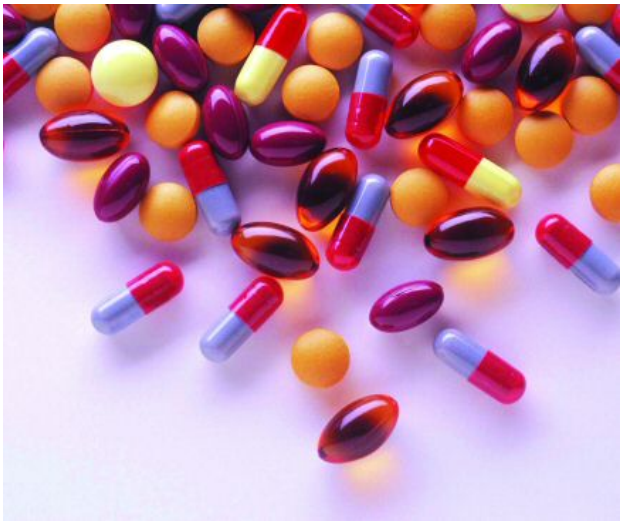
Birmingham Women's and Children's NHS Foundation Trust

The Formulary is designed to contain the most commonly used drugs on the NICU. There may be occasions when other drugs are recommended for use by specialists from other hospitals e.g. Birmingham Children's Hospital. On these occasions the indication for use and dose MUST be clearly documented in the case notes. Discuss with the pharmacist if necessary.

NICU FORMULARY

Jan 2022 Edition



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RESUSCITATION DRUGS

Adrenaline

(1:10 000 solution)

20 micrograms/kg (0.2ml/kg) IV

Sodium Bicarbonate

1 to 2 mmol/kg slow IV

(2 to 4 ml/kg of 4.2% sodium bicarbonate solution)

10 % Glucose

2.5ml/kg bolus IV

0.9% Sodium Chloride
(Only if known Hypovolaemia)

10ml/kg IV

Reference: UK Resuscitation Council, Resuscitation Guidelines 2021

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Click on the letter below to jump to the relevant page

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Version Date	Author	Description of Amendment
November 2010	Gemma Holder	
May 2011	Melanie Sutcliffe Diana Young Erika Setzu Amrat Mahal	
March 2013	Gemma Holder Louise Whitticase Diana Young Zahra Irshad	
September 2014	Gemma Holder Louise Whitticase Diana Young	
August 2015	Louise Whitticase Gemma Holder	
March 2016	Louise Whitticase Gemma Holder Amar Iqbal	
July 2017	Louise Whitticase Gemma Holder Sara Clarke	
October 2017	Alex Coles Gemma Holder	
December 2017	Louise Whitticase Gemma Holder	
January 2018	Louise Whitticase Gemma Holder	
February 2018	Louise Whitticase Gemma Holder	
April 2018	Louise Whitticase Gemma Holder	
May 2018	Louise Whitticase Gemma Holder	
August 2018	Louise Whitticase Gemma Holder	
October 2018	Louise Whitticase Gemma Holder	
June 2019	Louise Whitticase Gemma Holder	
July 2021	Louise Whitticase Gemma Holder	

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January 2022	Louise Whitticase Gemma Holder

Added September 2014	Glycerol suppositories	
	Glyceryl Trinitrate Ointment	
	Insulin (hyperkalaemia)	
	License status of medications	
Amended September 2014	Abidec®	Updated dosing for babies on Breast Milk Fortifier
	Adrenaline	Monitoring advice updated Compatibility data revised
	Ametop®	Maximum dose added
	Amoxicillin	Administration guidance updated Dosing in renal impairment added Incompatibility data added
	Benzylpenicillin	Dosing revised Administration guidance updated Caution regarding false positive urinary glucose if testing for reducing substances added
	Breast Milk Fortifier	Administration guidance updated Dose added for breast feeding
	Caffeine citrate	Incompatibility data added Information on prolonged therapy and CAP trial removed
	Calcium gluconate	Packaging advice updated: Should be packaged in a plastic amp. Repeated or prolonged administration using glass containers is contraindicated in children under 18 years owing to the risk of aluminium accumulation Dilution instructions revised Incompatibility data added Administration guidance updated Monitoring advice updated
	Calcium Sandoz®	Indication revised Reference to Alkaline Phosphatase removed
	Carobel	Not to be used in pre-terms Dosing revised Administration guidance updated
	Cefotaxime	Preparation revised to 500mg vials Dosing advise made clearer Interactions revised
	Ceftazidime	Incompatibility data added
	Ceftriaxone	Dilution instructions revised Contraindications updated Compatibility data revised Dosing in renal/hepatic impairment added
	Cefuroxime	Dilution instructions revised Incompatibility data added
	Chloral hydrate	Dosing in renal/hepatic impairment added Advice on use in pre-terms added
	Clonazepam	Product availability updated-Roche product discontinued in UK Dosing revised Dilution instructions revised Administration guidance updated Monitoring advice updated
	Curosurf®	Storage requirements added
	Dalivit®	Updated dosing for babies on Breast Milk Fortifier
	Dexamethasone	Dilution instructions revised Monitoring advice updated Interactions revised
	Digoxin	Incompatibility data added Therapeutic levels revised Dosing information on IV-> oral switch added
	Dobutamine	Compatibility data revised incompatibility data revised

	Domperidone	Dosing revised Contraindications added
	Dopamine	Compatibility data revised incompatibility data revised
	Erythromycin	Caution neonate under 2 weeks (risk of hypertrophic pyloric stenosis) added
	Eye drops	Single use minims advised
	Flucloxacillin	Dosing in hepatic impairment added Risk of kernicterus in jaundiced neonates when high doses given parenterally added
	Fluconazole	Dosing revised incompatibility data added
	Flumazenil	Maximum dose removed
	Furosemide	Indications revised Furosemide liquid (Frusol®) contains 10% v/v alcohol added
	Gentamicin	Dosing revised Therapeutic monitoring levels revised Increase dose interval on ibuprofen removed incompatibility data revised Interactions revised
	Glucose concentrated	20% preparation added
	Heparin	Dosing revised Dilution instructions revised Administration guidance updated Preparations updated
	Hyaluronidase	Phentolamine removed Use not advisable in extreme preterm infants added
	Hydrocortisone	incompatibility data added
	Ibuprofen (Pedea®)	Contraindications revised Compatibility data revised Reference to reducing fluid intake removed Increase dose interval if on gentamicin/ vancomycin removed
	Ibuprofen (Neoprofen®)	Contraindications revised Compatibility data revised
	Insulin (hyperglycaemia)	Indications revised Dilution instructions revised incompatibility data revised compatibility data revised
	Joulies phosphate	Indications revised Reference to Alkaline Phosphatase removed Dosing revised
	Lactulose	Monitoring advice updated
	Magnesium sulphate	Dosing revised incompatibility data revised Monitoring advice updated Preparations updated
	Meropenem	Dilution instructions revised incompatibility data added
	Metronidazole	Dosing revised incompatibility data added
	Morphine sulfate	Dosing revised Compatibility data revised incompatibility data added
	Naloxone	IV dosing reference revised
	Noradrenaline	incompatibility data revised
	Omeprazole	Preparations updated Administration guidance updated Compatibility data revised Dosing in hepatic impairment added
	Oramorph®	Indication revised
	Palivizumab®	Preparation instructions revised

	Paracetamol	Dosing updated 'There is some evidence that paracetamol may reduce the effectiveness of childhood vaccinations, therefore routine administration of paracetamol before and repeatedly after immunisation in the absence of symptoms is not indicated' added
	Parenteral nutrition	Statement on how to manage bigger babies requiring more than one lipid syringe/ day to meet their requirements added
	Phenobarbital	Dosing revised Administration guidance updated Compatibility data revised
	Phenytoin	Compatibility data revised incompatibility data revised therapeutic level revised
	Potassium Chloride	Worked calculation added incompatibility data added
	Prostin®	Compatibility data revised
	Ranitidine	Compatibility data revised incompatibility data added note Rosemont brand contains 8% w/v alcohol added
	Retinopathy of prematurity Screen	Updated page included
	Sodium bicarbonate	Dilution instructions revised incompatibility data revised
	Sodium chloride	Sodium content breast milk removed
	Sodium feredetate (Sytron®))	Dosing revised
	Special Feeds	Information on what stock items in Pharmacy and what needs to be ordered for individual babies added
	THAM	Concentration of preparation revised Dose calculation revised incompatibility data revised
	Ursodeoxycholic acid	Doses of vitamin D and E revised Concentration of preparations added
	Vancomycin	Dilution instructions revised Cautions updated incompatibility data revised
	Vitamin K (Phytomenadione)	Dosing updated Oral dose restriction added
	Zidovudine	Administration guidance updated
	Addendum 1- Summary Vitamin Requirements	Updated in line with individual pages Sytron® should be continued until 6-12 months of age (until tolerating balanced weaning diet) Abidec® should be continued until 1 year of age (N.B. DOH advice that all children <5 years old should receive multi vitamins containing vitamins A, D + E) added
	Addendum 2- Hyperkalaemia	Protocol completely revised
Deleted September 2014	Vitamin D	
Amended November 2014	Addendum 1- Summary of Vitamin requirements	Updated to reflect individual monographs
	Morphine sulphate	Label amended to reflect revised loading dose
Added November 2014	Lidocaine	
Amended January 2015	Benzylpenicillin	Dilution instructions revised
	Amoxicillin	Dilution instructions revised
Added July 2015	Baby Oscar study solution (Addendum 4)	
Amended Jan 2016	Abidec	Amended Healthy Start availability onsite Boots
	Adenosine	Infusion instructions amended
	Adrenaline	Comment regarding caution with dopamine added
	Ambisone	Preparation instructions altered
	Amoxicillin	MHRA alert added Preparation instructions altered
	Benzylpenicillin	Preparation instructions altered

		Dosing and frequency instructions clarifying when to administer higher dose clarified Specific prescribing times given
	Caffeine Citrate	New 'high dose' added
	Calcium Sandoz	Sandoz preparation no longer available
	Carobel	Indications for use clarified
	Cefotaxime	Now first line for gonococcal infection Specific prescribing times given
	Clonazepam	Dose frequency changed to 24 hrs rather than 40 – 60 hours
	Dalivit	Amended Healthy Start availability onsite Boots
	Dexamethasone	Organon brand details removed
	Dobutamine	Comment re caution with adrenaline added
	Domperidone	Change in license status noted Comment regarding performing ECG if cardiac concerns added
	Dopamine	Comment re caution with adrenaline added Incompatibility with lipid added
	Fluconazole	Delete use for prophylaxis
	Gaviscon	Administration instructions amended
	Gentamicin	Administration times added
	Heparin Sodium	Concentration for maintaining broviac line patency changed
	Insulin	Comment re using term units and not abbreviations added Timing of checking of blood sugar added
	Meropenem	Prescription times added
	Metronidazole	Prescription times added
	Nystatin	Added for fungal prophylaxis
	Palivizumab	Preparation instructions amended
	Paracetamol	Comment re administering before men B vaccine added
	Parenteral Nutrition	Indications for use added Amended starting lipid day 1
	Phenobarbital	Comment re using water for injection as diluent added
	Sodium Chloride	Comment re administering concentrated solution via central line added
	Special Feeds	Table updated
	Urso and fat soluble vits	Comment re starting in babies on lipid added
	Vaccinations	Updated
	Vancomycin	Instructions for changing bolus to infusion added
	Addendum 5-Coagulation Problems	Added
	Addendum 6 – Privigen Liquid	Added
	Addendum 7 - Short synacthen test	Added
	Addendum 8 – Intubation policy	Added
	Addendum 9-Palliative Care Medication	Added
Deleted Jan 2016	Ceftriaxone	
Added July 2017	Addendum 11: ENFit syringes	
	Addendum 12**:** Meticillin-Resistant Staphylococcus Aureus (MRSA) Decolonisation treatment	
	Drug allergy guidance	
	Drug administration and preparation	Changing IV infusions every 24 hours and guidance re multi-dose
	Human Milk Fortifier	Changed name from Breast Milk Fortifier Advice re part quantities and storage

