FIRST HOUR OF CARE: QUICK REFERENCE MANUAL

East of England Neonatal ODN
(Hosted by Cambridge University Hospitals)

First Hour Fluid Management & Medications

East of England Neonatal Operational Delivery Network
Collaborative working to deliver high quality care to our babies and their families

First Hour Access:

Peripheral Venous Access: ***1st line access for most infants; allows administration of antibiotic infusions and maintenance fluids****

- Strong consideration for 1st line access even in infants requiring umbilical lines – risk of hypoglycaemia and delay in antibiotic administration if umbilical access attempts, and confirmation of line positions, are not timely.
- Ideal for bolus medications which do not require central access (Protecting sterility of central lines from multiple access)

Peripherally inserted central catheter line (PICC) / Silastic Long lines:

- **Not always first line within the first hour of care** – To be used in the event of contra-indication to umbilical access. Gastroschisis for example

Indications

- Major gastrointestinal problems and prolonged intolerance to enteral feeds
- Parenteral nutrition administration
- Where peripheral access is unsuccessful or to minimise multiple attempts
- Requirement for centrally administered drugs/infusions e.g. inotropes
- Long term drug administration
- Need for higher concentrations of glucose (>12.5%)

- Blood products should not be given via a long line due to the risk of occlusion

Line choice

- Babies <1kg in weight – 1Fr / Premicath
- Babies >1kg in weight – 2Fr

Measurement

Measure from the proposed insertion point

- To the sternal notch for lines inserted in the upper limbs
- To the xiphisternum for lines inserted in the lower limbs

Confirmation of line position

- The tip of upper limb PICCs should ideally lie in the superior vena cava, with the relevant arm positioned perpendicular to the chest wall when the check radiograph is taken. Tip must pass the shoulder joint
- For lower limb inserted PICCs, the tip should ideally be I the inferior vena cava above L4-L% level, and the possibility of malposition in an ascending lumbar vein requires specific consideration.

FHOC Reference: Clinical Guidelines: Insertion of a UVC & Insertion of a UAC

First Hour Access:

Central Access: *(Umbilical Lines should remain in situ only as long as clinical indications exist)*

Umbilical Venous Catheter (UVC)

Indications:

- Infants requiring, or likely to require, medications prohibited by peripheral access (e.g Inotropes, Hypertonic Solutions/High Strength Dextrose, Parenteral Nutrition)
- Emergency vascular access for resuscitation of infants at birth
- Exchange transfusion
- Low birth weight infants to avoid multiple peripheral cannulation

Contra-indications:

- Abdominal wall abnormality, necrotising enterocolitis, peritonitis

Complications:

- Sepsis, haemorrhage, embolism/thrombosis, pericardial effusion, pleural effusion, portal hypertension, ***Malpositioned catheter****
  - *Catheters placed in the **heart** can cause pericardial effusion, cardiac tamponade, endocarditis, arrhythmia, and death*
  - *Catheters placed in the **portal system** are associated with necrotising enterocolitis, colonic perforation & hepatic necrosis*
  - Catheters in a low position (pre-hepatic) may be at increased risk of hepatic necrosis and intra-abdominal extravasation

Length by formula (cm): [UAC length/2]+ 1 + stump length (cm)
OR*:* Directly measure length from cord base to xiphisternum and add on cord stump length

Position (MUST BE CONFIRMED BY XRAY):

- *The catheter should lie **outside the cardiac silhouette ideally at T8-T9***
- *A UVC tip sited at or below T10 should only be used on short term basis (if considered essential) due to a higher risk of extravasation*

- Run 0.9% saline 1ml/hr via UVC while awaiting confirmation of position on radiograph

Umbilical Arterial Catheter (UAC)

Indications:

- Frequent measurement of arterial blood gases or blood sampling
- Continuous monitoring of arterial blood pressure
- Resuscitation (though UVC is first choice)
- Exchange transfusion

