

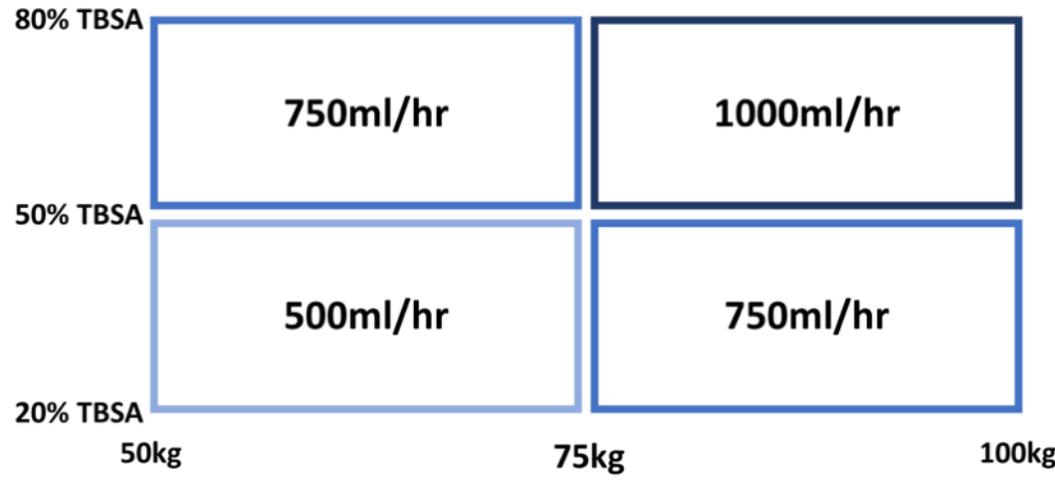
CG032 Burns (Adults and Children)

1. Key Recommendations for operational use		
1	Immediate management	<ul style="list-style-type: none"> • Ensure scene safety. • Obtain a detailed, accurate burn history. • Remove jewellery or clothing from burned area unless already adhered. • For thermal burns: <ul style="list-style-type: none"> - cool with water irrigation for 20 minutes (if <3 hours post injury). - apply cling film dressings longitudinally, never apply circumferentially. • For chemical burns: <ul style="list-style-type: none"> - ensure appropriate PPE - confirm with SFRS/SORT. - remove contaminated clothing and brush off any powdered material before irrigation. - irrigate with high volume water irrigation for 20 minutes regardless of time since injury. - apply cool, wet gauze. - do not apply cling film. • For hydrofluoric acid burns: <ul style="list-style-type: none"> - ensure appropriate PPE - nitrile gloves provide limited protection: <ul style="list-style-type: none"> • avoid direct contact until after irrigation. • use double gloves. • change gloves immediately after each patient contact. - irrigate with high volume water irrigation for 1 minute before applying calcium gluconate gel. - do not use topical calcium chloride. - if calcium gluconate gel is unavailable then continue irrigation. • For tar/Bitumen burns: <ul style="list-style-type: none"> - cool with water irrigation for at least 20 minutes until the tar is hard and cool. - leave tar in place for removal in theatre.
2	Airway	<ul style="list-style-type: none"> • Assess for airway burns OR inhalation injury: <ul style="list-style-type: none"> - perioral / nasal stigmata, altered voice, stridor, hypersalivation, mucosal ulceration. • Consider intubation if: <ul style="list-style-type: none"> - upper airway patency is threatened or can be anticipated. - gas exchange / lung mechanics are inadequate. - airway compromise is evident due to altered mental status. - air or prolonged road transfer is indicated. • Use an uncut endotracheal tube. • Plan for surgical airway in case intubation fails: <ul style="list-style-type: none"> - pre-mark anatomical landmarks. - use a longitudinal incision. • Insert NG/OG tube in intubated patients.