		Use at >2kg revised Indications revised
	Furosemide	Continuous infusion added
	Isoprenaline hydrochloride	
	Morphine Sulfate Oral Solution	Changed name from Oramorph® 100microgram/ml preparation added
	Bevacizumab	
	Milrinone	
	Oral Glucose gel	
	Paracetamol	IV added
Deleted July 2017	Clonazepam	
	Breast Milk Fortifier	Renamed Human Milk Fortifier
	Domperidone	
	Oramorph	Changed name to Morphine Sulfate Oral Solution
	Dalivit	
Amended July 2017	How to dilute drugs for intravenous administration safely	
	Abidec	Amended inclusion of babies born at >34/40 who remain an inpatient at 4 weeks of age for duration of inpatient stay and healthy start vitamin advice on discharge Dose for combination feeding, high calorie formula and special feeds and those on liver vitamin regime Dose with HMF at >2kg revised
	Aciclovir	Changes added to preparation Advice and approval notes for VZIG amended
	Adenosine	Notes added to routes and monitoring
	Benzylpenicllin	Administration instructions revised
	Carobel	Gaviscon Infant warning added Note re concentrating further added
	Fentanyl	Order in CD requisition book Record administration and destruction in CD record book
	Fluconazole	Incompatibility updated
	Furosemide	Administration, route and monitoring revised
	Gaviscon Infant	Carobel warning added
	Gentamicin	Notes added re times levels processed
	Glucose solutions (concentrated)	Notes added about stickers for hypoglycaemia screen
	Glyceryl Trinitrate (GTN)	Patches added to preparation, administration, dosage
	Insulin	Instruction added to dosage re monitoring checks, incompatibility revised
	Joulies phosphate	Notes added re using with HMF/ preterm formula and PN
	Lactulose	Dose revised
	Meropenum	Criteria for use added
	Midazolam	Order in CD requisition book Record administration and destruction in CD record book
	Morphine sulfate	Record administration and destruction in CD record book
	Nystatin	License status updated, use after feeds
	Omeprazole	MHRA/CHM advice added
	Palivizumab	Preparation amended, note to prescriber and Bluetec note added
	Paracetamol	Note added to noting preparation strength when choosing dose
	Parenteral Nutrition	Formulations updated, guidelines amended in-line with network PN
	Phenobarbital Sodium	Notes re taking levels revised Record administration and destruction in CD record book
	Phenytoin	Notes added re using an in-line filter, signs of toxicity and antidote
	Potassium Chloride	Incompatibility updated

		Order in CD requisition book
	Rocuronium Bromide	Incompatibility notes added
	Sodium Bicarbonate	Changes made to indication for use, recommendations for infusion over 6-12 hours rather than bolus, cautions updated
	Sodium Feredetate	Dose for special formula added
	Special feeds	Supply route updated Indications revised Hydrolysed nutriprem added
	Ursodeoxycholic Acid and fat soluble vitamins	Doses revised, practical dosing guide for alfacalcidol added, Vitamin A preparation updated, guidance re abidec and PN added Monitoring information updated
	Vaccinations	Schedule updated and guidance re immunosuppression added.
	Vancomycin continuous	Notes added re times levels processed and times to take
	Vancomycin intermittent Regime	Notes added re times levels processed and times to take Guidance added re switching from continuous regime
	Addendum 1	Updated in line with changes to abidec/ ursodeoxycholic acid pages
	Addendum 4	Baby Oscar study solution amended
	Addendum 8	Intubation prescription chart added
	Addendum 9	Palliative care medication doses amended Example Controlled Drug Discharge TTO added
Added October 2017	Addendum 13	MiniDEX Trial
Amended October 2017	Morphine sulfate oral solution	Clarity around not further diluting 100microgram/ml preparation added.
	Midazolam	Preparation for IV infusion updated
Added December 2017	Paraldehyde	
Amended December 2017	Vaccinations	Updated in line with Public Health England's Green Book chapter on live attenuated vaccines
Amended February 2018	Dinoprostone	Withdraw 50mL from the bag into a syringe to run through a syringe pump The 500ml bag containing Dinoprostone should NEVER be infused directly into the patient. Discard the bag immediately.
Amended April 2018	Caffeine citrate	Change in oral preparation to licensed product
Amended May 2018	Insulin for hyperkalaemia (page and addendum)	Monitoring instructions clarified
Amended May 2018	Nystatin	Clarification to be used even if baby NBM added
Amended May 2018	Potassium chloride replacement fluids	Withdraw 50mL from the bag into a syringe to run through a syringe pump The 500ml bag containing 10mmol/500ml should not be infused directly into the patient. Discard the bag immediately.
Amended May 2018	Milrinone	Do not give a bolus in babies with CDH
Added August 2018	LaBiNIC (Probiotic)	
Amended August 2018	Ceftazidime	Displacement value changed with new brand
Amended October 2018	Flucloxacillin	Displacement value changed with new brand
Amended October 2018	Bevacizumab	Preparation changed
Amended October 2018	Gaviscon Infant	Max 6 times in 24 hours removed
Amended June 2019	Fluconazole	Treatment dose changed from 6 – 12mg/kg to 12mg/kg
Amended June 2019	Human Milk Fortifier	Wording altered to make adding to smaller volumes clearer
Amended June 2019	Sodium Chloride	Administration changed to bolus rather than to feeds
Amended March 2020	Vaccine schedule Sodium Feredetate	Amended in line with new vaccination schedule Additional formulation of SodiFer added as Sytron is currently MCS
Amended July 2020	Glycerol Trinitrate	Added 'Monitor Methaemoglobin'

Amended Jan 2021	Adrenaline and noradrenaline	Dosing changed from nanograms to micrograms
Amended Jul 2021	Caffeine Citrate	Standard maintenance dose changed from 12mg/kg to 10mg/kg and method of administration changed from infuse over 30 mins to slow IV injection over 10 mins
	Resuscitation guideline	Adrenaline dose updated in line with national guideline update
	Hydrocortisone	Dose for prevention of CLD in all babies <28 weeks gestation (From Premiloc study) added, monitoring and cautions updated Administration amended to include option of giving via slow IV over 3-5 minutes
	Isoprenaline	Statement added that different preparations exist to take care with strengths
	Digoxin	New preparation added Dilution instructions amended Dosing instructions clarified
Added Jul 2021	Paracetamol for PDA	
Amended Jan 2022	Hydrocortisone	Wording changed on days of age from 0-6 and 7-9 to 1-7 and 8-10 Admin instructions changed
	Zidovudine	Duration of PEP updated to include potential for 2 weeks if strict criteria met in line with QEHB birth plans

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ADDENDUM

Abbreviations used in this manual:

mg	Milligrams
kg	Kilograms
ml	Millilitres
L	Litres
IV	Intravenous
IM	Intramuscular
SC	Subcutaneous
ET	Endotracheal
PO	By mouth
NG	Nasogastric tube

Units:

1 Kilogram (kg)	=	1000 grams
1 gram (g)	=	1000 milligrams
1 milligram (mg)	=	1000 micrograms
1 microgram	=	1000 nanograms

A 1% weight by volume (w/v) solution contains 1 gram of substance in 100mL of solution. A 10% weight by volume (w/v) solution contains 10g of substance in 100mL of solution.

It therefore follows that:

1mL of a 1% solution (1:100) will contain 10 milligrams of substance

1mL of a 0.1% solution (1:1000) will contain 1 milligram of substance

1mL of a 0.01% solution (1:10000) will contain 100 micrograms of substance

Definitions:

Renal Impairment: Increase in base line creatinine of 20% and decreased urine output to less than 1mls/kg/hr
Hepatic Impairment: Conjugated bilirubin > 50 associated with increased liver enzymes of 20% above baseline

Drug allergy (suspected or confirmed)

Suspected drug allergy is any reaction caused by a drug with clinical features compatible with an immunological mechanism. All drugs have the potential to cause adverse drug reactions, but not all of these are allergic in nature. A reaction is more likely to be caused by drug allergy if:

- The reaction occurred while the child was being treated with the drug, or
- The drug is known to cause this pattern of reaction, or
- The child has had a similar reaction to the same drug or drug-class previously.

A suspected reaction is less likely to be caused by a drug allergy if there is a possible non-drug cause or if there are only gastro-intestinal symptoms present.

The following signs, allergic patterns and timing of onset can be used to help decide whether to suspect drug allergy:

Immediate, rapidly-evolving reactions (onset usually less than 1 hour after drug exposure)

- Anaphylaxis, with erythema, urticaria or angioedema, and hypotension and/or bronchospasm. See also Antihistamines, allergen immunotherapy and allergic emergencies
- Urticaria or angioedema without systemic features
- Exacerbation of asthma e.g. with non-steroidal anti-inflammatory drugs (NSAIDs)

*Non-immediate reactions, **without** systemic involvement* (onset usually 6–10 days after first drug exposure or 3 days after second exposure)

- Cutaneous reactions, e.g. widespread red macules and/or papules, or, fixed drug eruption (localised inflamed skin)

*Non-immediate reactions, **with** systemic involvement* (onset may be variable, usually 3 days to 6 weeks after first drug exposure, depending on features, or 3 days after second exposure)

- Cutaneous reactions with systemic features, e.g. drug reaction with eosinophilia and systemic signs (DRESS) or drug hypersensitivity syndrome (DHS), characterised by widespread red macules, papules or erythroderma, fever, lymphadenopathy, liver dysfunction or eosinophilia
- Toxic epidermal necrolysis or Stevens–Johnson syndrome
- Acute generalised exanthematous pustulosis (AGEP)

Suspected drug allergy information should be clearly and accurately documented in clinical notes and prescriptions, and shared among all healthcare professionals. Children and parents or carers should be given information about which drugs and drug-classes to avoid and encouraged to share the drug allergy status.

If a drug allergy is suspected, consider stopping the suspected drug and advising the child and parent or carer to avoid this drug in future. Symptoms of the acute reaction should be treated, in hospital if severe. Children presenting with a suspected anaphylactic reaction, or a severe or non-immediate cutaneous reaction, should be referred to a specialist drug allergy service. Children presenting with a suspected drug allergic reaction or anaphylaxis to NSAIDs, and local and general anaesthetics may also need to be referred to a specialist drug allergy service, e.g. in cases of anaphylactoid reactions or to determine future treatment options. Children presenting with a suspected drug allergic reaction or anaphylaxis associated with beta-lactam antibiotics should be referred to a specialist drug allergy service if their disease or condition can only be treated by a beta-lactam antibiotic or they are likely to need beta-lactam antibiotics frequently in the future (e.g. immunodeficient children).

For further information see Drug allergy: diagnosis and management. NICE Clinical Guideline 183 (September 2014) www.nice.org.uk/guidance/cg183

Reference: Paediatric Formulary Committee. *BNF for Children* (online) London: BMJ Group, Pharmaceutical Press, and RCPCH Publications <http://www.medicinescomplete.com> [Accessed on 06.03.17]

How to dilute drugs for intravenous administration safely (see addendum 11 ENFit for oral administration)

Many drugs have to be diluted before they can be used in babies because they were formulated for use in adults. In addition dilution is almost always required when a drug is given as a continuous infusion. Serious errors can occur at this stage if the dead space in the hub of the syringe is overlooked. Thus if a drug is drawn into a 1ml syringe up to the 0.05ml mark the *syringe* will then contain between 0.14 and 0.18ml of drug. If the syringe is then filled to 1ml with diluent the syringe will contain **three** times as much drug as was intended.

To dilute any drug safely, therefore follow the steps below (you will require a *large* syringe-suitable for holding the total final volume and a *small* syringe-small enough to accurately measure the volume of drug to be diluted for each dilution):

1. Draw up the intended volume of diluent into the *large* syringe (total volume – drug volume to be added)
2. Draw up the drug into the *small* syringe through a filter straw/ needle (at this point ensure you have drawn up at least 0.1ml more than the required dose)
3. Attach a green needle if using a filter straw to the *small* syringe and expel any excess drug via the green needle to obtain the intended drug volume in the *small* syringe (this primes the needle to account for dead space)
4. Transfer the drug drawn up in the *small* syringe to the *large* syringe containing the diluent via the same green needle you have just primed, using a single depression of the plunger
5. Carefully expel any air. Cap and mix thoroughly by inverting the *large* syringe several times.
6. Clearly label the syringe

Reference: Neonatal Formulary: Drug Use in Pregnancy and the First Year of Life (6th Edn) London: Wiley-Blackwell;2011

Compatibility information

Refers to Y-site compatibility ONLY and not admixtures. All drugs and solutions should be assumed to be incompatible unless stated otherwise. Ideally only two drugs should run together at a Y-site as most available compatibility data is only for two-drug combinations. The information given is not definitive as varying drug concentration and/or diluent may result in incompatibility. Hence, when two drugs are infused via a Y-site, it is good practice to observe the distal portion for signs of incompatibility and monitor the patient closely for adverse clinical effects.

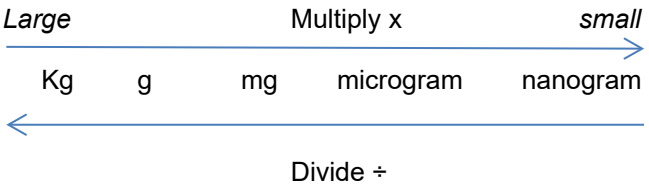
Drug administration and preparation

Intravenous fluids with additives and drug infusions prepared at ward level must be changed every 24 hours unless otherwise specified in the drug monograph.

Unless described in the monograph as “Multidose”, ALL injectable products, including bags of sodium chloride and glucose must be treated as single-use-only and discarded immediately after use.