Contra-indications:

- Abdominal wall abnormality, necrotising enterocolitis, peritonitis, evidence of lower limb or buttocks vascular compromise, IUGR with antenatal absent or reversed end diastolic flow - consider peripheral arterial line as first choice

Complications

- **Positional:** Perforation, misdirection, refractory hypoglycaemia (if UAC tip opposite coeliac axis & dextrose infusion is running)
- **Vascular Accident:** Abdominal aortic thrombosis leading to congestive heart failure, embolism, vasospasm, loss of extremity, air embolism
- **Equipment Related:** Breaks or knots in catheter
- **Other:** Sepsis, haemorrhage, necrotising enterocolitis, intestinal perforation, pericardial effusion, hypertension, arrhythmia

Length by formula (cm): [3 x weight (kg)] + 9 + stump length (cm)

Position (MUST BE CONFIRMED BY XRAY):

- ***High placement:*** *T6 - T10* | ***Low placement:*** *Below L3 (ideally L4 - L5)*
- *Catheter tips at T11 to L2 **must** be pulled to a low placement or removed*

- To help maintain catheter patency use heparanised saline solution (either 0.45% or 0.9% saline containing 1 unit heparin per ml). Infuse at a rate of 0.5-1ml/hour according to size of baby

First Hour Access:
Considering umbilical catheterisation as first line venous access:

Peripheral venous access can prove difficult during initial stabilisation of the preterm infant. Multiple cannulation attempts can have an impact on:

- Skin integrity – Umbilical access should be used as the primary form of venous access in extreme pre-terms. During early skin maturation, multiple attempts can affect skin integrity through iatrogenic injury, over handling, loss of humidification and loss of barrier function.
- Thermoregulation – Multiple cannulation attempts and handling increases the risk of hypothermia in the first hour of care.
- Vein preservation – Multiple failed attempts will impact on the viability of peripheral veins for subsequent access
- Pain/stressors – Peripheral cannulation increases pain scores and has been shown t be a stressor associated with impairment of neurodevelopment.
- Hypoglycaemia – In those neonates at risk, multiple failed attempts at cannulation will delay correction

Initial Umbilical venous catherisation over peripheral cannulation should be carried out in:

- **Extreme prematurity (<26/40)**
- **Birth weight <800g**
- **Emergency venous access is needed**

Consider prioritising the initial insertion of umbilical venous catheters in older babies:

- >3 failed attempts at peripheral cannulation
- Conditions known to compromise venous access eg Hypothermia, poor perfusion, hypotension, hypovolemia, sepsis and genetic syndromes after discussion with a Neonatal Consultant

First Hour Fluids:

First Hour Fluids – Suggested Starting Rates	
Preterm Infant <28 weeks gestation:	80 to 100 ml/kg/day
Preterm Infant 28+0 to 36+6 weeks gestation:	60 to 80 ml/kg/day
Term Infant ≥37 weeks gestation:	50 to 60 ml/kg/day
Severe Perinatal Hypoxic-Ischaemic Insult in a Term Infant:	30 to 40 ml/kg/day*

**These infants are at risk of significant fluid retention – 30ml/kg/day may be required if renal impairment is suspected. Frequent blood glucose monitoring is essential as higher strength dextrose solutions may be required to meet the infant's glucose requirement and prevent hypoglycaemia*

- Subsequent choice of IV fluid type, and volume, will be determined by the infant's renal profile, serum electrolyte profiles, fluid balance (including urine output) and weight change
- Extremely preterm neonates will require highly frequent electrolyte monitoring during stabilisation (~4 hourly) and may require rates far in excess of 100ml/kg/day, as guided by senior review, particularly if at the extreme of viability

- All infants with significant clinical indicators of sepsis, significant perinatal stress or those infants < 34 weeks gestation must have fluids started within the first hour
- Where TPN is not indicated, or cannot be started within the 1st hour, **10% Glucose Solution would be the first line solution** where IV fluids are required