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3	Breathing	<ul style="list-style-type: none"> • Consider: <ul style="list-style-type: none"> - smoke inhalation (circumstances; nasal / pharyngeal soot). - CO poisoning (oximetry unreliable). - cyanide toxicity. - respiratory distress may be caused by non-burn trauma or a pre-existing medical condition. • Apply oxygen as required and titrate to SpO₂. <ul style="list-style-type: none"> - if CO poisoning is suspected, apply high flow oxygen irrespective of SpO₂. 	
4	Circulation	<ul style="list-style-type: none"> • Early shock is unlikely to be due to burns - actively exclude other causes. • Establish IO access after two failed attempts at IV. • Start crystalloid fluid resuscitation (Section 9 and 10). • If feasible, insert a urinary catheter and start to record hourly urine output. 	
5	Disability	<ul style="list-style-type: none"> • Consider a cardiac / neurological / diabetic / drug / self-inflicted / non-accidental injury event as a precipitant cause. • Patients with an altered mental state after a burn injury should be assumed to have CO poisoning until proven otherwise. • Provide analgesia: titrate opioids as needed. 	
6	Exposure	<ul style="list-style-type: none"> • Assess for other injuries. • Assess for ocular / periorbital burns: <ul style="list-style-type: none"> - remove contact lenses if present. • Measure core temperature. • Prevent hypothermia: <ul style="list-style-type: none"> - start active warming as feasible. 	
7	Depth of burn	<ul style="list-style-type: none"> • Most burns are a mixture of different depths. • A burn is dynamic and its depth will change depending on the effectiveness of first aid and resuscitation. 	
		<p style="text-align: center;">Superficial</p>	<ul style="list-style-type: none"> • erythema, rapid capillary refill; appears as 'sunburn', no blisters. • do not include in the %Total Body Surface Area (TBSA) calculation.
		<p style="text-align: center;">Partial thickness</p>	<ul style="list-style-type: none"> • superficial-partial thickness burns present with pain +/- blisters, some capillary refill present, sensate, moist, hairs intact. • deep-partial thickness burns present as mottled/white, absent capillary refill, dry and with reduced sensation or insensate.
		<p style="text-align: center;">Full thickness</p>	<ul style="list-style-type: none"> • insensate, fixed staining / charring, leathery, hairs fall out

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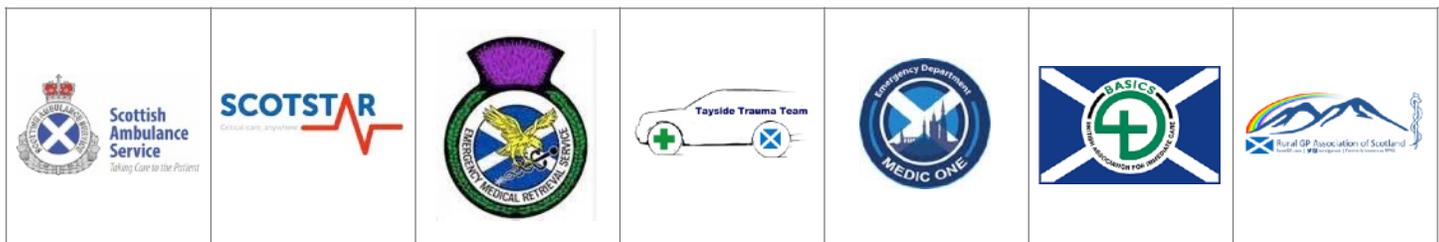
8	Estimation of burn area	<ul style="list-style-type: none"> Estimate burn area using Lund and Browder chart (Appendix 1) or electronic equivalent (e.g. Mersey Burns app) tailored to patient age. Consider only partial and full thickness burns in %TBSA calculation. Record the time, estimate (and methodology used).
9	Pre-hospital fluid therapy	<ul style="list-style-type: none"> For adults in the pre-hospital setting, consider using the ‘threshold method’:  <ul style="list-style-type: none"> Do not use “threshold method” in children. Instead refer to Fluid therapy (Section 10).
10	Fluid therapy	<ul style="list-style-type: none"> In adults: <ul style="list-style-type: none"> consider using the ‘threshold method’ in pre-hospital settings (Section 9). start fluid replacement with burns >15% TBSA. 24hr replacement volume = 3ml x % area burned x actual body weight (kg). In children: <ul style="list-style-type: none"> start fluid replacement with burns >10% TBSA. 24hr replacement volume = 2ml x % area burned x actual body weight (kg). Use Hartmann’s solution or Plasma-lyte148. Administer half over the first 8 hours post burn, the remaining half over next 16 hours. Titrate rate to standard markers of volume status: <ul style="list-style-type: none"> aim for a urine output of 0.5 to 1.0 ml/kg/hour (use ideal body weight). consider pulse pressure variation in ventilated patients. The formula is a guide only; the initial %TBSA is likely to be inaccurate and higher volumes may be required if: <ul style="list-style-type: none"> large areas of full thickness burns. high voltage electrical injury. smoke inhalation injury. pre-standing dehydration (e.g. alcohol toxicity). additional traumatic injuries. Give maintenance fluids in addition for all children < 30kg.

