Regional guidance for the use of Dinoprostone in suspected duct dependent congenital heart conditions

Purpose: This guidance describes the management of babies with a suspected duct dependent congenital heart condition. Indications, doses, and the administration of Dinoprostone infusion are described. Details of side effects and monitoring are included.

Drug name: Prostaglandin E2 (Dinoprostone)

Prostaglandin E2 (Dinoprostone) is a potent vasodilator which is effective in maintaining the patency of the ductus arteriosus in duct dependent congenital heart conditions.

The common indications for starting Dinoprostone are:

Antenatally diagnosed left ventricular (LV) or right ventricular (RV) outflow tract obstruction or TGA

Suspected coactation of the aorta

High suspicion of CHD with poor pulses or significant cyanosis

Confirmed or suspected duct dependent congenital heart condition on echocardiogram

Dose ranges from 5 to 100 nanograms/kg/min. Higher doses >20ng/kg/min should be used on the advice of a paediatric cardiologist or cardiac intensivist.

Standard starting dose is 10 nanograms/kg/min, can be administered peripherally or centrally.

Prostaglandin E2 is associated with apnoea and can occur at any dose which requires close observation and may necessitate respiratory support.

Time Critical if saturations below 70% or no improvement in acidosis or lactate despite starting prostaglandin

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Patient management

- Manage as per newborn life support or advanced paediatric life support guideline for sick infant: follow airway, breathing and circulation protocol while managing sick infant.
- Do not forget common differential diagnosis like sepsis, respiratory and metabolic conditions. These conditions are far more common than duct-dependent CHD and can mimic similar clinical presentation.
- When hypovolaemia is suspected, consider small aliquots of fluid boluses (5–10 mL/kg) with review of effect in children with suspected congenital heart defects.
- Correcting severe acidosis may help in improving cardiac function.
- Monitor for commonly occurring side effects such as apnoea and be prepared to provide ventilatory support if needed although many babies respond to simple stimulation to counter effects.
- Paediatricians or neonatologists with cardiology expertise, where available, can help to establish a cardiac diagnosis, but this should not delay initiation of prostaglandin infusion where indicated clinically.
- All cases need to be discussed with the on-call paediatric cardiologist via the retrieval team referral telephone line to establish a conference call.

Contact **NNeTS for neonatal transfer (0191 230 3020), or NECTAR for paediatric transfer (0191 282 6699)**, a conference call will be arranged including the Paediatric Cardiologist on-call to allow for discussion of transport options and bed availability at an early stage.

Maintain regular communication via conference call with Cardiologist and retrieval team.

Patient monitoring

- Attach continuous ECG monitoring, including respiratory monitoring with apnoea alarm and record baseline observations on age-appropriate PEWS chart. Set appropriate alarms within documented clinically prescribed parameters.
- Monitor continuous pre and post ductal saturations (right hand and lower limb)
- Temperature along with all other observations should be recorded hourly.
- Observe for signs of cardiac failure as indicated by tachycardia, hypotension, pallor, skin mottling, increased capillary refill time and cool peripheries.

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- Blood gases should be performed and at intervals thereafter. **This should include blood glucose monitoring within one hour of commencing infusion. Both blood glucose and lactate can be measured on the gas machine.**
- Facilities for intubation and ventilation must be accessible and immediately available if required.
- Inform senior nursing leads and medical staff of any concerns or changes in condition.

Drug infusion preparation

1ml syringe	**500 ml bag of 5% glucose (10% Dextrose or 0.9%Saline also compatible)**
50ml syringe	**Infusion line**
Drug labels	**Filter needle**
Bag spike	**Dinoprostone ampule 0.75milligrams in 0.75ml vial (stored in the fridge)**

Ensure patient has working access and where possible two working points of vascular access. A prostaglandin infusion should always run on its own.

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Making up the infusion

Draw up 0.5mls of Dinoprostone (500 micrograms) via a filter needle into 1 ml syringe

Add 0.5ml of Dinoprostone to a 500ml of 5% glucose (10% glucose or 0.9% saline can be used) giving Dinoprostone concentration in the bag of 500micrograms in 500mls (1 microgram per ml = 1000 nanograms per ml)

Gently agitate the bag to evenly mix Dinoprostone throughout

Using a 50ml syringe withdraw 50mls from the bag and connect infusion giving set and label syringe

Discard remaining bag solution

Insert syringe into driver and calculate the mls/per hour as per prescription

Standard starting dose is 10nanograms/kg/min

The syringe contents expire every 24 hours.

