Hypotension 2009-11

HYPOTENSION

Hypovolaemia is an uncommon cause of hypotension in the preterm newborn. Excessive volume expansion can increase mortality

DEFINITION

Thresholds for intervention
- Aim to maintain mean arterial BP > gestational age in weeks
- If mean BP unavailable or pulse pressure wide (e.g. PDA), aim to maintain systolic BP > gestational age in weeks in first 24 hr, and > 30 mmHg thereafter
- Aim for even higher mean arterial blood pressure in case of persistent pulmonary hypertension of newborn (see PPHN guideline)

RECOGNITION AND ASSESSMENT

Assessment of BP
- Measure mean arterial pressure (MAP):
  - by direct intra-arterial BP [umbilical arterial catheter (see Umbilical artery catheterisation guideline) or peripheral arterial line if trace satisfactory]
  - automated oscillometry (Dinamap) has limited accuracy in hypotensive preterm neonates; usually over-reads BP in the lower ranges
- Assess as many of the following indices of tissue perfusion as possible (thresholds for abnormality in brackets):
  - toe-core temperature difference (> 2°C)
  - urine output (< 1 mL/kg/hr)
  - blood lactate (> 2.5 mmol/L)

Causes of hypotension or poor perfusion
- Cardiac dysfunction or hypovolaemia owing to:
  - extreme immaturity
  - hypoxia
  - pneumothorax
  - hypothermia
  - morphine analgesia
  - bleeding
  - polyuria secondary to glucosuria
  - Sepsis

IMMEDIATE TREATMENT

Aim of treatment is to improve organ perfusion, not to correct a ‘BP reading’
Seek senior advice throughout

Transilluminate chest to exclude pneumothorax

Fluid
- Not more than 10 mL/kg unless there is evidence of fluid/blood loss and hypovolaemia
- If clinical condition poor, BP very low, or mother has been treated with IV antihypertensive agent, give inotrope (see below) after fluid bolus

Which fluid?
- Use sodium chloride 0.9% 10 mL/kg over 30 min EXCEPT when there is:
  - coagulopathy with bruising: give fresh frozen plasma 10 mL/kg over 30 min (see Coagulopathy guideline)
  - Acute blood loss: give packed cells 10 mL/kg over 30 min

Reassess clinically within 30 min of each bolus
If hypotension persists after fluid bolus, seek senior advice
- start inotropes

**Inotropes**
- If evidence of poor perfusion, give **dobutamine** as initial agent commencing at 10 microgram/kg/min. If no response after 20 min, increase to 15 microgram/kg/min

| Always use dobutamine as first inotrope for pulmonary hypertension |

- Dobutamine will have now improved organ perfusion, but if mean BP remains low, commence dopamine at 3 microgram/kg/min, increasing by 5 microgram/kg/min increments in 30 min intervals to a maximum of 20 microgram/kg/min
- where possible, perform echocardiogram to assess response to dopamine at doses >10 microgram/kg/min
- If hypotensive but peripheral perfusion good or bounding, as in sepsis, consider dopamine as initial inotrope after fluid bolus, as this will cause vasoconstriction that will help alleviate poor vascular tone seen with sepsis

**How**
- Dopamine must be given centrally because:
  - can cause tissue injury if given into liver or extravasation injury if given peripherally
  - Dobutamine can be given peripherally

- If hypotension persists despite these measures:
  - give hydrocortisone 1 mg/kg IV followed by 1 mg/kg IV 8-12 hrly for 2-3 days as necessary
  - seek senior advice throughout

**Refractive hypotension**

| Seek senior advice before starting adrenaline infusion. Depending on individual circumstances, discuss alternative agents (e.g. noradrenaline, vasopressin) |

If acidic with severe hypotension, but not hypovolaemic
- Give adrenaline 100-300 nanogram/kg/min (see Neonatal Formulary for instructions on making up solution)
- Monitor limb perfusion and urine output

**MONITORING**
- If pneumothorax suspected, transilluminate
- Chest X-ray:
  - if intubated
  - urgent, if respiratory status worsening
  - look for air leak or overinflation
- Blood gases
- Check effective delivery of drugs:
  - record volume in syringe hrly
  - check for leaks
  - ensure correct position of UVC delivering inotropes

**SUBSEQUENT MANAGEMENT**
- If being given morphine, reduce dose if possible
- If ventilated, try to reduce mean airway pressure without compromising chest inflation and oxygenation
- If poor response to above measures:
  - echocardiogram to assess for myocardial dysfunction/congenital heart disease
Weaning inotropes

- Wean dopamine or dobutamine in 5 microgram/kg/min decrements as tolerated and directed by senior advice