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11	Dressings for transfer	<ul style="list-style-type: none"> • Cover all burned areas with cling film +/- non-adherent dressing to prevent infection and allow for ease of assessment. • Apply cling film to limbs longitudinally rather than circumferentially. • Then wrap patient in sterile/clean sheets/covers to prevent heat loss. • If transfer is delayed for any reason or journey will be longer than 6 hours, contact Burns Centre for advice on dressings. • Do not apply Silver Sulfadiazine 1% cream (Flamazine) as it will mask the burn injury and make it difficult to assess. • Cover irrigated and fully decontaminated chemical injuries with a wet compress. • Children should have cold soaks removed prior to lengthy inter-hospital transfer due to risk of hypothermia.
12	Triage	<ul style="list-style-type: none"> • Triage using Burns Triage Guide in appendix 2. • Ideally, use COBIS Referral Form for secondary retrievals.
13	Escharotomies	<ul style="list-style-type: none"> • An escharotomy is rarely required until several hours after burn resuscitation commences and so pre-hospital escharotomy is unlikely to be needed. • Consider chest +/- neck escharotomy if there is circumferential or near-circumferential thoracoabdominal eschar with impending or established respiratory compromise which cannot be managed with mechanical ventilation (See appendix 3). <ul style="list-style-type: none"> - make incisions through burnt tissue only – do not incise underlying fascia. - prepare for extensive haemorrhage. - make initial longitudinal incisions through anterior axillary lines. - if required join these with transverse incisions through the subcostal and infraclavicular margins. • Do not perform pre-hospital limb escharotomy: <ul style="list-style-type: none"> - seek advice from Burns Centre if transfer is delayed or prolonged.

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2. Document History			
Reference Number	CG032		
Version	1		
Writing group (Lead author in bold)	Alastair Baird	Consultant	EMRS West
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Distribution	BASICS Scotland		✓
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		EMRS North	✓
		EMRS West	✓
		Neonatal	X
		Paediatric	✓
Tayside Trauma Team		✓	



3. Scope and purpose

- Overall objectives:

The aim of this guideline is to ensure appropriate treatment and triage of major burns patients.

- Statement of intent:

This guideline is not intended to be construed or to serve as a standard of care. Adherence to guideline recommendations will not ensure a successful outcome in every case, nor should they be construed as including all proper methods of care or excluding other acceptable methods of care aimed at the same results. The ultimate judgement must be made by the appropriate healthcare professional(s) responsible for clinical decisions regarding a particular clinical procedure or treatment plan. Clinicians using this guideline should work within their skill sets and usual scope of practice.

- Feedback:

Comments on this guideline can be sent to: sas.cpg@nhs.scot

- Equality Impact Assessment:

Applied to the ScotSTAR Clinical Standards group processes.

- Guideline process endorsed by the Scottish Trauma Network Prehospital, Transfer and Retrieval group.



4. Explanatory Statements		
4.1 General immediate management	Authors' recommendation	Level [Reference]
<ul style="list-style-type: none"> • <i>Ensure scene safety.</i> <p>Scene safety is of paramount importance and instruction should be sought from Fire and Rescue services.</p>	Strong	Guidelines [1,2,3]
<ul style="list-style-type: none"> • <i>Obtain a detailed, accurate burn history.</i> <p>Circumstances around the injury can be very important to the initial and ongoing care of the patient. Every attempt should be made to obtain as much information from the patient possible prior to intubation.</p>	Strong	Guidelines [1,2]
<ul style="list-style-type: none"> • <i>Remove jewellery or clothing from burned area unless already adhered.</i> • <i>For thermal burns:</i> <ul style="list-style-type: none"> - <i>cool with water irrigation for 20 minutes (if <3 hours post injury).</i> - <i>apply cling film dressings longitudinally, never apply circumferentially.</i> • <i>For chemical burns:</i> <ul style="list-style-type: none"> - <i>ensure appropriate PPE - confirm with SFRS/SORT.</i> - <i>remove contaminated clothing and brush off any powdered material before irrigation.</i> - <i>irrigate with high volume water irrigation for 20 minutes regardless of time since injury.</i> - <i>apply cool, wet gauze.</i> - <i>do not apply cling film.</i> <p>Cool water irrigation for 20 minutes has been demonstrated to be the most effective method of burn cooling and has beneficial effects on burn healing outcomes. Immediate irrigation of chemical burns has been shown to lead to a five-fold decrease in full thickness severity and halves hospital stay.</p> <p>Reducing airflow over the burn will reduce pain and wound contamination. Cling film is non-adherent. If unavailable, use a sterile, clean dressing. There is no robust evidence to support the use of water-based gel dressings.</p>	Strong	Guidelines [1,2,4]