Antibiotics & Suspected Sepsis:

When to give

- Make antibiotic management decisions based on risk factors and clinical indicators **(see tables 1 and 2 on page 41)**
- **In babies born after 34+0 weeks of pregnancy, consider using the Kaiser Sepsis Risk Calculator to guide management (see guideline)**
- **Manage as early onset neonatal sepsis** in babies with any red flags or with 2 or more 'non-red-flag' risk factors or clinical indicators.
  Administer antibiotics within 1 hour of decision to treat
  Do not wait for results before starting antibiotics
- In babies without red flags and only 1 risk factor or 1 clinical indicator use clinical judgement to decide whether it is safe to withhold antibiotics and whether they require a period of monitoring
- For babies without risk factors or clinical indicators of possible infection continue routine care

What to give

- See antibiotic table on page 42 for full details
- First line treatment for early onset sepsis will be **Benzyl Penicillin plus Gentamicin** in the majority of infants or refer to your local antibiotic guidance.

Investigations

- Blood culture and CRP ***before*** starting antibiotics
- Recheck CRP at **18**-24 hours following commencement of antibiotic treatment
- Other useful investigations include FBC and CXR (if respiratory pathology)
- In cases of suspected chorioamnionitis the placenta should be sent for histological examination and culture (see page 53)
- If there is strong clinical suspicion of meningitis or **positive blood culture (other than CONS)** and it is safe to do so – perform a lumbar puncture to obtain CSF

FHOC Reference: Clinical Guideline: East of England Neonatal Antibiotic Policy

TABLE 1: Risk factors for early-onset neonatal infection, including 'red flags'	
Red Flag	➢ Suspected or confirmed infection in another baby in the case of a multiple pregnancy
	➢ Invasive group B streptococcal infection in a previous baby or maternal group B streptococcal colonisation, bacteriuria or infection in the current pregnancy.
	➢ Pre-term birth following spontaneous labour before 37 weeks' gestation.
	➢ Confirmed rupture of membranes for more than 18 hours before a pre-term birth.
	➢ Confirmed prelabour rupture of membranes at term for more than 24 hours before the onset of labour.
	➢ Intrapartum fever higher than 38°C if there is suspected or confirmed bacterial infection.
	➢ Clinical diagnosis of chorioamnionitis

TABLE 2: Clinical indicators of possible early-onset neonatal infection (observations and events in the baby), including 'red flags'	
Red Flag	➢ Apnoea (temporary stopping of breathing)
Red Flag	➢ Seizures
Red Flag	➢ Need for cardiopulmonary resuscitation
Red Flag	➢ Need for mechanical ventilation
Red Flag	➢ Signs of shock
	➢ Altered behaviour or responsiveness
	➢ Altered muscle tone (for example, floppiness)
	➢ Feeding difficulties (for example, feed refusal)
	➢ Feed intolerance, including vomiting, excessive gastric aspirates and abdominal distension
	➢ Abnormal heart rate (bradycardia or tachycardia)
	➢ Signs of respiratory distress (including grunting, recession, tachypnoea)
	➢ Hypoxia (for example, central cyanosis or reduced oxygen saturation level)
	➢ Persistent pulmonary hypertension of newborns
	➢ Jaundice within 24 hours of birth
	➢ Signs of neonatal encephalopathy
	➢ Temperature abnormality (lower than 36°C or higher than 38°C) unexplained by environmental factors
	➢ Unexplained excessive bleeding, thrombocytopenia, or abnormal coagulation
	➢ Altered glucose homeostasis (hypoglycaemia or hyperglycaemia)
	➢ Metabolic acidosis (base deficit of 10mmol/litre or greater)

Antibiotics: Early Onset Sepsis – up to 72 hours of age

(See EoE Antibiotic Prescribing policy if suspected abdominal pathology)

