retain samples of clothing etc for the hospital. The role of the Ambulance Service is to report the **possibility** of non-accidental injury to the appropriate agencies, not to confirm that it has taken place (**refer to child protection guideline**).

Key Points – Burns

- Airway status can deteriorate rapidly and may need complex interventions available at the emergency departments.
- Stopping the burning process is essential.
- The time from burning is an essential piece of information.
- Consider transport to regional burns centres as local policy / protocol dictates.
- Pain relief is important.

REFERENCES

- ¹ Collis N, Smith G, Fenton OM. Accuracy of burn size estimation and subsequent fluid resuscitation prior to arrival at the Yorkshire Regional Burns Unit: a three year retrospective study. *Burns* 1999;25(4):345-51.
- ² Cooke MW, Ferner RE. Chemical burns causing systemic toxicity. *Arch Emerg Med* 1993;10(4):368-71.

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METHODOLOGY

Refer to methodology section.