Worcestershire Acute Hospitals NHS Trust

Heart failure and weak pulses

Key Document code:	WAHT-TP-095	
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Approved by:	Paediatric Quality Improvement meeting	
Date of Approval:	26th March 2021	
Date of review: This is the most current document and should be used until a revised version is in place	26th March 2024	

The following guidance is taken from the Partners In Paediatrics (PIP)

HEART FAILURE AND WEAK PULSES

CAUSES

- Congenital heart malformations
  - aortic stenosis
  - coarctation of the aorta
  - hypoplastic left heart
- Cardiomyopathies
- Pericardial effusion
- Myocarditis
- Arrhythmias
- Hypoxia
- Hypovolaemia
- Acidosis
- Toxins

RECOGNITION AND ASSESSMENT

Presentation

- Usually during first few weeks of life
- Later triggered by an intercurrent infection, with associated myocarditis or prolonged arrhythmia

Symptoms and signs

- Failure to thrive
- Rapid weight gain
- Sweating
- Breathlessness, particularly during feeding
- Tachypnoea
- Tachycardia
- Absent or low volume peripheral or central pulses
- Enlarged heart
- Prominent cardiac impulses
- Quiet heart sounds in pericardial effusion
- Thrill
- Gallop rhythm
- Enlarged liver

Recognition of cardiogenic shock

- For definition of shock see **Sepsis (including meningococcal)** guideline
- Cardiogenic shock should be considered:
  - when septic shock fails to improve after adequate fluid replacement (e.g. ≥40 mL/kg)
  - with a known heart condition
  - in the presence of a large heart on CXR
  - shock, with a history of poisoning
  - when there is a murmur/pulmonary oedema, or both

INVESTIGATIONS

- Check BP in upper and lower limbs (normal <15 mmHg difference)

SpO_2

- Check pre (right arm) and postductal (lower limbs)
- In air and after giving oxygen

Chest X-ray

- For cardiac conditions, specifically record:
  - cardiac situs (normal or right side of chest)
  - aortic arch left- or right-sided
  - bronchial situs (is right main bronchus on the right?)
  - cardiac size and configuration
  - size of pulmonary vessels and pulmonary vascular markings

Electrocardiogram

- See **ECG interpretation** guideline

Echocardiogram

- Locally, if available, or refer to local paediatric cardiac centre

MONITORING

- ECG monitor
- Non-invasive BP
- Pulse oximetry
- Core-skin temperature difference
- Daily weights
- Urine output (≥1 mL/kg/hr)
- If shocked or ≥40 mL/kg fluid resuscitation:
  - intra-arterial BP monitoring
  - CVP

THERAPEUTIC MEASURES

In all children with heart failure

1. If breathless, elevate head and trunk
2. If infant not feeding well, give nasogastric feeds
3. In moderate-to-severe failure or if patient hypoxic or distressed, prescribe oxygen therapy via nasal cannulae (maximum 2 L/min) or face mask with reservoir bag (maximum 15 L/min) aiming for SpO_2 94–98%
4. Diuretics: furosemide 1 mg/kg oral or by slow IV injection over 5–10 min and amiloride 100 microgram/kg (maximum 10 mg) both 12-hrly
5. If on IV furosemide check potassium 12-hrly; repeat 4–6 hrly if outside normal range. If serum potassium <4.5 mmol/L, give additional potassium chloride 0.5 mmol/kg 12-hrly enterally
6. Correct acidosis, hypoglycaemia and electrolyte imbalance
7. Relieve pain with morphine: loading dose 100 microgram/kg IV over 5 min (aged >1 month), followed by 50 microgram/kg IV 4–6 hrly over 5 min or 10 microgram/kg/hr via IV infusion (doses can be doubled if necessary)
8. If anaemic (Hb <100 g/L), correct with infusion of packed cells over 3–4 hr to bring Hb to 120–140 g/L

If cardiogenic shock present

1. Monitor CVP and ensure adequate pre-load: give human albumin solution (HAS) 4.5% 10 mL/kg as IV bolus or, if HAS not available, sodium chloride 0.9% 10 mL/kg as IV bolus
2. If shock severe, see **Sepsis (including meningococcal)** guideline, start mechanical ventilation with positive end-expiratory pressure early; if pulmonary oedema present, start urgently
3. If shock severe, give early inotropic drug support: dopamine, dobutamine, adrenaline or noradrenaline as per NNU/PICU protocols

DUCT-DEPENDENT CONGENITAL HEART DISEASE

- May present in first 2 weeks of life

Duct-dependent systemic circulation

- Breathless, grey, collapsed, poor pulses
  - severe coarctation of the aorta
  - critical aortic stenosis
  - hypoplastic left heart syndrome

Duct-dependent pulmonary circulation

- Blue, breathless or shocked
- pulmonary atresia
- critical pulmonary valve stenosis
- tricuspid atresia
- severe Fallot's tetralogy
- transposition of the great arteries

Treatment

- See **Cyanotic congenital heart disease** guideline