Calculating the prescribed dose in ml per hour: worked example.

Patient weight is 2.8kg, dose prescribed is 10nanograms/kg/min

1. **Multiply the dose by the patient weight**
2. **Multiply by 60 (dose per hour)**
3. **Divide by 1000 (volume/hour)**

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Drug effects

In practice the major complication on starting therapy is apnoea requiring ventilator support. Patient monitoring is essential: minimum parameters **heart rate, blood pressure, saturations, respiratory rate and core temperature.**

The common side effects are **apnoea, hypotension, fever, tachycardia and looking flushed**. Other known side effects include hypothermia, cardiac arrest; bradycardia, convulsions, diarrhoea and disseminated intravascular coagulation.

Apnoea's are less likely to occur if dose is less than 15nanograms/kg/min and normally occurs within 1 hour of starting the infusion. Dinoprostone has a very short half-life, drug effect is 95% inactivated within 90 seconds of discontinuation of infusion. Check infusion cannula regularly for patency.

Desired response to commencing Dinoprostone within 20 minutes of commencing infusion: aim for palpable pulses, resolving acidosis and improving oxygen saturation. Suspicion of cyanotic congenital heart disease with restricted pulmonary blood flow aim for saturations 75-85%, can accept saturations 70% if lactate is maintained below 2mmol/litre on blood gas.

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Further important information

DO NOT DELAY IN STARTING Dinoprostone if there is clinical suspicion of duct dependent CHD while waiting for paediatric cardiology opinion or echocardiogram, even when in-house echo facilities are present.

Dinoprostone (prostin) infusion can be given via peripheral, central line, or IO if required.

DO NOT bolus the Dinoprostone infusion.

Infusion rates, particularly for small babies can be low. This may cause a delay between starting Dinoprostone and it reaching the patient. In these instances, giving Dinoprostone alongside a continuous maintenance dextrose infusion can improve flow rate and allow quicker recognition if the line tissues. Ensure pump pressures are checked hourly.

Other drugs such as antibiotics or fluid boluses need to be given through a separate line and a second line should be available so that Prostin infusion can be quickly switched if the first line fails.

Remember to prime the giving set to minimise delay in the Prostin infusion reaching the patient. Ideally the infusion should be connected via a Y connector close to the cannula with an anti-syphon valve to prevent backtracking up the line.

All cases suspected to have duct dependent congenital heart condition should be discussed with the on-call paediatric cardiologist at the first opportunity, but collapsed or sick infants will need immediate stabilisation, including starting Prostin infusion.

Ibuprofen should not be routinely used as this may counteract the effects of Prostin.

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References:

https://www.newcastle-hospitals.nhs.uk/content/uploads/2021/02/NECTAR_Neonatal_collapse_V1.0.pdf

https://bnfc.nice.org.uk/drugs/dinoprostone/

Singh Y, Mikrou P (2018) ***Use of prostaglandins in duct-dependent congenital heart conditions***. *Archives of Disease in Childhood - Education and Practice* **103:**137-140

https://www.sheffieldchildrens.nhs.uk/download/1018/circulation/26138/1-dinoprostone-regional-guideline.pdf

Clinibee – GSTT formulary – Dinoprostone monograph, accessed 14/12/23

Medusa – Dinoprostone monograph accessed 14/12/23

https://foi.avon.nhs.uk/Download.aspx?r=2&did=21048&f=Dinoprostone%20Prostaglandin%20E2-5_1.pdf

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Worked examples:

Baby is 2.8kg

Calculation is: 10 X 2.8 = 28 nanograms/kg

28 X 60 = 1680 ng/per hr

1680 / 1000 = 1.68 mls/hr

1.68 mls/hr = 10 ng/kg/min

Baby is 3.3kg

Calculation is: 10 X 3.3 = 33

33 X 60 = 1980

1980 / 1000 = 1.98 mls/hour

1.98 mls/hr = 10 ng/kg/min

Baby is 3.9kg

Calculation is: 10 X 3.9 = 39

39 X 60 = 2340

2340 / 1000 = 2.34 mls/hr

2.34 mls/hr = 10 ng/kg/min