<ul style="list-style-type: none"> • <i>For hydrofluoric acid burns:</i> <ul style="list-style-type: none"> - <i>ensure appropriate PPE - nitrile gloves provide limited protection:</i> <ul style="list-style-type: none"> • <i>avoid direct contact until after irrigation.</i> • <i>use double gloves.</i> • <i>change gloves immediately after each patient contact.</i> - <i>irrigate with high volume water irrigation for 1 minute before applying calcium gluconate gel.</i> - <i>do not use topical calcium chloride.</i> - <i>if calcium gluconate gel is unavailable then continue irrigation.</i> <p>Nitrile gloves provide limited protection from concentrated HFA therefore avoid direct contact with affected parts until irrigation completed, unless appropriate PPE is available from SORT/SFRS. Fluoride in hydrofluoric acid aggressively sequesters calcium causing direct tissue damage and systemic hypocalcaemia. Irrigate the wound to remove residual substance for a maximum of 1 minute before massaging calcium gluconate gel into the affected area. Continue application until at least 15 minutes after pain subsides.</p>	Strong	Guidelines [5]
<ul style="list-style-type: none"> • <i>For tar/Bitumen burns:</i> <ul style="list-style-type: none"> - <i>cool with water irrigation for at least 20 minutes until the tar is hard and cool.</i> - <i>leave tar in place for removal in theatre.</i> <p>Once cooled, tar forms a relatively impermeable protective dressing. It can be softened with topical agents in hospital or removed in theatre.</p>	Strong	Guidelines [1,6]
4.2 Airway		
<ul style="list-style-type: none"> • <i>Assess for airway burns OR inhalation injury:</i> <ul style="list-style-type: none"> - <i>perioral / nasal stigmata, altered voice, stridor, hypersalivation, mucosal ulceration.</i> • <i>Consider intubation if:</i> <ul style="list-style-type: none"> - <i>upper airway patency is threatened or can be anticipated.</i> - <i>gas exchange / lung mechanics are inadequate.</i> - <i>airway compromise is evident due to altered mental status.</i> - <i>air or prolonged road transfer is indicated.</i> 	Strong	Guideline [1,2,3,4,7]
<ul style="list-style-type: none"> • <i>Use an uncut ETT for intubation.</i> • <i>Plan for surgical airway in case intubation fails:</i> <ul style="list-style-type: none"> - <i>pre-mark anatomical landmarks</i> - <i>use a longitudinal incision</i> <p>An uncut ETT will reduce the risk of extubation if facial swelling occurs. Use a longitudinal skin incision to expose the anatomy followed by a transverse incision into the cricothyroid membrane if there is tissue oedema or burnt skin over the area.</p>	Strong	Guidelines [3,4]
<ul style="list-style-type: none"> • <i>Insert NG/OG tube in intubated patients.</i> <p>A NG/OG tube will relieve gastric distention and aid ventilation.</p>	Strong	Guidelines [1,7]