Converting from one unit to another

To convert from a *larger* unit to a *smaller* unit – multiply by 1000
To convert from a *smaller* unit to a *larger* unit – divide by 1000



Calculating dose as volume

Used when calculating how much volume of a particular strength preparation you need to give the patient to give the prescribed dose.

$$\frac{\text{What you WANT (prescribed dose)}}{\text{What you have GOT (what it is available in)}} \times \text{What it is IN (Volume)}$$

Ensure units are the same

DRUG CALCULATIONS TO WORK OUT WHAT BABY IS RECEIVING

Mg/kg/hour=

- $\frac{\text{Stock dose (mg)}}{\text{Stock volume (ml)}}$ = *concentration (mg/ml)*
- concentration (mg/ml) x rate (ml/hr) = *dose delivered (mg/hr)*
- $\frac{\text{dose delivered (mg/hr)}}{\text{weight (kg)}}$ = *dose delivered (mg/kg/hour)*

Micrograms /kg/hour=

- $\frac{\text{Stock dose (mg)}}{\text{Stock volume (ml)}}$ = *concentration (mg/ml)*
- concentration (mg/ml) x 1000 = *concentration (microgram/ml)*
- concentration (microgram/ml) x rate (ml/hr) = *dose delivered (microgram/hr)*
- $\frac{\text{dose delivered (microgram/hr)}}{\text{weight (kg)}}$ = *dose delivered (microgram/kg/hour)*

Micrograms/kg/min=

- $\frac{\text{Stock dose (mg)}}{\text{Stock volume (ml)}}$ = *concentration (mg/ml)*
- concentration (mg/ml) x 1000 = *concentration (microgram/ml)*
- concentration (microgram/ml) x rate (ml/hr) = *dose delivered (microgram/hr)*
- $\frac{\text{dose delivered (microgram/hr)}}{\text{weight (kg)}}$ = *dose delivered (microgram/kg/hour)*
- $\frac{\text{dose delivered (microgram/kg/hour)}}{60}$ = *dose delivered (microgram/kg/min)*

Units/kg/hour=

- Stock dose (units) / Stock volume (ml) = *concentration (units/ml)*
- concentration (units/ml) x rate (ml/hr) = *dose delivered (units/hr)*
- dose delivered (units/hr) / weight (kg) = *dose delivered (units/kg/hour)*

Nanogram/kg/min=

- Stock dose (mg) / Stock volume (ml) = *concentration (mg/ml)*
- concentration (mg/ml) x 1000 = *concentration (microgram/ml)*
- concentration (microgram/ml) x 1000 = *concentration (nanogram/ml)*
- concentration (nanogram/ml) x rate (ml/hr) = *dose delivered (nanogram/hr)*
- dose delivered (nanogram/hr) / weight (kg) = *dose delivered (nanogram/kg/hour)*
- dose delivered (nanogram/kg/hour) / 60 = *dose delivered (nanogram/kg/min)*

Mmols/hour=

- Stock dose (mmol) / Stock volume (ml) = *concentration (mmol/ml)*
- concentration (mmol/ml) x rate (ml/hr) = *dose delivered (mmol/hr)*

Mmols/kg/day=

- Stock dose (mmol) / Stock volume (ml) = *concentration (mmol/ml)*
- concentration (mmol/ml) x rate (ml/hr) = *dose delivered (mmol/hr)*
- dose delivered (mmol/hr) / weight (kg) = *dose delivered (mmol/kg/hour)*
- dose delivered (mmol/kg/hour) x 24 = *dose delivered (mmol/kg/day)*

ABIDEC®

Indications for use:

Vitamin supplementation

Start at 7 days of age and receiving at least 50% enteral feeds for:

- All babies with birth weight < 1500g
- All babies born at gestation ≤ 33+6 weeks gestation

Babies receiving parenteral nutrition: start when receiving ≤10mls/kg/day intalipid / SMOFlipid® syringe

Babies born at ≥ 34 weeks gestation who are still an inpatient at 4 weeks of age should commence vitamins for the remainder of their inpatient stay provided they are receiving at least 50% enteral feeds

Babies ≥ 34 weeks should not be given Abidec® as TTO

All parents (of babies born ≥ 34 weeks gestation) should be instructed to obtain free healthy start vitamins from the onsite Boots pharmacy at discharge and informed that multivitamins are recommended until 5 years of age

Use in preference to Dalivit® unless advised otherwise by a consultant

Preparation:

Contains vitamin A, B group, C and D

Note: excipients include arachis oil

License status:

Administration:

Dosage:

Babies born at ≤ 33+6 weeks gestation or birth weight ≤1500g :

Breast milk :

Fortified breast milk: 0.3mls od

(for infants establishing enteral feeds when starting Abidec® prescribe 0.3ml od in view of imminent introduction of HMF when intake reaches 150ml/kg/d D/MEBM; if clinical decision is not to use HMF then see unfortified breast milk below)

≥2kg discuss with dietician or nutrition support team; to review continued use of HMF (see Human Milk Fortifier page)

N.b. In those progressing to oral feeding, commence 0.6mls od when having 50% oral breast feeds/day

Unfortified breast milk/ breast feeding: 0.6mls od

Receiving preterm formula

(<2kg: Nutriprem 1 / SMA Pro Gold Prem 1, >2kg or at discharge: Nutriprem 2):

0.3mls once a day

N.b. In those receiving a combination of unfortified breast milk/preterm formula, increase to 0.6mls od when having >50% unfortified breast milk/day

High calorie term formula Infatrini/ Infatrini Peptisorb

0.3ml once a day

Term formula/ Peptijunior/ Monogen/Ppregestimil lipil :

0.6mls once a day

Check with Dietician regarding vitamin requirements if on any other specialised formula

Babies born at ≥34 weeks gestation who are still an inpatient at 4 weeks of age:

Breast milk or term formula: 0.3mls (not as TTO see indications above)

If on specialised formula, discuss with Dietitian

Routes:	Oral/ NG
Other:	Prescribe at 22.00 Abidec® should be discontinued if baby is started on Ursodeoxycholic acid and liver vitamin regime
Reference:	Adapted from ESPGHAN. Enteral Nutrient Supply for Preterm Infants: Commentary from European Society for Paediatric Gastroenterology, Hepatology and Nutrition Committee on Nutrition. JPGN 2010; issue 1: pg 85-91

Written by: Gemma Holder (Neonatal Consultant), Sara Clarke (Neonatal Network Dietitian)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

ACICLOVIR

Indications for use:

Treatment of disseminated herpes simplex infection, chicken pox and herpes-zoster infection

Preparation:

Injection (one of two preparations supplied):

a. Powder for reconstitution 250mg vial

Reconstitute 250mg vial of aciclovir powder with 9.8 mls water for injection or 0.9% sodium chloride to give 25mg in 1mL (250mg in 10mL). Dilute to 50mls with 5% glucose to give solution of **5mg/ml.** Shake the prepared infusion well to ensure adequate mixing occurs. Take required dose and infuse over 1 hour

Since no antimicrobial preservative is included, reconstitution and dilution must be carried out under full aseptic conditions, immediately before use, and any unused solution discarded

b. Aciclovir solution for infusion 25 mg in 1 ml

Take 1 ml and make up to 5 mls with 5% glucose to give solution of **5mg/ml.** Take required dose and infuse over 1 hour

License status:

IV infusion not licensed for herpes zoster in children under 18 years

Administration:

See below under dosage

Into as large a vein as possible

Dosage:

Treatment of herpes simplex infection:

20 mg/kg IV infusion over 1 hour.

Give 8 hourly for 14 days (21 days if CNS involvement. Confirm cerebrospinal fluid negative for herpes simplex virus before stopping treatment or discuss with micro if result not available)

Conversion to oral treatment is not suitable for children under 1 month of age

Chicken pox and herpes zoster infection:

10 – 20 mg/kg infused over 1 hour 8 hourly for at least 7 days. Longer course may be required

Routes:

IV infusion

Preferably via a central venous access device to avoid potential venous irritation as the preparation has a high pH. If given peripherally, the insertion site must be monitored closely for phlebitis

Other:

Incompatible with caffeine citrate, dopamine, dobutamine, meropenem, and morphine sulfate

Dose should be altered in renal failure; Refer to BNF-C and consult product literature

Information regarding whether Varicella Zoster immunoglobulin is required for prophylaxis can be found on

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/616119/VZIG_gudiance.pdf

Varicella Zoster immunoglobulin dose is 250mg IM. APPROVAL/ ADVICE FROM MICROBIOLOGY, ORDER FROM BCH PHARMACY VIA SWITCHBOARD

Reference:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]
Trissel, L.A. Handbook of Injectable drugs. Available at http://www.medicinescomplete.com/mc/hid/current/ [Accessed 19.08.15]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 16.01.2017]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

ADENOSINE

Indications for use:

Supraventricular tachycardia

May be used in babies with diaphragmatic hernia if remains poorly oxygenated – see Congenital Diaphragmatic Hernia guideline on intranet and discuss with PICU Consultant before use

Preparation:

Adenosine 3mg/ml

For supraventricular tachycardia:

Take 3mg (1ml) of adenosine and dilute to 3ml with 0.9% sodium chloride to give 1mg/ml i.e. 1000 micrograms/ml

For infusion to treat babies with diaphragmatic hernia: (unlicensed indication)

Take 150mg of adenosine (50mls of 3mg/ml solution) This is a concentration of 3mg/ml. No further dilution is required. Run infusion at rate calculated by weight x 1 ml/hr to give 50 micrograms/kg/min (3mg/kg/hr)

License status:

Adenocor® licensed in children, Adenoscan® not

Administration:

Babies with supraventricular tachycardia (SVT):

Dosage:

Draw up the following 3 doses:

Dose 1: 150 micrograms/kg

Dose 2: 200 micrograms/kg

Dose 3: 300 micrograms/kg

Administer Dose 1 by rapid intravenous injection over 2 seconds followed by rapid flush of 0.9% sodium chloride (1 to 2ml)

If tachycardia is not terminated give Dose 2 (2 minutes later), followed by Dose 3 if still tachycardic after another 2 minutes. Max single dose 300 microgram/kg

Cardiologist must be contacted if SVT is not terminated after Dose 3 i.e. 300 micrograms/kg

For babies with Diaphragmatic Hernia:

Continuous infusion at rate of 50microgram/kg/min (3mg/kg/hr)

Routes:

IV/UVC – large peripheral or central vein

Preferably give centrally as adenosine is painful on administration and is rapidly metabolised in the peripheral circulation

Administer adenosine via a dedicated line using a 3 way tap to facilitate rapid intravenous injection over 2 seconds followed by rapid flush of 0.9% sodium chloride

Do not give this medicine by IV injection via a line being used for an infusion containing a medicine additive without first stopping the running infusion. Flush the line both before and after giving the injection

Monitoring:

Monitor and record ECG continuously. Resuscitation facilities must be available immediately.

References:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

Adenosine infusion for the management of persistent pulmonary hypertension of the newborn. Ng C Franklin O, Vaidya M et al. Pediatr Crit Care Med 2004 Jan;5(1) 10 – 3

NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 06.03.17]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

ADRENALINE (EPINEPHRINE)

Indications for use:

FOR CARDIAC ARREST SEE EMERGENCY DRUG FLOW CHART AT START OF FORMULARY

Anaphylaxis: IM

Post extubation stridor: Nebulised (unlicensed indication)

Hypotension: see following page

Preparation:

1 mg in 1 ml (1 in 1000)

Administration:

FOR CARDIAC ARREST SEE EMERGENCY DRUG FLOW CHART AT START OF FORMULARY

Dosage:

Anaphylaxis*:

0.15ml (150micrograms) 1:1000

Can be repeated after 5 mins if required (According to blood pressure, pulse and respiratory function)

Nebulised**:

Take 1ml of 1:1000 and make up to 4mls with 0.9% sodium chloride. Effect rapidly wears off, can be repeated if required

Routes:

Anaphylaxis : IM

Post extubation stridor: Nebulised

Reference:

* BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

** Guy's and St Thomas', Kings College and University Lewisham Hospitals Paediatric Formulary (9th Edn) London: Guy's and St Thomas' NHS Foundation Trust ; 2012. Available online at http://www.guysandstthomas.nhs.uk/resources/publications/formulary/paediatric-formulary-9th-edition.pdf [accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

ADRENALINE (EPINEPHRINE)

Indications for use:

Hypotension

Preparation:

Use 1:1000 (1mg/ml) preparation (NOT 1:10 000 [100micrograms/ml])

License status:

(1:1000 not licensed for IV administration)

Prepare as per prescription label

Adrenaline

Take……micrograms Adrenaline (wt in Kgs x3000) and make up to 50 mls with …….. i.e. 0.1 ml/hr provides 0.1microgram/kg/min

Run at …… ml/hour (i.e…… microgram/kg/min)

Route……

Signed……Date……

Administration:

Dosage:

Starting dose 0.1 microgram/kg/min and adjust according to response

Usual dose 0.1 - 1 microgram/kg/min

Doses up to 1.5micrograms/kg/min have been used in acute hypotension

NOTE: If commencing adrenaline because baby is unresponsive to first line medications (dopamine, dobutamine and hydrocortisone) the dopamine should be weaned and stopped (as should dobutamine if possible)

A combination of all of the above may result in tachycardia, decreased filling in diastole and subsequent decreased cardiac output

Routes:

Must be infused centrally

UVC / CVL

Compatibility:

Sodium Chloride 0.9%

Glucose 10%

Glucose 5%

Glucose 4% + Sodium chloride 0.18%

Incompatibility:

Sodium Bicarbonate and alkaline solutions

Adrenaline is sensitive to light and air. Do not remove ampoules from carton until ready to use

References:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

AMBISOME® -AMPHOTERICIN (LIPOSOMAL)

Indications for use:

Treatment of fungal infections following discussion with Microbiologist

Preparation:

NB. The following is for 'AMBISOME®' only. There are other products with different trade names. Different preparations vary in their pharmacodynamics, pharmacokinetics, dose and administration; **these preparations should not be considered interchangeable.** To avoid confusion prescribers should specify the brand.
Do not use this data for other brands.
Always follow package insert

50 mg vial of Ambisome®

Add 12 ml water for injection to vial and shake vigorously to produce solution containing 4 mg/ml.