Indication	Drug, dose and route	Dose interval	Notes
Early onset	**BENZYLPENICILLIN 25mg/kg IV**	**12 hourly up to 7 days** **or 8 hourly if very ill**	• Use intravenous Benzylpenicillin with gentamicin as the first-choice antibiotic regimen for empirical treatment of suspected infection unless microbiological surveillance data reveal local bacterial resistance patterns indicating a different antibiotic • Higher dose of Benzylpenicillin (50mg/kg) is recommended for babies who have suspected meningitis to achieve bactericidal concentration in the CSF • If the baby appears very ill consider shortening the dose interval to every 8 hours • If there is microbiological evidence of gram negative bacterial sepsis, add another antibiotic such as cefotaxime. If gram negative infection n is confirmed, stop benzylpenicillin • Care is needed with prescribing times and trough levels
	BENZYLPENICILLIN 50mg/kg IV** *****If meningitis is suspected*****		
	+ GENTAMICIN 5mg/kg IV *See EoE Gentamicin prescription chart for drug monitoring and dose interval instructions	**Up to 7 days 5mg/kg every 36 hours**	
Suspected CSF involvement	**AMOXICILLIN 100MG/KG and**	**12 hourly up to 7 days**	• Decision to be made by a senior clinician, especially if blood stained CSF. • If meningitis is suspected but the causative pathogen is unknown, treat with intravenous amoxicillin and cefotaxime. • If meningitis is caused by Gram negative infection, stop amoxicillin and treat with cefotxime alone • If GpB Strep is confirmed in CSF, then antibiotics should be changed to Benzylpenicillin, giving a dose of 50mg/kg and gentamicin 5mg/kg. Treatment using Benzylpenicillin should be continued for 14 days. Gentamicin to be given for 5 days. • f Listeria is in blood culture or CSF, treat with amoxicillin and gentamicin
	CEFOTAXIME 25mg/kg IV **BUT** **50mg/kg** **In severe infection**	**12 hourly up to 7 days**	
E-Coli infections **If no improvement after 48 hours.**	**CEFOTAXIME 25mg/kg IV** **BUT** **50mg/kg** **In severe infection**	**12 hourly up to 7 days**	

FHOC Reference: Clinical Guideline: East of England Neonatal Antibiotic Policy

Vitamin K & Caffeine Citrate:

VITAMIN K (PHYTOMENADIONE):

Indications:

- For prophylaxis against haemorrhagic disease of the newborn
  - Although a best interests argument can be made for most preterm and sick term infants, ideal practice would include antenatally advising parents regarding the need & use of vitamin K; public misconceptions persist

Dose:

- Vitamin K (Phytomenadione) 0.4mg/kg IM (up to maximum initial dose of 1mg IM) at birth

Notes (doses based on KONAKIAN PAEDIATRIC – see BNFc for other formulations)

If the first dose is given via the oral or intravenous routes;

- repeat an oral dose of 2mg at 4-7 days
- If solely breastfed and received initial oral doses – give a further oral dose of 2mg at 4 weeks

CAFFEINE CITRATE:

Indications:

- Apnoea of Prematurity
- Facilitate premature infants weaning off mechanical ventilation
- 'Prophylaxis' in premature infants at high risk of needing mechanical ventilation (e.g. infants <1.25 kg on non-invasive ventilation)
- Neuroprotection: Improves rate of survival without neurodevelopmental disability at 18 to 21 months (reduces incidence of cognitive delay & cerebral palsy) in infants of very low birth weight (<1.25kg in trials)
- Should be administered promptly for all eligible infants.

Dose:

- Prescribe as 'CAFFEINE CITRATE'
- May be given BY MOUTH or BY INTRAVENOUS INFUSION:
  - Loading Dose: 20mg/kg (Administer over 30 minutes if given by intravenous injection)
  - Daily Maintenance Dose: 5mg/kg (Started 24 hours after first dose)
  - Daily maintenance may be increased to maximum of 10mg/kg IF apnoeas persist