4.3 Breathing	Authors' recommendation	Level [Reference]
<ul style="list-style-type: none"> • <i>Consider:</i> <ul style="list-style-type: none"> - <i>smoke inhalation (circumstances; nasal / pharyngeal soot).</i> - <i>CO poisoning (oximetry unreliable).</i> - <i>cyanide toxicity.</i> - <i>respiratory distress may be caused by non-burn trauma or a pre-existing medical condition.</i> <p>The combination of significant skin burns in conjunction with inhalation injury increases risk of mortality above that predicted on the basis of age and burn size. CO/cyanide toxicity often complicate the early clinical course of patients with inhalation injury. Fluid resuscitation can exacerbate upper airway oedema, leading to respiratory distress and asphyxia.</p>	Strong	Guidelines [1,2,3,4,7]
<ul style="list-style-type: none"> • <i>Apply Oxygen as required and titrate to SpO₂.</i> <ul style="list-style-type: none"> - <i>if CO poisoning is suspected apply high flow oxygen irrespective of SpO₂.</i> 	Strong	[4,8]
4.4 Circulation		
<ul style="list-style-type: none"> • <i>Early shock is unlikely to be due to burns - actively exclude other causes.</i> <p>Associated trauma may also cause internal bleeding, resulting in tachycardia and hypotension. Severe burns cause a systemic inflammatory response throughout the body causing a systemic capillary leak, intravascular fluid loss, and large fluid shifts. These responses occur mostly over the first 24 hours, peaking at six to eight hours after injury.</p>	Strong	Guidelines [1,7]
<ul style="list-style-type: none"> • <i>Establish IO access after two failed attempts at IV.</i> • <i>Start crystalloid fluid resuscitation (Section 9 and 10).</i> 	GPP	
<ul style="list-style-type: none"> • <i>If feasible, insert a urinary catheter and start to record hourly urine output.</i> <p>To monitor fluid balance and assess for over or under resuscitation.</p>	GPP	Guidelines [9,10]
4.5 Disability		
<ul style="list-style-type: none"> • <i>Consider a cardiac / neurological / diabetic / drug / self-inflicted / non-accidental injury event as a precipitant cause.</i> • <i>Patients with an altered mental state after a burn injury should be assumed to have CO poisoning until proven otherwise.</i> <p>Typically, the patient with burns is initially alert and orientated.</p>	Strong	Guideline [1]
<ul style="list-style-type: none"> • <i>Provide analgesia: titrate opioids as needed.</i> <p>Analgesia requirements will vary by patients and by depth and area of burn injury. Inhalational and intranasal analgesia may be appropriate if intravascular access is challenging or delayed. (See CG021 Intranasal Fentanyl.)</p>	Strong	Guidelines [2,4]

4.6 Exposure	Authors' recommendation	Level [Reference]
<ul style="list-style-type: none"> Assess for other injuries. <p>The burn is often the most obvious injury but other serious/life threatening injuries may be present.</p>	Strong	Guidelines [1,4]
<ul style="list-style-type: none"> Assess for ocular / periorbital burns: <ul style="list-style-type: none"> remove contact lenses if present. 	Strong	Guidelines [1,4]
<ul style="list-style-type: none"> Measure core temperature. <p>Hypothermia in burns patients has been shown to be independently associated with mortality.</p>	Strong	Guidelines [1,4]
<ul style="list-style-type: none"> Prevent hypothermia prevention: <ul style="list-style-type: none"> start active warming as feasible. 	GPP	
4.7 Depth of burn		
<ul style="list-style-type: none"> Most burns are a mixture of different depths. A burn is dynamic and its depth will change depending on the effectiveness of first aid and resuscitation. 	Information	[1]
4.8 Estimation of burn area		
<ul style="list-style-type: none"> Estimate burn area using Lund and Browder chart (Appendix 1) or electronic equivalent (e.g. Mersey Burns app) tailored to patient age. Consider only partial and full thickness burns in %TBSA calculation. Record the time, estimate (and methodology used). 	Strong	Guidelines [3,4,11]
4.9 Pre-hospital fluid therapy		
<ul style="list-style-type: none"> For adults in the pre-hospital setting, consider using the 'threshold method': <p>The threshold method fluid grid is a simplified fluid calculator for adult burn patients based on estimated %TBSA, age and estimated weight brackets only. It is only suitable for the first four hours of fluid resuscitation. Patients will usually be commenced on the Parkland Formula once in hospital.</p> <ul style="list-style-type: none"> Do not use threshold method in children. Instead refer to Fluid therapy (Section 10). <p>The "Threshold Method" is not appropriate for children due to wide variations in patient size.</p>	Conditional	4 [12]