Withdraw 20mg (5ml) from the reconstituted vial into a syringe. Remove the needle and attach the 5 micron filter provided to the syringe along with a new needle. Add the AmBisome® via the filter to 15ml glucose 5% to produce a final concentration of 1mg/ml. Infuse prescribed amount over 60 minutes

Infuse over 60 mins using a 1.2 micron in-line filter

License status:

Not licensed for children under 1 month

Administration:

IV infusion over 60 minutes. Do not administer with any other infusion
After infusion complete, infuse 2ml of glucose 5% at the same rate as used to administer the Ambisome®

Dosage:

Test dose:
Initial dose of 100 micrograms/ kg infused over 10 mins as part of first day's dose. Stop infusion then flush with 5% glucose at the same rate, observe over 30 mins and give rest of treatment dose if no reaction over 60 mins

1 mg/kg daily, increased as necessary in steps of 1 mg/kg/day; Max 3 mg/kg daily(empirical) or 5 mg/kg (proven infection)

Routes:

IV

Incompatibility:

Sodium Chloride. Existing line must be flushed with 5% glucose prior to administration or use a separate line
Must not come into contact with any product other than glucose 5%

Further information:

Liposomal amphotericin (Ambisome®) contains 900mg sucrose in each vial

Reference:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

AMETOP® Tetracaine (AMETHOCAINE)

Indications for use:	Topical local anaesthetic. Only licensed for a child greater than 1 month of age.
Preparation:	4% topical gel. 1.5g tube
Administration:	Apply over potential venepuncture sites and cover with occlusive dressing for 30 mins prior to procedure. Remove dressing and gel.
Dosage:	See above. Max 1 tube applied at separate sites at a single time
Routes:	Topical only
Other:	Never apply to mucous membranes or damaged or broken skin. Only used in OPD
References:	BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

AMILORIDE HYDROCHLORIDE

Indications for use:	Prevent potassium loss in babies receiving regular loop diuretics
Preparation:	1 mg in 1 ml solution
Licence status:	Not licensed for use in children
Administration:	
Dosage:	0.1 – 0.2 mg/kg Give 24 hourly and monitor electrolytes and effect (If required can be increased to 12 hourly
Routes :	Oral / NG
Reference:	BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

AMOXICILLIN

Indications for use:

Infection – please refer to Antibiotic Policy

Preparation:

500mg vial

9th July 2014 – MHRA Class 4 Drug Alert: do NOT administer amoxicillin injection manufactured by Wockhardt UK Ltd to neonates and infants below one year old. Amoxil (GlaxoSmithKline) and Bowmed Ibisqus Ltd amoxicillin can continue to be administered to neonates and infants below one year old.

Reconstitute 500 mg vial with 9.6 ml water for injection to give **50mg/ml solution**

Take required dose and infuse over 30 mins

Administration:

By infusion over 30 minutes

To reduce the risk of CNS toxicity and convulsions administration of doses greater than 30mg/kg by IV infusion is recommended

Dosage :

Listerial meningitis (in combination with another antibacterial), group B streptococcal infection, enterococcal endocarditis (in combination with another antibacterial):

50mg/kg (dose may be doubled to 100mg/kg in neonates up to 28 days old- n.b. higher frequency in those >28 days old)

Frequency:

Less than 7 days old	12 hourly
7-28 days old	8 hourly
>28 days old	6 hourly

Indication for use should ALWAYS be documented

Prescribe in dedicated antibiotic section on new prescription chart

Review culture results after 36 hours (where possible) and at most 48 hrs and ensure regular review is undertaken and the outcome documented as stipulated on prescription chart.

Routes:

IV / UVC

Other:

Reduce dose in severe renal impairment, risk of crystalluria with high doses-refer to BNF-C and product literature

Discard after use

Give first dose as soon as possible

Prescribe subsequent doses at 06:00/18:00, 10.00/22.00 or 12.00/23.59 for 12 hrly dosing and 02.00, 10.00 and 18.00 for 8 hrly dosing

If baby on Transitional Care or Ward, prescribe at 11.00/23.00

Incompatibility:

Aminoglycosides, midazolam, sodium bicarbonate

References:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

ATROPINE

Indications for use :

1. Prior to laser therapy treatment of retinopathy of prematurity to prevent bradycardia
2. As premedication for elective intubation

Preparation:

600micrograms in 1 ml – solution supplied in 1ml ampoules

Dilute 0.1ml of the ampoule with 0.9ml of 0.9% Sodium Chloride to give a solution containing **60micrograms/ml**

License status:

Not licensed for children under 12 years for either indication

Administration:
Dosage:

1. Prior to laser treatment 10 micrograms/kg by slow bolus

   NB this is not required if baby has received atropine as part of pre-intubation drug regimen within 6 hours of laser treatment

2. As premedication 20micrograms/kg over 1 minute

Routes:

IV

Compatibility:

Sodium Chloride 0.9%

Other:

Administration produces effect within 30 seconds that lasts at least 6 hours

References:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

Guy's and St Thomas', Kings College and University Lewisham Hospitals Paediatric Formulary (9th Edn) London: Guy's and St Thomas' NHS Foundation Trust ; 2012. Available online at http://www.guysandstthomas.nhs.uk/resources/publications/formulary/paediatric-formulary-9th-edition.pdf [accessed 19.08.15]

Neonatal Formulary: Drug Use in Pregnancy and the First Year of Life (7th Edn) London: Wiley-Blackwell;2014

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

BENZYLPENICILLIN SODIUM

Indications for use:

Infection – please refer to Antibiotic Policy

Preparation:

600mg vial

Reconstitute 600 mg vial with 5.6ml of water for injection to give 100mg/ml solution

Administration:

Take required dose and further dilute with equal volume of glucose 5% or sodium chloride 0.9% to give 50mg/ml solution

25mg/kg dose- By slow IV injection

50mg/kg dose- by infusion over 15- 30 minutes (longer administration time important to avoid CNS toxicity)

Dosage:

see below

Frequency:

Less than 7 days old	25 mg/kg 12 hourly Increased to 25mg/kg 8 hourly if baby severely unwell or blood culture is positive 50mg/kg 12 hourly if CSF positive for Gp B Strep (in line with NICE guidance)
7 - 28 days old	25 mg/kg 8 hourly (increased to 50mg/kg in severe infection)
Greater than 28 days old	25 mg/kg 6 hourly (increased to 50mg/kg in severe infection)

Indication for use should ALWAYS be documented

Prescribe in dedicated antibiotic section on new prescription chart

Review culture results after 36 hours (where possible) and at most 48 hrs and ensure regular review is undertaken and the outcome documented as stipulated on prescription chart.

Routes:

IV/UVC

Other:

Discard after use

Give first dose as soon as possible

Prescribe 12 hrly doses at 02:00/14:00, 06:00/18:00 or 12.00/23.59 and

8 hrly dosing at 02.00/10.00/18.00

Caution-false positive urinary glucose if tested for reducing substances

If baby on Transitional Care or Ward, prescribe at 11.00/23.00 (babies should not be in TC or on the ward if they are unwell enough to require tds dosing)

In renal impairment Refer to BNF-C and consult product literature

References:

NICE Guidelines 2012: Antibiotic use in early-onset neonatal infections

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 16.01.2017]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

BEVACIZUMAB (Avastin®)

ONLY FOR USE BY OPTHALMOLOGIST

Indications for use:

- Aggressive posterior retinopathy of prematurity (ROP)
- Zone I ROP
- Any 'sight threatening' ROP which is not amenable to laser therapy because
  - No view of retina
  - Child too sick to withstand procedure after discussion with anaesthetist/intensivist
- ROP which has failed to respond to conventional laser therapy

Preparation:

5mg in 0.2ml pre-filled syringe (unlicensed special to be obtained by Boots from BCH Pharmacy)

Administration:

Dosage:

0.625mg – 1.25mg (0.025 – 0.05ml of 25mg/ml solution)
Eye(s) should be dilated as per ROP screening protocol prior to use

Routes:

Intravitreal injection

Other:

Detailed assessment and documentation of patient's retinal status, past medical history and relevant features. Ideally over more than one time point (though disease severity may not allow this).

If anti-VEGF decided upon detailed, documented discussion with parents including the unknown long term risks to development of the brain.
Where there is uncertainty of the appropriateness of the treatment choice a second consultant's opinion should be taken.
Review within a week for early response and follow up mandated including retinal examinations until complete vascularization or stable for over 12/12

Reference:

BCH Protocol for use of Avastin® Updated March 2017

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

CAFFEINE CITRATE

Indications for use:

Respiratory Stimulant

Treatment of central apnoea of prematurity

Should be discontinued at 34 weeks post conceptual age if baby symptom free

Preparation:

Caffeine citrate injection 10mg/ml
Caffeine citrate oral solution 10mg/ml
NB. Take care 2mg caffeine *citrate* = 1mg caffeine *base*
Prescriptions should always specify as caffeine citrate

Administration:

'Standard Dose'

Dosage:

Loading: 25mg/kg caffeine citrate infused over 30 minutes or by mouth/via nasogastric tube (dose as per local practice)

Maintenance: 10mg/kg caffeine citrate daily
Prescribe at 10:00 given by slow IV injection over 10 minutes or by mouth/ via nasogastric tube

Increase dose with weight if symptomatic

'High Dose' (to be used only on Consultant Request)

There is emerging evidence that high dose caffeine facilitates extubation and prevents reintubation in preterm babies and lessens frequency of apnoea of prematurity

Loading: 40mg/kg caffeine citrate infused over 30 minutes or by mouth/via nasogastric tube

Maintenance: 20mg/kg caffeine citrate daily infused over 30 minutes or by mouth/via nasogastric tube

NB: Maintenance dose is commenced approx 24 hrs after loading dose

Routes:

IV / Oral / NG

Other:

Levels (rarely required) taken pre-dose
The therapeutic range for plasma-caffeine concentration is usually 10–20 mg/litre (50–100 micromol/litre), but a concentration of 25–35 mg/litre (130–180 micromol/litre) may be required.NB: Signs of toxicity only occur with levels greater than 50mg/L (260 micromol/litre)
Dose may need to be reduced in renal/ hepatic impairment

Interactions:

Caffeine levels are reduced by Phenobarbital and Phenytoin. If caffeine is administered concurrently with phenobarbital/phenytoin, it may be necessary to give doses every 12 hours rather than 24 hourly. Plasma caffeine concentrations may be increased with ciprofloxacin

Incompatibility:

Aciclovir, furosemide

References:

Schmidt B, Roberts RS, Davis Pet al. Long term effects of caffeine therapy for apnoea of prematurity. N Engl J Med 2007;357:1893 – 902
Schmidt B, Anderson PJ, Doyle LW et al. Survival without disability to age 5 years after neonatal caffeine therapy for apnoea of prematurity. JAMA 2012;307:275-82

Mohammed S, Nour I, Shabaan AE et al High versus low-dose caffeine for apnea of prematurity:a randomised controlled trial Eur J Pediatr (2015)174:949-956
Steer P, Flenady V, Shearman A High dose caffeine cirtrate for extubation of preterm infants: a randomised control trial Arch Dis Child Fetal neonatal Ed 2004;89:F499-F503
Evelina London Paediatric Formulary London:. Available online at http://cms.ubqo.com/public/d2595446-ce3c-47ff-9dcc-63167d9f4b80 [accessed 22.06.21]
Neonatal Formulary: Drug Use in Pregnancy and the First Year of Life (7th Edn) London: Wiley-Blackwell;2014
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 22.06.21]
BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; Available at https://bnfc.nice.org.uk/ [Accessed 22.06.21]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

CALCIUM GLUCONATE

Indications for use:

Stabilising the myocardium to prevent arrhythmias in hyperkalaemia

Calcium deficiency

Preparation:

IV: Calcium gluconate 10% ; 100mg/ml equivalent to 1g/10ml calcium gluconate. (Ca^{2+} 0.226mmol(226micromol)/ml) 10ml amp
Should be packaged in a plastic amp. Repeated or prolonged administration using glass containers is contraindicated in children under 18 years owing to the risk of aluminium accumulation

Can be used undiluted in emergencies

For continuous infusion:
Dilute to a maximum concentration 0.045mmol (45micromol)/ml with glucose 5% or sodium chloride 0.9% (i.e. MINIMUM dilution is making 10ml amp up to 50mls)

Administration: Dosage:

Hyperkalaemia (prevention of arrhythmias) and acute hypocalcaemia:
0.11mmol/kg (0.5ml/kg calcium gluconate 10%) as a single dose injected slowly over 5 – 10 mins, diluted to at least 5 times the volume with sodium chloride 0.9% or glucose 5%.

Hypocalcaemia maintenance dose:
0.5mmol(500micromol)/kg/day (2.2ml/kg/day calcium gluconate 10%) by continuous iv infusion, diluted to at least 5 times the volume with sodium chloride 0.9% or glucose 5%, over 24 hours and adjust according to response.

