North Bristol Intensive Care Unit

North Bristol NHS Trust

BURN PROTOCOLS
Fluid Resuscitation & Haemodynamic Monitoring
(For patients with >15% TBSA burns)

PHASE 1 (TIME of INJURY – 8 HOURS)

Use Modified Parkland Formula
(1.5 ml/kg/%TBSA)
Divide calculated figure by 8 for hourly infusion requirement in first 8 hours (taking into account fluid resuscitation prior to arrival)
Add maintenance requirement (1 ml/kg/hr) until feeding established

Measure urine output hourly

Urine output < 40 ml	Urine output 40 – 60 ml	Urine output 60 – 150 ml	Urine output > 150 ml
Increase infusion rate by 10% (or 100 ml/hr)	Stay at current infusion rate	Decrease infusion rate by 10% (or 100 ml/hr)	Decrease infusion rate by 20% (or 200 ml/hr)

Measure urine output hourly

If urine output adequate (40-60 ml/hr) Progress to Phase 2 at 8 hour point

If urine output < 30 ml/hr for 2 hours despite increase in fluid Progress to Albumin Rescue

PHASE 2 (8 – 24 HOURS)

Use Modified Parkland Formula
(1.5 ml/kg/%TBSA)
Divide calculated figure by 16 for hourly infusion requirement over next 16 hours
Add maintenance requirement (1 ml/kg/hr) until feeding established

Measure urine output hourly

Urine output < 40 ml	Urine output 40 – 60 ml	Urine output 60 – 150 ml	Urine output > 150 ml
Increase infusion rate by 10% (or 100 ml/hr)	Stay at current infusion rate	Decrease infusion rate by 10% (or 100 ml/hr)	Decrease infusion rate by 20% (or 200 ml/hr)

Measure urine output hourly

If urine output adequate (40-60 ml/hr) Continue

If urine output < 30 ml/hr for 2 hours despite increase in fluid Progress to Albumin Rescue

These guidelines offer pathways to attempt to achieve a reasonable urine output during shock burn resuscitation. They only suggest actions to be taken and should be used in conjunction with good clinical judgment

Hartmann's Solution is the resuscitation fluid of choice

Arterial lines should be considered in all patients with > 15% TBSA burns

Urine output:
In the average adult patient aiming for a urine output of 0.5 ml/kg/hr

Consider 0.25 – 0.5 ml/kg/hr if > 65 yrs

Situations in which predicted fluid resuscitation may need to be increased:

1. Delayed admission
2. Rhabdomyolysis/Myoglobinuria
3. Electrical burns
4. Inhalational injury (see inhalational protocol)
5. Associated trauma including crush injury
6. Malnutrition
7. Liver disease

Situations in which predicted fluid resuscitation may need to be decreased:

1. Morbid obesity
2. Patient drinking freely
3. If predicted 24hr total fluid resuscitation at 8 hr point is > 5 ml/kg/%TBSA (or >16 l) consider:
   a). Early consultant review
   b). Earlier use of **Albumin Rescue**
   c). Insertion of PiCCO

Lactate > 4 mmol/l:

1. Consider need for early **Albumin Rescue**
2. Rule out other injuries
3. Rule out Abdominal Compartment Syndrome
4. Consider cyanide or carbon monoxide poisoning

Use of blood products:

There is no indication for the use of blood products unless the patient is coagulopathic or bleeding

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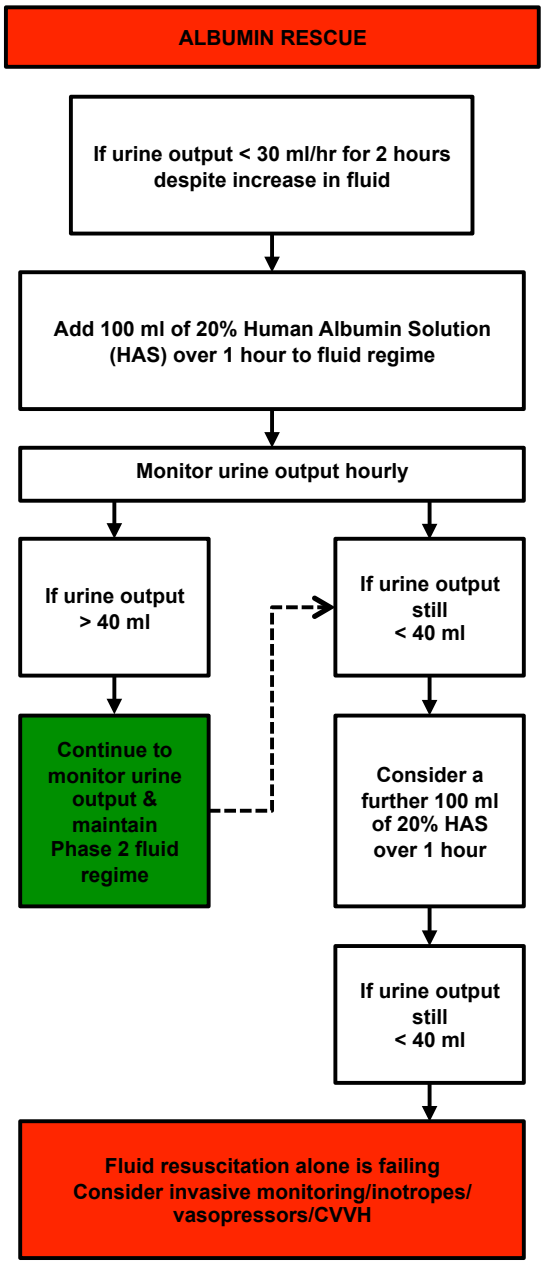

Invasive monitoring (PiCCO):

Invasive monitoring should be considered in all patients where Albumin Rescue is failing to produce an adequate urine output

Additionally it should be considered earlier in:

1.Patients with cardiovascular co-morbidities
2.Patients with known renal impairment
3.Where fluid management is anticipated to be difficult:
a). Underlying burn pathology (e.g. electrical or inhalational injury)
b). Other associated injuries (e.g. trauma)

Pulse Pressure Variation (PPV) via arterial line

Aim for PPV < 12%

PiCCO insertion for detailed studies

Aim Stroke Volume Variation (SVV) < 12%
Aim Cardiac index (CI) > 3-4 l/min/m^2

Caveats:
1. Potential for false negative PPV & SVV if tidal volume < 8ml/kg
2. PPV & SVV targets should only be used to guide resuscitation when urine output is low

If PPV or SVV < 12% or CI < 3-4 l/min/m^2 consider:

1. Albumin Rescue if not already initiated
2. Start Noradrenaline infusion
3. Consider Dobutamine infusion
4. Echocardiogram
5. Consideration of haemofiltration

Haemofiltration:

If oliguria continues despite fluid and haemodynamic optimisation with Albumin Rescue, vasopressors +/- inotropes then a direct cytotoxic renal insult needs to be considered

If this is suspected haemofiltration (CVVH) needs to be initiated as soon as possible

If at any point fluid resuscitation is proving ineffective or there are any ongoing concerns, early burns and intensive care consultant input is mandatory.