4.10 Fluid therapy	Authors' recommendation	Level [Reference]
<ul style="list-style-type: none"> • In adults: <ul style="list-style-type: none"> - consider using the 'threshold method' in pre-hospital settings (Section 9). - start fluid replacement with burns >15% TBSA. - 24hr replacement volume = 3ml x % area burned x actual body weight (kg). • In children: <ul style="list-style-type: none"> - start fluid replacement with burns >10% TBSA. - 24hr replacement volume = 2ml x % area burned x actual body weight (kg). • Use Hartmann's solution or Plasma-lyte148. • Administer half over the first 8 hours post burn, the remaining half over next 16 hours. • Titrate rate to standard markers of volume status: <ul style="list-style-type: none"> - aim for a urine output of 0.5 to 1.0 ml/kg/hour (use ideal body weight). - consider pulse pressure variation in ventilated patients. • The formula is a guide only; the initial %TBSA is likely to be inaccurate and higher volumes may be required if: <ul style="list-style-type: none"> - large areas of full thickness burns. - high voltage electrical injury. - smoke inhalation injury. - pre-standing dehydration (e.g. alcohol toxicity). - additional traumatic injuries. • Give maintenance fluids in addition for all children < 30kg. <p>The British Burns Association have recently adjusted the familiar Parkland and Modified Parkland formulae to reduce the risk of over-resuscitation with its associated morbidity. This applies to both adults and children.</p>	Strong	Guideline [1,9,10,13]
<h3>4.11 Dressings for transfer</h3>		
<ul style="list-style-type: none"> • Cover all burned areas with cling film +/- non-adherent dressing to prevent infection and allow for ease of assessment. • Apply cling film to limbs longitudinally rather than circumferentially. • Then wrap patient in sterile/clean sheets/covers to prevent heat loss. • If transfer is delayed for any reason or journey will be longer than 6 hours, contact Burns Centre for advice on dressings. • Do not apply Silver Sulfadiazine 1% cream (Flamazine) as it will mask the burn injury and make it difficult to assess. • Cover irrigated and fully decontaminated chemical injuries with a wet compress. • Children should have cold soaks removed prior to lengthy inter-hospital transfer due to risk of hypothermia. 	Strong	Guidelines [1,2,4,13]