Maximum infusion rate (non emergency) of 0.022mmol (22 micromol)/kg/hour

Frequency:

Hyperkalaemia: once only

Correction of hypocalcaemia:
As continuous iv infusion

Routes:

IV/UVC/LL

Infuse centrally wherever possible,
Solution >20mg/ml must be given via central line

Other:

Calcium salts can form complexes with many drugs, and this may result in a precipitate; do not let any fluid containing calcium come into contact with any other IV administered drug.
Calcium salts are irritant. Extravasation may cause tissue irritation and necrosis.
The infusion site must be monitored regularly to ensure extravasation injury has not occurred
Not to be given simultaneously with ceftriaxone even via different infusion lines or at different infusion sites as risk of precipitation in kidneys and lungs.

Reference:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

CALCIUM (ORAL)

Indications for use:	Hypocalcaemia
Preparation:	Alliance Calcium Syrup®- 2.55mmol/5ml calcium
Dosage:	0.25mmol/kg Calcium 6 hrly, adjusting dose to response
Routes:	Oral / NG
Other:	Give at different times to phosphate supplementation
Reference:	BNF for Children London: BMJ Group and Pharmaceutical Press; 2013 – 2014 Available at http://www.bnf.org/bnf/index.htm [Accessed 09.06.14]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

CAROBEL

Indications for use:

For use:

1. In term/near term babies receiving NG or bottle feeds as first line pharmaceutical treatment for gastro-oesophageal reflux (as per NICE guidelines 2015)
   NOT RECOMMENDED FOR USE IN PRETERM OR LOW BIRTH WEIGHT INFANTS
2. On the advice of speech and language therapist for babies with evidence of suck swallow incoordination when suck feeds are initiated

Carobel should not be used in conjunction with Gaviscon Infant®

Preparation:

In a bottle feed: Prepare the milk to manufacturer's guidelines. Add instant carobel as below. Shake well (30-60 seconds). Leave for 3-4 minutes to thicken. Shake again and feed immediately.

As a spoon-feed or paste: this method is appropriate for breastfed infants but may be the preferred method for bottle fed infants. Add instant carobel as indicated below. **Stir well and leave for 3-4 minutes to thicken.** Stir again and feed immediately, by spoon, prior to and during the feed as instructed.

Administration:

Via bottle feed or as a spoon-feed.

Dosage:

1 scoop: 1.7g Always use the scoop provided

Prepare according to dietician/SALT instructions

The following are different from the manufacturer's instructions but are the concentrations used by the SALT and dieticians at Birmingham Children's Hospital:

For use on SALT advice for concern regarding swallowing/ coordination of feeds:

Stage 1: 1.7% Carobel 1 level scoop to 100mls milk

Stage 2: 3.15% Carobel 2 level scoops to 110mls milk

For use for gastro-oesophageal reflux:

2.2% Carobel 1 level scoop to 80mls milk

Can be made more concentrated if symptoms persist (see manufacturer's instructions)

Frequency:

Each feed.

Routes:

PO/NG

Other:

Carobel will continue to thicken up to 4-15 minutes after mixing. Therefore it is advisable to add carobel one scoop at a time, stir well and allow to thicken, and then add more carobel until the desired consistency is achieved.

Must be stored in drug cupboard after use

Reference:

As per manufacturer's instructions

Written by: Gemma Holder (Neonatal Consultant)

CEFOTAXIME

Indications for use:

Infection – please refer to Antibiotic Policy

Neonatal Gonococcal Infection (see 'Conjuctivitis' guideline on intranet)

Preparation:

500mg vial

Reconstitute 500mg vial with 1.8 mls of water for injection to give **250mg/ml solution.**

If <2kg: Take 1ml of 250mg/ml solution and dilute to 10ml with water for injection to give 25mg/ml solution. Take required dose and infuse over 30 mins

If >2kg: Take 1ml of 250mg/ml solution and dilute to 2.5ml with water for injection to give 100mg/ml solution. Take required dose and infuse over 30 mins

Administration:

Infuse over 30 minutes,

Dosage:

Birth – up to 28 days old: 25mg/kg

Dose can be doubled in severe infections or meningitis

More than 28 days old: 50mg/kg

(do not double dose in severe infections or meningitis, frequency can be increased, see below)

Treatment of **Neisseria Gonorrhoeae**

Single dose 100mg/kg IM

If systemically unwell, treat with 50mg/kg (frequency documented below) for at least 7 days

Indication for use should ALWAYS be documented

Prescribe in dedicated antibiotic section on new prescription chart

Review culture results after 36 hours (where possible) and at most 48 hrs and ensure regular review is undertaken and the outcome documented as stipulated on prescription chart.

Frequency:

Birth – up to 28 days old:

Less than 7 days old	12 hourly
7 - 21 days old	8 hourly
22 - 28 days old	6 hourly

More than 28 days old: 8 hourly (note higher dose); can be increased to 6 hourly in severe infections and meningitis

Routes:

IV/UVC/IM (for gonococcal conjunctivitis)

Other:

Reference:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 16.01.2017]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services

CEFTAZIDIME

Indications for use:

Infection – please refer to Antibiotic Policy

Preparation:

500mg vial

Villerton (Bowmed) brand

Reconstitute 500mg vial with 4.8mls of water for injection to give **100mg/ml solution**

Fresenius Kabi brand

Reconstitute 500mg vial with 4.5mls of water for injection to give **100mg/ml solution**

Displacement value varies greatly between different products, consult package insert if a different brand is available.

Administration:

By slow bolus

Dosage:

25 mg/kg

Double dose in severe infections and meningitis

Frequency:

Less than 7 days old 24 hourly

7 - 21 days old 12 hourly

More than 21 days old 8 hourly

Indication for use should ALWAYS be documented

Prescribe in dedicated antibiotic section on new prescription chart

Review culture results after 36 hours (where possible) and at most 48 hrs and ensure regular review is undertaken and the outcome documented as stipulated on prescription chart.

Routes:

IV / UVC

Other:

Prescribe first dose to be administered as soon as possible

Subsequent doses should be prescribed 12 hrly at 02.00/14.00, 06.00/18.00 or 12.00/23.59 or 8 hrly at 02.00/10.00/18.00

Please use immediately after reconstitution and discard the remainder

Incompatible with amphotericin, dobutamine, erythromycin, fluconazole, gentamicin, midazolam, phenytoin sodium, sodium bicarbonate, vancomycin.

Decrease dose in renal failure-Refer to BNF-C and consult product literature

References:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

CEFUROXIME

Indications for use:

Infection – please refer to Antibiotic Policy

Preparation:

250mg vial

GlaxoSmithKline (Zinacef®) brand

Reconstitute 250 mg vial with 2.3ml of water for injection to give **100mg/ml**

Administration:

By bolus

Dosage:

Birth – 28 days old: 25mg/kg

More than 28 days old: 20mg/kg

Increase dose to 50mg/kg in all age groups in severe infections

Indication for use should ALWAYS be documented

Prescribe in dedicated antibiotic section on new prescription chart

Review culture results after 36 hours (where possible) and at most 48 hrs and ensure regular review is undertaken and the outcome documented as stipulated on prescription chart.

Frequency:

Less than 7 days old	12 hourly
7 - 21 days old	8 hourly
22 - 28 days old	6 hourly
>28 days old	8 hourly (may be increased to 6 hourly in severe infection)

Routes:

IV / UVC

Other:

Prescribe first dose to be administered as soon as possible

Subsequent doses should be prescribed 12 hrly at 02.00/14.00, 06.00/18.00 or 12.00/23.59 or 8 hrly at 02.00/10.00/18.00

Please use immediately after reconstitution and discard the remainder

Decrease dose in renal failure-Refer to BNF-C and consult product literature

Incompatibility:

Aminoglycosides, fluconazole, midazolam, ranitidine, sodium bicarbonate, vancomycin

Reference:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 19.08.15]
Trissel, L.A. Handbook of Injectable drugs. Available at http://www.medicinescomplete.com/mc/hid/current/ [Accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

CHLORAL HYDRATE

Indications for use:

Sedation

e.g.

- Pre procedure e.g. MRI
- Cerebral irritability
- When requiring sedation for respiratory support and other forms of sedation e.g. morphine deemed inappropriate

Preparation:

Oral suspension: 500 mg in 5 ml solution

Rectal: 50mg and 100 mg suppositories

License status:

Unlicensed Special Products

Administration:

Dosage:

*Pre- procedure:

30 – 50mg/kg 45 – 60 mins before procedure. Doses up to 100mg/kg may be used with respiratory monitoring

Other reasons for sedation:

20 – 30 mg/kg 8 hourly

NB: please repeat dose if necessary, but not more than 8 hourly. This is based on clinical practice and is outside BNF-C guidelines (caution: drug known to accumulate).

Routes:

NG / Oral / PR

Other:

Avoid in severe renal/ hepatic impairment

Try to avoid any repeat doses in preterm infants and neonates < 7 days old. Only prescribe “as required” and review after 48 hours.

References:

* BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

Guy’s and St Thomas’, Kings College and University Lewisham Hospitals Paediatric Formulary (9th Edn) London: Guy’s and St Thomas’ NHS Foundation Trust ; 2012. Available online at http://www.guysandstthomas.nhs.uk/resources/publications/formulary/paediatric-formulary-9th-edition.pdf [accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women’s Services)

CHLOROTHIAZIDE

Indications for use:	Chronic lung disease Congenital heart disease
Preparation:	Oral Suspension 250mg / 5ml
License status:	Unlicensed Special Products
Administration:	
Dosage:	10-20 mg/kg
Frequency:	Start once daily and monitor electrolytes and effect Can be increased to twice daily
Routes:	Oral/NG
Caution:	Avoid in very jaundiced babies (theoretical risk kernicterus) & in babies with liver disease. Hypokalaemia Renal impairment
Other:	Usually prescribed with Spironolactone

References: BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

CUROSURF® PORACTANT ALFA

Indications for use:

Surfactant Deficiency
See 'Surfactant – Initial management' guideline on Intranet

Preparation:

80mg/ml
Vials available: 1.5 ml containing 120mg
3 ml containing 240mg
Store in fridge

Administration:

Dosage :

Prophylaxis:
(dose 100mg – 200mg/kg)

Weight of baby (kg)	Whole vials required
0.6 – 1.2	1 x 120mg
1.2 – 2.4	1 x 240mg

Maximum combined dose 400mg/kg
(in genuine surfactant deficient lung disease 2 doses are usually required)

In established RDS an initial dose of 200mg/kg may be required.

If in doubt about how much to prescribe, please check with On Call Consultant.

Frequency:

To be given as soon as possible after birth
Can be repeated 12hrly

Routes :

ETT

Storage:

In a refrigerator but warm to room temperature before use. Gently turn upside down a few times, without shaking in order to obtain a uniform suspension

Reference:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

DEXAMETHASONE

Indications for use:

Aid weaning from ventilator in babies with chronic lung disease – ensure consent is obtained from parents and clearly documented prior to administering

Extubation in upper airway obstruction

Preparation:

Should be prescribed as dexamethasone base to minimise confusion

Oral Solution 2mg in 5ml (as dexamethasone base)

To obtain smaller doses accurately may further dilute if necessary. Take 1ml of oral solution and make up to 4ml with water for injection to give a solution containing 100 micrograms/ml

IV preparation:

Hospira brand 6.6mg/2ml (as dexamethasone base)

Check strength and preparation carefully

Prepare as per prescription label for Dexamethasone made by Hospira. Some preparations include phosphate or sodium phosphate in the drug weight: discuss with pharmacist if other preparation supplied.

Administration:

DEXAMETHASONE	**Dose**	**Frequency**
(product made by Hospira only) Take 0.3ml (1mg) of dexamethasone base 6.6mg/2ml and make up to 1ml with 0.9% sodium chloride to give 1mg/ml dexamethasone base.	Route IV	Pharmacy
Prescribers Signature	Date Commenced	Date Cancelled

Dosage :

Chronic lung disease:

10 day tapering course as follows:

60 micrograms/kg (dexamethasone base) 12 hourly for 3 days

40 micrograms/kg (dexamethasone base) 12 hourly for 3 days

20 micrograms/kg (dexamethasone base) 12 hourly for 2 days

8 micrograms/kg (dexamethasone base) 12 hourly for 2 days

There may be situations where this course is repeated or a prolonged course of low dose steroid is given. This would normally be on the advice of the Respiratory Team at Birmingham Children's Hospital and should be clearly documented in the casenotes.

Extubation in upper airway obstruction (usually given as iv bolus):

0.1mg/kg Dexamethasone base 8 hrs prior and at extubation with 3rd dose 8hrs later if symptoms.

Routes :

IV / NG / Oral

Compatibility:

Glucose 5%, 0.9% sodium chloride

Interactions:

Rifampicin, carbamazepine, phenobarbital and phenytoin enhance metabolism of dexamethasone and reduce its effect. Dexamethasone antagonises the effects of insulin. May cause hypokalaemia, caution if used concurrently with loop diuretics

incompatible with midazolam

Other:

Monitoring: Measure blood pressure before starting Dexamethasone and then daily. If an arterial line is in situ, blood pressure should be monitored continuously, otherwise non- invasive blood pressure should be used.

