Evelina London

NHS
Guy's and St Thomas'
NHS Foundation Trust

Clinical Guidance

Paediatric Critical Care: Neonatal Collapse

Summary

This guideline is for staff to use when treating the collapsed neonate- a neonate who is shocked or requiring respiratory support. It discusses assessment, resuscitation, investigations and advice when managing sepsis, cardiac, metabolic and neonates involved in trauma.

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Relevant external law, regulation, standards	
This clinical guideline has been produced by the South Thames Retrieval Service (STRS) at Evelina London for nurses, doctors and ambulance staff to refer to in the emergency care of critically ill children. This guideline represents the views of STRS and was produced after careful consideration of available evidence in conjunction with clinical expertise and experience. The guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient.	

Change History		
Date	Change details, since approval	Approved by
03/2021	Formatting, addition of hyperlinks, added balanced crystalloid as resus fluid, adrenaline as first line inotrope in line with national resus guidance.	ELCGC May 2021

Paediatric Critical Care: Neonatal Collapse

South Thames RETRIEVAL SERVICE

REMEMBER
- Non-specific presentation, multiple potential underlying causes
- **Main groups: sepsis, cardiac, metabolic disorder, trauma/NAI**
- Sepsis & cardiac disease commonest causes (both present as shock)
- General supportive measures improve outcome

INTERVENTIONS
1) Presume sepsis → **Early antibiotics**
2) CVS & respiratory collapse → **Early ventilatory support**
3) Think cardiac lesion → **Early "prostin" (dinoprostone)**
4) Don't ever forget glucose

Initial Evaluation & Resuscitation

Tachycardia/ poor perfusion & pulses/ hypotension/ obtunded = **SHOCK**
Also: apnoea, hypoglycaemia, hypothermia, irritability

Initial resuscitation:
- High flow oxygen & consider early intubation/ ventilation
- IV access: IO if >2 attempts
- Push 10mL/kg IV 0.9% sodium chloride or balanced crystalloid

- If fluid responsive, but still shock – repeat fluid bolus up to 40ml/kg
- If still shocked after 40ml/kg fluid boluses, consider inotropes

Cautious fluid resuscitation if any signs of heart failure (see right)

- Antibiotics: cefotaxime, amoxicillin, consider aciclovir

Consider duct dependent cardiac lesion

Immediate investigations
- Arterial/ venous gas, blood glucose, FBC, coagulation, U&Es, LFTs
- Ammonia, lactate, glucose – baseline metabolic tests
- Blood culture
- Ideally urine culture & CSF culture (*unless contra-indications to LP*)
- Chest x-ray
- ECG (if HR >220bpm, consider SVT – (STRS *Arrhythmias link*)

Fluid refractory shock = hypotension despite 40mL/kg fluid
- Continue fluid boluses if beneficial response with improving HR (monitor liver edge/ signs of cardiac failure)

Start adrenaline at 0.1micrograms/kg/minute initially
- if peripheral cannula-check working well & monitor: insert IO if concern

Re-assess heart rate, blood pressure, pulses:
- Poor pulses, cold, high lactate = **cold shock** →increase **adrenaline**
- Vasodilated, bounding pulses, wide pulse pressure = **warm shock** → **add noradrenaline**
- If adrenaline or noradrenaline >0.5micrograms/kg/minute or possible Addisonian crisis (low glucose, ↓Na^+, ↑K^+), consider IV hydrocortisone

Ventilation for shock:
Positive pressure supports the left ventricle
- PEEP via facemask also allows continuous assessment for apnoea
- Proceed to early intubation/ventilation
- Anticipate decompensation with induction- use ketamine, fentanyl, rocuronium (avoid propofol)

Glucose in neonates - neonates are susceptible to hypoglycaemia
- Monitor regularly & aim blood glucose 4-8 mmol/L
- Start 0.9% sodium chloride & 10% glucose 2mL/kg/h
- Calculate ***glucose delivery (mg/kg/minute) = glucose% x mLs/h / weight x 6***

DUCT DEPENDENT CONGENITAL HEART DISEASE[1]
- Cyanosis not responding to oxygen
- Poor or absent femoral pulses
- 4 limb BP or pre/ post ductal saturation differential
- +/- Heart murmur present, or cardiomegaly

Low threshold to start "Prostin" (dinoprostone):
- 5 nanograms/kg/min if clinically well
- 20 nanograms/kg/min if unstable or absent femoral pulses
- 50-100 nanograms/kg/minute if no response (consultant approval – discuss with STRS and cardiology)

Remember when using "Prostin" (dinoprostone):
- It can cause apnoeas
- Hypotension may occur with high doses
- Lack of response → urgent cardiology review essential

DO NOT DELAY TRANSFER

Intubate and ventilate if:
- Preductal sats < 70%
- Grunting / acidosis / poor pulses/ apnoea
- Transferring on "prostin" ≥15nanaograms/kg/minute[2]

Assessment of heart failure:
- Signs: gallop, cardiomegaly, hepatomegaly
- Potential diagnosis: CHD, cardiomyopathy, myocarditis
- Cautious fluid resus - stop if increasing liver size

Cardiac differential diagnoses

Coarctation Aorta
- Systolic arm >/- leg gradient >20mmHg, absent femoral pulses
- May need high dose "prostin" to open duct

Hypoplastic Left Heart Syndrome
- Poor pulses, may be pink (pulmonary overcirculation)
- Target sats 75-85%- titrate O_2-discuss with STRS

Transposition of the Great Arteries (TGA)
- Pre-ductal (R arm) saturations < post-ductal saturations
- +/- emergency atrial septostomy

TAPVD (obstructed)
- Shocked & cyanosed, plethoric CXR
- Echo & surgery, may deteriorate on "prostin"

SVT
- HR >220, unresponsive to fluid, narrow QRS
- See cardiac arrhythmia guideline

Myocarditis
- Cardiac failure, tachycardia, small QRS
- Ventilation/ inotropes, consider IVIG, send viral PCRs

Other differential diagnoses (non-cardiac)

Sepsis	**Group B strep, E.coli**	PROM, maternal GBS, fever in labour	IV cefotaxime & amoxicillin
	Herpes Simplex	↓GCS, coagulopathy, ↑ALT, herpes contact	Add IV aciclovir – low threshold to treat. History often absent.
	Pertussis	Apnoea, cough, or contact. ↑WCC (lymphocytosis)	See pertussis guideline. Add macrolide. 6 hourly FBC – may need exchange Tx
Metabolic	**Urea cycle defect**	↓GCS, seizures, ↑ammonia, alkalosis	Ammonia >150mmol/L. Repeat to confirm. Metabolic opinion.
	Organic acidaemia	Profound metabolic acidosis, ketone positive	Supportive (inotropes, ventilation). May co-present with sepsis
	Mitochondrial	↑lactate, seizures, cardiomyopathy	Supportive (inotropes, ventilation). May co-present with sepsis
Trauma	**Intracranial bleed**	Focal neuro signs, ↑ fontanelle, retinal bleeds	Head CT - ?neurosurgical problem/ NAI/?Vit K Deficient Bleeding (send extended coag screen)
	Intra-abdominal bleed	Unexplained anaemia, abdominal bruising/ distention, urethral meatus	Abdominal/ head CT- ?NAI, ?Vit K Deficient Bleeding (send extended coag screen)

Ref: 1. Penny DJ ADC 2001: 84 F141-145, 2. Cammo KA ADC 2007; 92 F117-119. Lillie, J. Challenging Concepts in Paediatric Critical Care. Oxford 2020. 10.1093/med/9780198794592.003.0002.