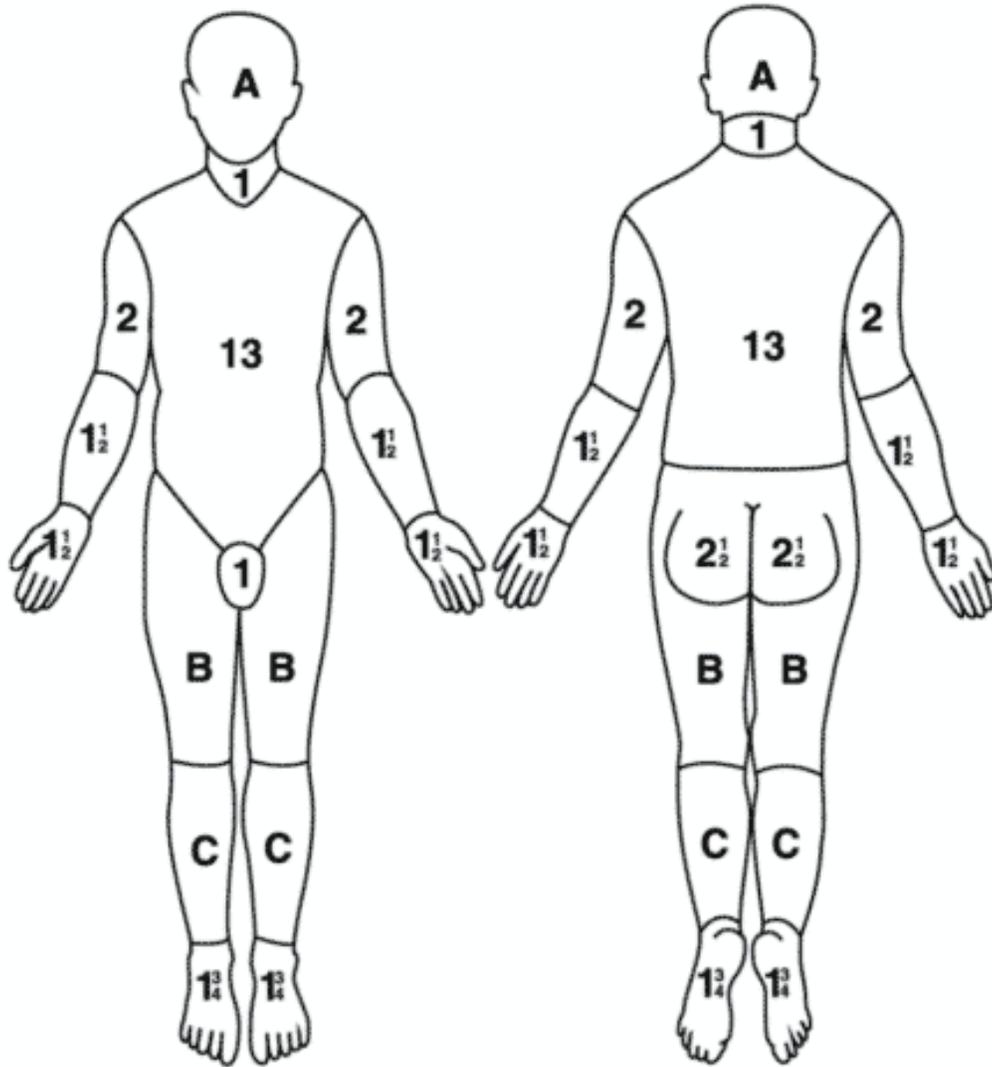
4.12 Triage	Authors' recommendation	Level [Reference]
<ul style="list-style-type: none"> • <i>Triage using Burns Triage Guide in appendix 2.</i> • <i>Use COBIS Referral Form for secondary retrievals.</i> <p>Whilst transfer to the Burns Centre for serious burns is recommended, this needs to be balanced against the risks of prolonged transfer, including hypothermia. Discussion with the Burns Centre is recommended if there are significant logistical issues.</p>	GPP	
<h3>4.13 Escharotomies</h3>		
<ul style="list-style-type: none"> • <i>Rarely required until several hours after burn resuscitation commences and so pre-hospital escharotomy is unlikely to be needed.</i> • <i>Consider chest +/- neck escharotomy if there is circumferential or near-circumferential thoracoabdominal eschar with impending or established respiratory compromise which cannot be managed with mechanical ventilation. (See appendix 3).</i> <ul style="list-style-type: none"> - <i>make incisions through burnt tissue only – do not incise underlying fascia.</i> - <i>prepare for extensive haemorrhage.</i> - <i>make longitudinal incisions through anterior axillary lines.</i> - <i>if required join these with transverse incisions through the subcostal and infraclavicular margins.</i> • <i>Do not perform pre-hospital limb escharotomy:</i> <ul style="list-style-type: none"> - <i>seek advice from Burns Centre if transfer is delayed or prolonged.</i> <p>A circumferential deep dermal or full thickness burn is inelastic and will not stretch. Following fluid resuscitation tissues will swell and reduce elasticity further. Ideally escharotomy should be performed in a sterile environment with diathermy available due to the risk of infection and haemorrhage.</p>	Strong	Guidelines [1,4,15]