Blood sugar should be monitored with each gas and urine checked for glucose if blood glucose >11mmol/L

References:

*Doyle LW, Davis PG, Morley CJ, McPhee A, Carlin JB and DART study investigators. Low-Dose Dexamethasone Facilitates Extubation Among Chronically Ventilator- Dependent Infants: A Multicenter, International, Randomized Controlled Trial. *Pediatrics*. 2006;117;75 – 83

**experience from local practice

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Trissel, L.A. Handbook of Injectable drugs. Available at http://www.medicinescomplete.com/mc/hid/current/ [Accessed 19.08.15]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 19.08.15]
BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

DIGOXIN

Indications for use:

Supraventricular arrhythmias

Preparation:

Injection: 100 micrograms in 1 ml – available as 1 ml vials (Unlicensed Special Product)

250 micrograms in 1ml (2ml ampoules)

For IV doses less than 50 microgram every effort should be made to use the 100microgram/ml solution and method for preparation

Suspension: 50 micrograms in 1 ml

CHECK EACH DOSE CAREFULLY AS OVERDOSE CAN CAUSE DEATH

Administration:

DOSES BELOW ARE RECOMMENDED IN BNF-C. CONSULTANT CARDIOLOGIST MAY REQUEST DIFFERENT DOSE – THIS SHOULD BE STATED IN CASE NOTES AND ON DRUG PRESCRIPTION CHART

For intravenous infusion dilute with 0.9% sodium chloride or 5% glucose to concentration of 5micrograms/ml.

Using digoxin 100microgram/ml Dilute 1ml to 10ml using sodium chloride 0.9% to give a 10microgram/ml solution. Withdraw the dose required and further dilute to at least twice the volume containing dose to be given i.e. at least to 5microgram/ml

Using digoxin 250microgram/ml Dilute 1ml to 10ml using sodium chloride 0.9% to give a 25microgram/ml solution. Withdraw the dose required and further dilute to at least five times the volume containing the dose i.e. at least to 5microgram/ml.

Can be further diluted with sodium chloride 0.9% or glucose 5%.

Loading dose: over 30-60 minutes

Maintenance dose: over 20 minutes

NB: protect infusion from light

Oral solution must NOT be diluted (e.g. do not add to milk)

Dosage :

Oral Dose:

Less than 1.5kg initially 25 micrograms/kg/day in 3 divided doses for 24 hours, then 4 – 6 micrograms/kg daily in 1 – 2 divided doses

1.5 – 2.5kg initially 30 micrograms/kg/day in 3 divided doses for 24 hours then 4 – 6 micrograms/kg daily in 1 -2 divided doses

Greater than 2.5kg initially 45 micrograms/kg/day in 3 divided doses for 24 hours then 10 micrograms/kg daily in 1 - 2 divided doses

IV infusion Dose:

Less than 1.5kg initially 20 micrograms/kg/day in 3 divided doses for 24 hours (50% immediately, then 25% at 6 hours and 12 hours- see table below). then 4 – 6 micrograms/kg daily in 1 – 2 divided doses

1.5 – 2.5kg initially 30 micrograms/kg/day in 3 divided doses for 24 hours (50% immediately, then 25% at 6 hours and 12 hours- see table below). then 4 – 6 micrograms /kg daily in 1 – 2 divided doses

Greater than 2.5kg initially 35 micrograms/kg/day in 3 divided doses for 24 hours (50% immediately, then 25% at 6 hours and 12 hours- see table below). then 10 micrograms/kg daily in 1 - 2 divided doses

Age/weight	1st part of load (50%)	2nd and 3rd part of load, 6 and 12 hours later (25% each)
under 1.5kg	10 microgram/kg	5 microgram/kg
1.5-2.5kg	15 microgram/kg	7.5 microgram/kg
over 2.5kg	17.5 microgram/kg	8.75 microgram/kg

Start maintenance dosing 12 hours after full load complete.

Routes :

Oral / NG

IV at request of consultant cardiologist only

On Call Neonatologist can request if oral/NG route not available

Compatibility:

Sodium Chloride 0.9% or glucose 5%

Incompatibility

Amiodarone, amphotericin liposomal (Ambisome®), dobutamine, fluconazole, insulin

Other:

Trough level to be taken after one week of starting therapy,

however levels may not be stable for two weeks due to long

neonatal half life (2 – 4 days).

Levels require 0.2mls of serum or plasma at least 6 hours after last dose.

OPTIMAL RANGE = 0.8-2 micrograms/L
Increased toxicity if hypokalaemia occurs

Use reduced dose in renal failure and monitor levels closely- Refer to BNF-C and consult product literature

Erythromycin, omeprazole, gentamicin, spironolactone and trimethoprim may increase blood levels.

When switching from IV to oral route may need to increase dose by 20% to maintain the same plasma digoxin concentration, discuss with consultant

Reference:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]
Guy's and St Thomas', Kings College and University Lewisham Hospitals Paediatric Formulary (9th Edn) London: Guy's and St Thomas' NHS Foundation Trust ; 2012. Available online at http://www.guysandstthomas.nhs.uk/resources/publications/formulary/paediatric-formulary-9th-edition.pdf [accessed 19.08.15]
Stockley's Drug Interactions. Available at: http://www.medicinescomplete.com/mc/stockley/current/interactions.htm?q=phenytoin+dopamine&searchButton=Search . [accessed 19.08.15]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 19.08.15]
Trissel, L.A. Handbook of Injectable drugs. Available at http://www.medicinescomplete.com/mc/hid/current/ [Accessed 19.08.15]
BCH Digoxin Administration guide June 2013. Accessed 28/07/21

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

DOBUTAMINE HYDROCHLORIDE

Indications for use:

Hypotension (Refer to Diaphragmatic Hernia Guidelines for specific management of hypotension in this condition)

Preparation:

12.5mg in 1 ml – solution supplied in 20ml ampoules

Prepare as per prescription label (NOTE: Single, double and quadruple strength labels are available. Please select correct label)

SINGLE STRENGTH

Dobutamine

Take……mgs Dobutamine (wt in Kgs x 30) and make up to 50 mls with …….. i.e. 1ml/hour = 10 micrograms/kg/min.

Run at …… ml/hour (i.e……. micrograms/kg/min)

Signed……Date……

Administration:

Dosage :

Use starting dose 5 micrograms/kg/min increasing stepwise to a maximum of 20 microgram/kg/min

NOTE: If commencing adrenaline because baby is unresponsive to first line medications (dopamine, dobutamine and hydrocortisone) the dopamine should be weaned and stopped (as should dobutamine if possible)

A combination of all of the above may result in tachycardia, decreased filling in diastole and subsequent decreased cardiac output

Routes :

IV / UVC / CVL

Administer centrally whenever possible and must be given centrally if more concentrated than single strength

Do not infuse through UAC

Compatibility:

Sodium Chloride 0.9%

Sodium Chloride 0.45%

Glucose 10%

Glucose 5%

Incompatibility:

Aciclovir, Alkaline solutions, Amphotericin, Calcium Gluconate, Ceftazidime, Digoxin, Flucloxacillin, Furosemide, Heparin, hydrocortisone, Magnesium Sulphate, Midazolam, omeprazole, Phenytoin, Sodium Bicarbonate, THAM

References:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]
Guy's and St Thomas', Kings College and University Lewisham Hospitals Paediatric Formulary (9th Edn) London: Guy's and St Thomas' NHS Foundation Trust ; 2012. Available online at http://www.guysandstthomas.nhs.uk/resources/publications/formulary/paediatric-formulary-9th-edition.pdf [accessed 19.08.15]
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Stockley's Drug Interactions. Available at: http://www.medicinescomplete.com/mc/stockley/current/interactions.htm?q=phenytoin+dopamine&searchButton=Search . [accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

DOPAMINE HYDROCHLORIDE

Indications for use: Hypotension (Refer to Diaphragmatic Hernia guideline for specific management of hypotension in this condition)

Preparation: 40mg in 1 ml – solution supplied in 5ml ampoules

Prepare as per prescription label (NOTE: Single, double and quadruple strength labels are available. Please select correct label)

SINGLE STRENGTH

Dopamine

Take……mgs Dopamine (wt in Kgs x 30) and make up to 50 mls with …….. i.e. 1ml/hour = 10 micrograms/kg/min.

Run at …… ml/hour (i.e…… micrograms/kg/min)

Signed……Date……

License Status: Not licensed for children under 12 years

Dosage: Use starting dose 5 micrograms/kg/min increasing stepwise to a maximum of 20 microgram/kg/min

NOTE: If commencing adrenaline because baby is unresponsive to first line medications (dopamine, dobutamine and hydrocortisone) the dopamine should be weaned and stopped (as should dobutamine if possible)

A combination of all of the above may result in tachycardia, decreased filling in diastole and subsequent decreased cardiac output

Routes: IV / UVC / CVL

Administer centrally whenever possible and must be given centrally if given more concentrated than single strength

Do not infuse through UAC

Compatibility: Sodium Chloride 0.9%

Sodium Chloride 0.45%

Glucose 10%

Glucose 5%

Glucose 10% + sodium chloride 0.18%

Incompatibility: Aciclovir, Alkaline solutions, Aminoglycosides, Amphotericin
Furosemide, Insulin, Penicillins, Sodium Bicarbonate, THAM, lipid emulsion

Interactions: Phenytoin

There are reports of this drug causing severe hypotension in patients on dopamine

Other: Stop infusion if blanching develops along site of vein

Extravasation can cause dangerous ischemia

References:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 19.08.15]

Stockley's Drug Interactions. Available at: http://www.medicinescomplete.com/mc/stockley/current/interactions.htm?q=phenytoin+dopamine&searchButton=Search . [accessed 19.08.15]

Email correspondence- Jim Glare, West Midlands Medicines Information and UKDILAS

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Amar Iqbal/ Louise Whitticase (Lead Pharmacist-Women's Services)

ERYTHROMYCIN

Indications for use:

Infection – please refer to Antibiotic Policy

Preparation:

Injection: 1g vial

Reconstitute 1g vial with 20mls of water for injection to give 50 mg/ml solution. Take 1 ml and dilute to 10ml with 0.9% sodium chloride to give **5 mg/ml.** Flush with 0.9% sodium chloride after administration

Suspension: 125 mg in 5 ml

Administration:

Dosage:

IV: 10-12.5 mg/kg infused over 1 hour

Oral: 12.5 mg/kg

Frequency:

6 hourly

Indication for use should ALWAYS be documented

Prescribe in dedicated antibiotic section on new prescription chart

Review culture results after 36 hours (where possible) and at most 48 hrs and ensure regular review is undertaken and the outcome documented as stipulated on prescription chart.

Routes :

IV / Oral / NG

Other:

Prescribe first dose to be administered as soon as possible

Subsequent doses should be prescribed 12 hrly at 02.00/14.00, 06.00/18.00 or 12.00/23.59 or 8 hrly at 02.00/10.00/18.00

Reduce dose in severe renal impairment-Refer to BNF-C and consult product literature

Caution neonate under 2 weeks (risk of hypertrophic pyloric stenosis)

References:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

EYE TREATMENT

Indications for use:

1. Antibiotics for infection (see Conjunctivitis Guideline on Intranet)
2. Steroid drops post laser treatment

Administration:

Dosage:

Chloramphenicol 0.5% 1 drop each eye, 2 hourly for the first 48 hours then qds thereafter (first line, unless specified by microbiologist)Chloramphenicol 1% eye ointment each eye qds (alternative first line)

Fusidic Acid 1% twice daily (staph infections)

Following laser surgery:

*Prednisolone 0.5% 1 drop to each treated eye qds

for 5 days

Routes :

Topically to both eyes for a minimum of five days and then review (continue for 48 hours after healing)

NB: please use a separate tube of ointment for each eye to avoid cross infections. Eye drops are supplied as single use Minims®

Other:

See Conjunctivitis Guideline on Intranet for specific treatment of Gonococcal, Chlamydia and Herpetic Ophthalmia

References:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

*Local guideline for Laser Therapy for Retinopathy of Prematurity available on intranet

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

FENTANYL

CONTROLLED DRUG

Indications for use:	In accordance with premedication guidelines for elective intubations Prescribe and administer on dedicated pre-intubation prescription chart
Preparation:	50 micrograms/ml solution (as citrate) – solution supplied in 2ml ampoules Take 1ml of 50micrograms/ml solution and dilute to 10mls with 0.9% sodium chloride to give **5 micrograms/ml solution**.
License status:	Not licensed for children under 2 years old
Administration:	
Dosage:	2 micrograms/kg over 30 seconds
Routes :	IV
Compatibility:	Sodium Chloride 0.9% Glucose 5%
Other:	Can be associated with muscle rigidity in higher doses or with rapid administration, particularly in preterm neonates Order via the ward CD requisition book Store in the Controlled Drugs Cupboard and record administration and destruction in the CD record book
References:	BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

FLUCLOXACILLIN

Indications for use:

Infection – please refer to Antibiotic Policy

Preparation:

Injection: 500mg vial

Villerton (Bowmed) brand

Reconstitute 500mg vial with 4.7mls of water for injection to give **100 mg/ml solution**

Wockhardt brand

Reconstitute 500mg vial with 4.6mls of water for injection to give **100 mg/ml solution**

Suspension: 25 mg in 1 ml (usually)

Administration:

By bolus over 3-4 minutes

Dosage:

25 mg/kg

IV dose may be doubled in severe infection

100 mg/kg in suspected meningitis or osteomyelitis

Frequency:

Less than 7 days old	12 hourly
7 - 21 days old	8 hourly
More than 21 days old	6 hourly

Indication for use should ALWAYS be documented

Prescribe in dedicated antibiotic section on new prescription chart

Review culture results after 36 hours (where possible) and at most 48 hrs and ensure regular review is undertaken and the outcome documented as stipulated on prescription chart.

Routes :

IV / UVC

Oral

Other:

Prescribe first dose to be administered as soon as possible

Subsequent doses should be prescribed 12 hrly at 02.00/14.00, 06.00/18.00 or 12.00/23.59 or 8 hrly at 02.00/10.00/18.00

Incompatible with atropine , calcium gluconate, dobutamine, erythromycin lactobionate, gentamicin sulfate, midazolam, morphine sulfate
Risk of kernicterus in jaundiced neonates when high doses given parenterally
Use with caution in patients with hepatic impairment
Refer to BNF-C and consult product literature for dosing in renal impairment

References:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 20.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

FLUCONAZOLE

Indications for use:

Invasive fungal infection

Mucosal candidiasis (rarely used)

Preparation:

Injection: 2 mg in 1 ml

Suspension: 10 mg in 1 ml

Administration:

IV infusion should be given over 30 mins

Dosage:

Invasive fungal infection:

Up to 13 days of age: 12mg/kg every 72 hours, treatment continued according to response

14 – 28 days of age: 12mg/kg every 48 hours, treatment continued according to response

Over 28 days: 12mg/kg every 24 hours, treatment continued according to response

Mucosal candidacies:

Less than 2 weeks old	3 – 6 mg/kg on first day then 3 mg/kg every 72 hrs
2-4 weeks old	3 – 6 mg/kg on first day then 3 mg/kg every 48 hrs
>4 weeks old:	3 – 6 mg/kg on first day then 3mg/kg daily

Routes :

IV infusion over 30 mins/ Oral / NG (good oral absorption)

Incompatibility:

Amphotericin, Calcium gluconate, cephalosporins, digoxin, furosemide

Other:

Monitor liver function before commencing treatment and weekly thereafter to assess for signs of damage

Reduce dose in renal impairment-Refer to BNF-C and consult product literature

References:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 23.03.17]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: (Lead Pharmacist-Women's Services)

FLUMAZENIL

Indications for use:	Reversal of sedative effects of benzodiazepines
Preparation:	100 microgram/ml available in 5ml amp
License status	Not licensed for use in children under 1 year
Administration:	
Dosage:	10 micrograms/kg over 15 seconds
Frequency:	Can be repeated at 1 minute intervals if required
Routes :	IV/UVC
Other:	Do not give this medicine by IV injection via a line being used for an infusion containing a medicine additive without first stopping the running infusion. Flush the line both before and after giving the injection.

References:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 20.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

FOLIC ACID

Indications for use:	Babies with haemolytic disease
Preparation:	2.5mg in 5ml syrup
Administration:	Start if DAT 2+ positive or higher Should be discharged home on folic acid and will be reviewed in outpatient clinic
Dosage :	1mg once daily Prescribe as a TTO and should be continued until there is no further evidence of haemolysis and the baby is discharged from follow up clinic
Routes :	Oral/ NG
Other:	Prescribe at 14.00
Reference:	Rath, MEA, Smits-Wintjens VEH, Walther, FJ, Lopriore E. Hematological morbidity and management in neonates with haemolytic disease due to red cell alloimmunization. 2011 Early Human Development (87) 583 - 588

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

FUROSEMIDE

Indications for use:

Controlling symptoms of heart failure

Oliguria

During transfusion of blood products if:

- PDA present
- On regular Furosemide
- Baby is felt to be at risk of volume overload

Preparation:

Injection: 20 mg in 2 ml

Suspension: 20 mg or 40mg in 5 ml

Administration:

Can be administered undiluted
To aid slow administration can be diluted to any suitable volume with sodium chloride 0.9%, e.g. 1mg in 1mL, or 2mg in 1mL

For Continuous IV infusion:

Take 20mg of Furosemide 10mg in 1ml and make up to 20mls with sodium chloride 0.9% to give **Furosemide 1mg/ml solution**

Dosage:

IV bolus: 1mg/kg over 5-10 mins at a usual rate of 100 microgams/kg/min (not exceeding 500 micrograms/kg/min)

Continuous IV infusion(at Consultant request only): (Note no dosing information in BNFc for neonates only **for Child >1month**)

Give **Furosemide 1mg/ml** solution using an infusion pump at a rate of 0.1mg/kg/hr (100micrograms/kg/hour) titrated against urine output. Maximum 0.4mg/kg/hr..

Should have at least 6 hourly gases to monitor sodium trend

Note information below

Oral: 1mg/kg

Start once daily and monitor electrolytes and effect.

Can be increased to 12 hourly if required in babies with a corrected gestational age of >31 weeks

Routes:

IV / Oral / NG

IV: Do not allow to mix with any other medicines or infusions. Precipitation can occur if mixed with any IV fluid (such as glucose or glucose sodium chloride mixtures) with a pH <5.6, so it should always be separated by a 1ml 'bolus' of 0.9% sodium chloride or water when given IV

Interactions:

Increases risk of aminoglycosides ototoxicity

Risk of hypokalaemia

Furosemide liquid (Frusol®) contains 10% v/v alcohol

Furosemide is unstable in acid solutions and may precipitate out of solutions of low pH
Do not dilute furosemide injection with glucose injections.

Other:

Existing line must be flushed with 0.9% sodium chloride prior to administration or use a separate line. Must not come in to contact with any other infusions made up in glucose

Preferably administer via a central venous access device to avoid potential venous irritation as the preparation has a high pH.[8] If a central venous access device is unavailable a risk benefit analysis should be made on an individual patient basis. If given peripherally, the insertion site must be monitored closely for phlebitis using a recognised infusion phlebitis scoring tool.

Monitoring:

Monitor blood pressure, fluid balance, electrolytes (sodium and potassium) and creatinine.

References:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 06.03.17]
Phelps SJ, Hagemann TM, Kelley RL, Thompson AJ, editors. The Teddy bear book: Pediatric injectable drugs. 10th ed. Bethesda, Maryland: American Society of Heath-System Pharmacists; 2013.

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

GAVISCON INFANT®

Indications for use:

Gastro-oesophageal reflux

(in babies 34 weeks and older only)

Gaviscon Infant should not be used in conjunction with Carobel

Preparation:

Prepare as per prescription label:

1 'dose' is half a dual sachet.

Drug Approved Name	**DOSE**	**FREQUENCY**
Infant Gaviscon (Sodium alginate 225 mg, Magnesium Alginate 87.5 mg per each 'dose')	See Directions	With Feeds
	Route	**Pharmacy**
Add 1 'dose' (i.e. half dual sachet) to 5 mls water. Add 1 ml of this solution to each 25 ml of feed OR add 1 'dose' to not less than 115ml of feed		
Prescriber Signature	Date Commenced	Date Cancelled

Administration:

Infants receiving bottle/NG feed: Mix with feed as prepared above

Infants receiving breast feed:

- Mix each sachet with 5ml of cooled boiled water until a smooth paste is formed
- Add another 10ml of cooled boiled water and mix
- For breast fed infants give Gaviscon Infant part way through each feed using a spoon or feeding bottle. Give appropriate amount depending on expected volume of feed
- If NG top up is required, no further gaviscon should be given

Dosage:

1 dose (1/2 dual sachet) to not less than 115 mls feed or give equivalent dose in water before breast feed

Use with caution with Breast Milk Fortifier and Nutriprem 1

Route:

Oral / NG

Each paired sachet contains enough powder for 2 standard 'doses'

Other:

Caution renal impairment (high sodium content may add to risk of hypernatraemia)

References:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

Neonatal Formulary: Drug Use in Pregnancy and the First Year of Life (6th Edn) London: Wiley-Blackwell;2011

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

GENTAMICIN

Indications for use: Infection – please see Antibiotic Guidelines

Preparation: 20mg in 2 ml vial

Administration: By slow bolus

Dosage & Frequency:

< 7 days of age : ALL gestations 5mg/kg **36 hourly**

≥ 7 days of age : <32 weeks CGA: 5mg/kg **36 hourly**
≥ 32 weeks CGA 5mg/kg **24 hourly**

First trough level pre 2nd dose <2mg/L, subsequent levels <1mg/L

Prescribe on dedicated Gentamicin prescription chart

Indication for use must <u>always</u> be documented
Review culture results after 36 hours (where possible) and at most 48 hours and either discontinue or indicate length of course on prescription chart

Please prescribe subsequent doses at routine drug times: 02.00, 06.00, 10.00, 12.00, 1400, 18.00, 22.00 or 23.59 unless on TC when drug times are 11.00 and 23.00

Routes: IV / UVC

Other:

<u>Levels – levels are done in Microbiology at BCH at 10.30 and 16.00. They need to reach the BWH lab by 12.00 to ensure they make the 16.00 run. Levels are usually telephoned through to the NNU by 17.00</u>
<u>URGENT requests may be taxied to BCH on request of Consultant with shift leader authorisation</u>

Take trough level pre 2nd dose (give 2nd dose if renal function satisfactory), then take level every 3rd dose unless more frequent monitoring is indicated

First trough level (pre 2nd dose) :
- Level 2 – 3mg/L increase dosing interval
- Level above 3mg/L STOP gentamicin, take pre-dose level at the time the next dose would have been due and wait for results before administering further dose

Subsequent trough levels:
- Level 1 – 2mg/L increase dosing interval
- Level above 2mg/L STOP gentamicin, take pre-dose level at the time the next dose would have been due and wait for results before administering further dose

If there is no significant renal impairment the dose may be given without level being available (as per NICE guidelines) but this should be documented
'Peak' or post dose levels are not routinely required unless specific indications (see BNF for Children)
N.B. If level greater than 4 mg/L or baby has received greater than 7 days treatment will need enhanced hearing follow up
Use vial immediately and discard the remaining solution. Store vials at room temperature

Interactions:

Increased toxicity with cephalosporins, vancomycin, Furosemide and amphotericin B.
Preferably not given with potentially ototoxic diuretics e.g. furosemide. If concurrent use unavoidable administration should be separated by as long a period as practicable
Aminoglycosides enhance effects of non-depolarising muscle relaxants (e.g.rocuronium) and depolarising muscle relaxants (e.g. suxamethonium).
Possible increases level of digoxin

Incompatible with: aciclovir, amphotericin, cephalosporins, erythromycin, flucloxacillin, furosemide, heparin, lipid, penicillins

Gentamicin activity may be impaired by beta-lactam antibiotics. However gentamicin may be used with penicillins and cephalosporins but the injections should be given at separate sites

Caution:	**Renal impairment**

Reference:

NICE Guidelines 2012: Antibiotic use in early-onset neonatal infections
BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 24.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

(ORAL) GLUCOSE GEL

Indications for use:

- Blood glucose 1-1.9mmol/l in infant with no abnormal clinical signs
- Infants ≥ 35 weeks' gestational age and younger than 48 hours after birth

Must be used in conjunction with a feeding plan

For babies with severe hypoglycaemia (BG <1mmol/l) use oral dextrose gel only as an interim measure while arranging for urgent medical review and treatment with IV

Preparation:

400mg per 1g (40% gel)

Administration:

Dosage:

200mg/kg glucose gel (0.5 ml/kg of 40% glucose gel)

Up to two doses given 30 minutes apart per episode of hypoglycaemia and a maximum of six doses of buccal glucose gel in 48 hours.

If more than one dose is required, baby should be discussed with the neonatal team and it is advisable for the baby to be examined before the 3rd dose is administered.

Weight of Baby (kg)	Volume of gel (ml)
1.5 – 1.99	1
2 – 2.99	1.5
3 – 3.99	2
4 – 4.99	2.5
5 – 5.99	3
6 – 6.99	3.5

- Draw up correct volume of 40% glucose gel using a 2.5 or 5ml oral / enteral syringe
- Dry oral mucosa with gauze, gently squirt gel with syringe (no needle) onto the inner cheek and massage gel into the mucosa using latex-free gloves
- Offer a feed preferably breast milk, immediately after administering glucose gel
- Repeat blood sugar measurement as requested

Routes:

Buccal

Reference:

Identification and Management of Neonatal Hypoglycaemia in the Full term Infant – A Framework for Practice BAPM April 2017

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

GLUCOSE SOLUTIONS (CONCENTRATED)

Indications for use:

Hypoglycaemia

(a hypoglycaemia screen should be undertaken in unexplained hypoglycaemia prior to increasing glucose concentration. Stickers are available detailing tests required for hypoglycaemia screen)

Preparation:

Prepare as per prescription labels:

12.5% Glucose
Take 500mls of 10% glucose and remove 31.5 mls. Add 31.5mls of 50% glucose.

15% Glucose
Take 500mls of 10% glucose and remove 62.5 mls. Add 62.5mls of 50% glucose.

20% Glucose
500ml bag available as stock (Baxter)

Administration:

Centrally via UVC/CVL

Dosage:

To be used when sugars not controlled on 10% Glucose infusion.