5. References

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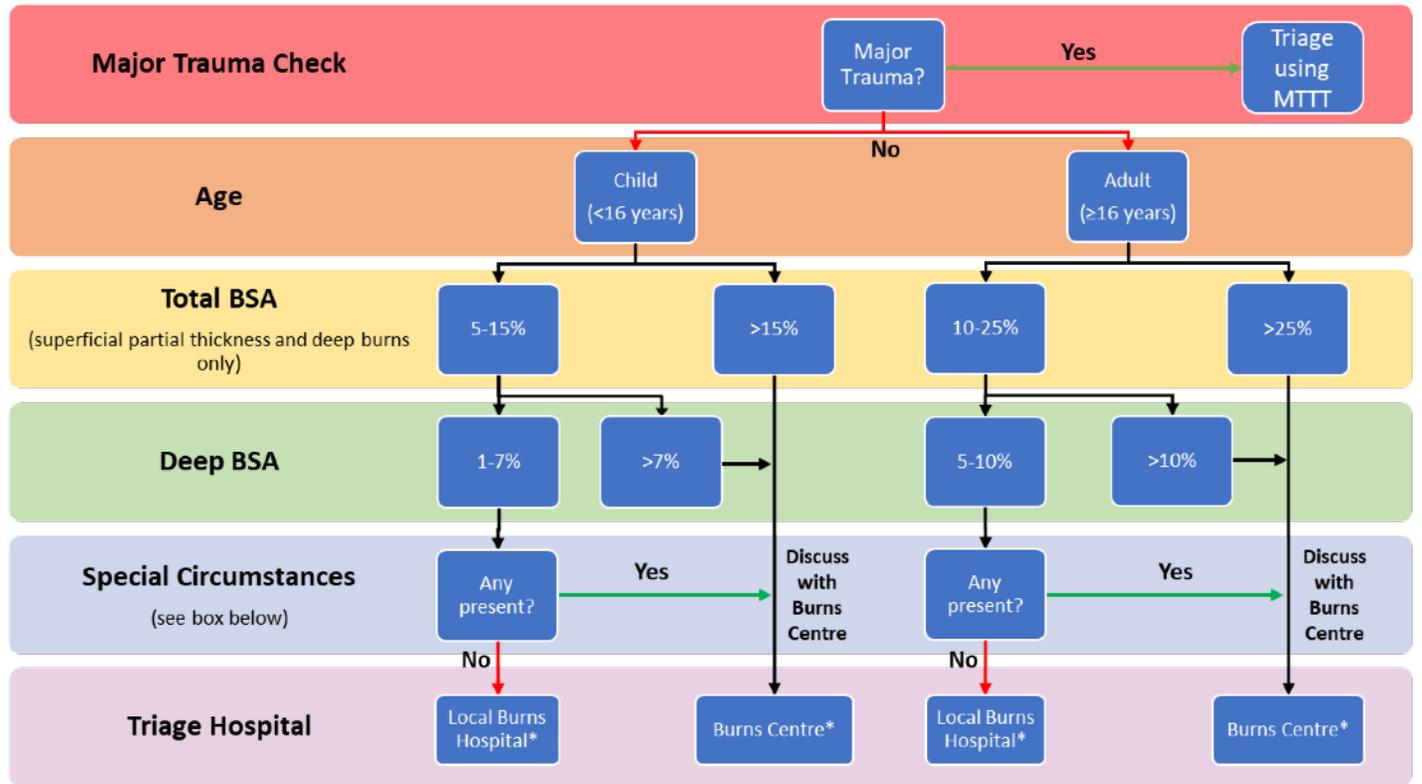
Appendix 1: Lund and Browder Chart



Age	0	1	5	10	15	Adult
Front or back half	%	%	%	%	%	%
A - Head	9.5	8.5	6.5	5.5	4.5	3.5
B - one thigh	2.75	3.25	4	4.25	4.5	4.75
C - one leg	2.5	2.5	2.75	3	3.25	3.5

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Appendix 2: Burns Triage Guide



Primary Retrievals			Secondary Retrievals	
Age	Burns Centre	Local Burns Hospital	<16 years	≥16 years
<16 years	RHC-Glasgow ED – 0141 452055 Plastics via switchboard – 0141 2010000	RHCYP-Edinburgh ED – 0131 5620207 Royal Aberdeen Children's Hospital ED – 01224 559999 Ninewells Hospital Dundee ED – 01382 423091	Conference call through ScotSTAR 03333 990222: • Paediatric retrieval team • RHC-G SPOC • RHC-G plastics consultant • +/- PICU consultant E-mail COBIS referral form to ggc.burnshubreferral@ggc.scot.nhs.uk	Conference call through ScotSTAR 03333 990249: • EMRS • GRI plastics consultant • GRI ICU consultant E-mail COBIS referral form to ggc.burnshubreferral@ggc.scot.nhs.uk
≥16 years	Glasgow Royal Infirmary ED – 0141 2114090 Plastics via switchboard - 0141 2114000	St John's Hospital Livingston ED – 0150 6523011 Aberdeen Royal Infirmary ED – 01224 559999 Ninewells Hospital Dundee ED – 01382 423091		

***If significant logistical issues preclude timely transfer (<1hr) to a Burns Hospital or potentially unsurvivable burns, discuss with Burns Centre and consider initial transfer to next most appropriate ED.**

Special Circumstances

Special Groups:

- Infants
- Pregnancy
- Elderly w/TBSA >10%
- Multi-morbid w/TBSA >10%
- Need for critical care
- NAI (all age groups)

Special Mechanisms:

- Chemical burns >5%
- HF acid burns >1%
- Cold injury
- High voltage (>1000v)
- High pressure steam
- Ionising radiation

Special Areas:

- Airway or inhalational
- Deep circumferential
- Deep to face, feet, hands, perineum or genitalia