Other:

The above percentages made will be **approximate** due to an **overage** in all manufactured bags. Overage is designed to ensure that each bag contains the designated volume plus enough fluid to prime a giving set.
The manufacturer's target fill volume for a 500mL Baxter Viaflo® infusion bag is 530mL. The product licence limits allow a 500mL bag to contain between 520mL and 540mL.
Based on the product licence limits, and using the above methods, the concentration of glucose produced will vary between the following range:

Target Glucose Strength %w/v	Actual Glucose Strength %w/v		
	500mL Bag	520mL Bag	540mL Bag
12.5 % w/v	12.5	12.4	12.3
15% w/v	15	14.8	14.6

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

GLYCEROL (GLYCERIN) SUPPOSITORIES

Indications for use:	Constipation
Preparation:	Suppositories: 1g contains gelatin 140mg, glycerol 700mg, purified water
Administration:	Moisten with water before insertion
Dosage:	¼ g - ½ g as required
Frequency:	Usually not required more than twice in 24 hours
Routes :	PR
Other :	
Reference:	Dose not available for preterm babies in BNFc. Above based on experience at BWH

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

GLYCERYL TRINITRATE (GTN)

Indications for use:	Severe peripheral tissue ischaemia caused by vasospasm secondary to peripheral arterial catheterisation or extravasation of vasopressors
Preparation:	0.4% ointment patches 25 mg (releasing 5 mg per 24 hours)
Administration:	Ointment: Apply thin film to affected area Patch: applied to the ischaemic area for one hour. As it is a patch, it may not cover edges of the affected area.
Dosage:	Ointment: 2mg i.e. 0.5ml of 0.4% ointment drawn up into 1ml syringe. Repeat 8 hourly if necessary Patch: 25 mg (releasing 5 mg per 24 hours) applied to the ischaemic area for one hour.
Routes :	Topically to affected area
Other:	Monitor carefully for hypotension or tachycardia Monitor methaemoglobin levels Absorption and systemic effects are likely to be most marked in babies with very thin skin
References:	North Trent Neonatal Network Clinical Guideline. 'Extravasation injuries in neonates'. Dr P Adiotomre, L Elliot. Written March 2005; updated Jan 2013

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

HEPARIN SODIUM

Indications for use:

To maintain patency of arterial lines

To maintain patency of broviac lines when a continuous infusion is not running

Preparation:

Heparin sodium 1000 units/ml

For arterial lines:

Add 500 units of heparin to 500mls of 0.45% sodium chloride to give concentration of 1 unit/ml. Run at 0.5mls/hr (0.5 unit/hr)

To maintain broviac line patency:

A 10 unit/ml preparation is available from Boots on a named patient basis

Administration:

*For arterial lines:

Dosage:

0.5mls/hr of above solution = 0.5unit/hr of heparin

**To maintain patency of broviac line:

Heplock twice weekly with 0.4mls of 10units/ml heparin sodium instilled into line. DO NOT FLUSH LINE.

Frequency :

For arterial lines:

Change solution every 24 hours

To maintain patency of broviac line:

Twice weekly

Route:

UAC/ IA

Broviac lines

Caution:

Only use 0.9% sodium chloride if concerns re hyponatraemia

Use with caution in uncorrected thrombocytopaenia platelets<50

if concerns re patency 1000 units to 500ml may be used

References:

Neonatal Formulary: Drug Use in Pregnancy and the First Year of Life (6th Edn) London: Wiley-Blackwell;2011
**Taken from Birmingham Children's Hospital recommendations for Heplocking Broviac Lines
BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 24.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

HUMAN MILK FORTIFIER (previously known as Breast Milk Fortifier)

Indications for use:

To provide recommended nutritional intake and improve growth in pre-term babies receiving breast milk
SEE FEEDING GUIDELINES FOR FULL CRITERIA FOR USE
Babies born at <34 weeks; to commence when on 150ml/kg/day

When babies reach 2kg please discuss with dietitian if continued use indicated.

If <2kg and < 40 weeks corrected gestation at discharge please discuss with dietitian

You MUST discuss with nutrition team if you feel a term baby or >2kg requires Human Milk Fortifier before prescribing

Preparation:

Cow and Gate 2.2g sachets
Each sachet contains (in addition to a range of vitamins and minerals)
8 kcal
0.6g protein
1.4g carbohydrate
18mg (0.8mmol) sodium

Administration:

Dosage:

For Tube or bottle feeding: Add the contents of one sachet (2.2g) to every 50ml of warm human milk (approx 37°c).

If less milk is available, make a HMF concentrate as follows:

- Mix 1 sachet with 5ml of EBM
- Place 1ml of this concentrated HMF solution into a feeding bottle and make UP TO 10mls with EBM (note: ratio 1ml HMF concentrate, 9ml EBM for EVERY 10ml feed required… 2ml HMF concentrate made up to 20ml with EBM etc etc)
- Discard remaining HMF concentrate solution

Swirl gently until dissolved completely.

If breast feeding: mix sachet with 3 – 5mls of expressed breast milk and administer using, breast shield, teat or syringe. Give immediately prior to breast feed so that it is diluted in the stomach with breast milk.

To calculate number of sachets to give/ day (equivalent to 1 sachet to 50ml feed) –

- eg. Breast fed baby weighing 1.5kg. assume taking 180ml/kg/d at the breast = 180 x 1.5 = 270ml/d = 270ml/50ml = 5.4 sachets. Round to the nearest whole sachet. Therefore give 5 sachets spread evenly throughout the day as above.

Frequency:

With feeds

Routes:

NG/ oral

Other:

It should be ideally added to milk immediately prior to giving feed

If not administered immediately, fortified breast milk must be refrigerated at temperature 2 – 4^0C and used within **12 hours**
Discard any unused fortified breast milk after 12hours.

USE WITH CAUTION IN BABIES RECEIVING DEXAMETHASONE DUE TO THE CATABOLIC EFFECTS OF STEROIDS (Monitor urea)

Written by: Gemma Holder (Neonatal Consultant), Sara Clarke (Neonatal Network Dietitian)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

HYALURONIDASE

Indications for use:

Treatment of extravasation injury

NB: **Hyaluronidase is not recommended in the extravasation of vasoconstrictive medication such as Dopamine, adrenaline and noradrenaline since the vasoconstriction could extend with its use. It is also contra- indicated when the site of extravasation appears to be infected**

Use not advisable in extreme preterm infants

Preparation:

1500 unit ampoule

Dissolve 1500 units ampoule in 3 mls of water for injection to give a solution containing **500 units/ml**

Administration:

Dosage:

500 -1000 units

Routes:

1. Inject 500 - 1000 units subcutaneously around the periphery of the extravasated site using aseptic technique (can inject via the tissued cannula if still in place)
2. Make 3 - 4 small incisions with a scalpel around the periphery of the area of extravasation
3. Using a yellow cannula inject 0.9% sodium chloride through the subcutaneous space in 25 - 100 mls aliquots through each incision in turn. The sodium chloride should exit freely through the remaining incisions
4. Massage the excess fluid towards the incisions if the limb becomes oedematous during the procedure
5. Cover the affected area with a jelonet dressing after the procedure for 24 – 48 hours

References:

Neonatal Formulary: Drug Use in Pregnancy and the First Year of Life (6th Edn) London: Wiley-Blackwell;2011

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

HYDROCORTISONE

Indications for use:

Prevention of CLD in all babies <28 weeks gestation (From Premiloc study)

Hypotension resistant to inotropic treatment and volume replacement

Adrenal insufficiency

Preparation:

Supplied as 100 mg powder in a vial (as sodium succinate)

Reconstitute powder with1.9 ml of water for injection to give a concentration of 50 mg / ml and shake vial until solution is clear. Take 0.2 ml and make up to 10 ml with 0.9% sodium chloride or 5% glucose to make a solution of 1 mg /ml.

Take required amount and give by slow IV injection over 3-5 minutes or infuse over 30 minutes.

Administration:

Dosage:

Routine low dose hydrocortisone in all babies <28 weeks gestation (to start as soon as possible after delivery and must be initiated within 24 hours of birth):

Day 1 (day of birth) –day 7: 0.5mg/kg **12 hourly** then

Day 8-10: 0.5mg/kg **24 hourly** then stop.

If baby requires treatment for hypotension with hydrocortisone within this 10 day regimen, revert to hypotension dose until blood pressure improves, then return to low dose hydrocortisone regimen (with appropriate weaning if necessary) to complete a **total** of 10 days hydrocortisone treatment

Hypotension

2.5mg / kg

Repeat if necessary after 4 hours then same dose every 6 hours for 48 hours or until blood pressure recovers

Reduce dose gradually over at least 48 hours.

***Hypotension for babies receiving therapeutic hypothermia:**

1mg/kg 6 hourly

Adrenal Insufficiency

Dose as advised by endocrine team

Routes :

IV. over 3-5 minutes

Other:

Monitor blood sugars due to risk of hyperlycaemia

Check blood pressure at least once daily (more frequently if being used to manage hypotension)

Cautions:

Steroid use increases the risk of fungal infection, and increases the risk of focal gut perforation, especially if the baby also receives treatment to aid duct closure

Stop hydrocortisone if gut perforation is confirmed

Paracetamol should be first choice for medical closure of PDA if baby receiving hydrocortisone. Ibuprofen and hydrocortisone must not be prescribed concurrently.

References:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 07.06.2021]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 07.06.21]

Baud O, Trousson C, Biran V et al Two year developmental outcomes of extremely preterm infants treated with early hydrocortisone: treatment effect according to gestational age at birth Arch Dis Child Fetal Neonatal Ed 2019; 104: F30 – F35

** Local Guideline: Therapeutic Hypothermia as a Neuroprotective Intervention for Neonatal Hypoxic Ischaemic Encephalopathy – Procedural Document. 2010. Dr Archana Mischra, Dr Melanie Sutcliffe

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

HYOSCINE HYDROBROMIDE PATCHES

Indications for use:	Excessive respiratory secretions
Preparation:	1mg patches (releasing 1mg/72hours)
License status:	Not licensed for use in excessive respiratory secretions
Administration:	
Dosage:	250 micrograms (1/4 patch) NB: not licensed in babies
Frequency:	Change every 72 hours
Routes:	Transdermal Rotate sites as plaster can irritate skin
Other:	Apply to dry, hairless skin behind ear To obtain ¼ patch, either cut with scissors along full thickness ensuring membrane not peeled away, or cover portion to prevent contact with skin Wash hands after handling and wash application site after removing
Reference:	BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

IBUPROFEN (PEDEA®) **TWO DIFFERENT BRANDS ARE ON THE MARKET SINCE SEPTEMBER 2013- check label and preparation carefully.

Indications for use:

Treatment of haemodynamically significant patent ductus arteriosus in preterm newborn infants <34 weeks gestational age.

Preparation:

2ml ampoule of clear, colourless to slightly yellow

Each 2ml ampoule contains 10mg Ibuprofen

NOTE different concentration to NeoProfen®*

Compatibility:

Sodium Chloride 0.9%

5% glucose

It is preferable to give the preparation undiluted

Dosage:

3 doses 1st dose 10mg/kg

2nd & 3rd dose 5mg/kg

Flush the infusion line before and after administration over 15 minutes, with 1.5-2mL sodium chloride 0.9% or glucose 5%, to avoid contact with any acidic solution

Routes:

IV infusion over 15 minutes, 24 hourly for 3 doses

Interactions:

Refer to Appendix 1 of BNF for Children for full list of drug interactions with NSAIDs

Other:

DO NOT ADMINISTER IF THE PATIENT HAS:

- Low platelets
- DIC
- Renal failure
- NEC
- Life threatening infection
- Marked unconjugated hyperbilirubinaemia
- Pulmonary hypertension

IF PLATELETS ARE <50 AND URINE OUTPUT ≤0.5ML/KG/HR, DISCUSS WITH CONSULTANT PRIOR TO GIVING DOSE.

Monitor weight, U&E's, platelets and urine output

A second course of 3 doses as above may be given if duct does not close 48 hours after last dose

Do not infuse with any other medicines or infusion fluids

Reference:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]
Pedea 5 mg/ml solution for injection SPC Available at http://www.medicines.org.uk/emc/medicine/20804 [Accessed 24.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

INSULIN (soluble)

Indications for use:

Hyperglycaemia

- Consider when 2 blood sugars at least 2 hours apart are above 14 or above 12 in association with glycosuria 2%
- May be appropriate to reduce percentage of glucose being delivered if requiring additional infusions i.e. from 10% to 5% (but do not compromise nutrition by stopping parenteral nutrition)

For use in hyperkalaemia – see next page

NB: first administer 0.5ml/kg of calcium gluconate 10% in hyperkalaemia

Preparation:

100 units in 1 ml – available as 10 ml vial Human Actrapid® insulin

Hyperglycaemia

Prepare as per prescription label (Single and double strength labels are available. Please ensure correct label is chosen)

INSULIN MUST BE DRAWN UP VIA AN INSULIN SYRINGE

Add insulin to diluent volume and invert syringe several times to ensure even mixing of insulin.

Insulin adheres to plastic. Consistent glucose control will not be achieved for several hours unless delivery tubing is first flushed with at least **20mls fluid**

SINGLE STRENGTH INSULIN INFUSION

Step 1: Take 5 units Human Actrapid® insulin (short acting) and make up to 50ml ……% sodium chloride.

This will give **0.1 units/ml i.e. 0.5ml/kg/hr = 0.05units/kg/hr**

Run infusion at……ml per hour.

Represcribe and change infusion after 24 hours

Signed…….

Date……

Insulin prescriptions must include the term 'units' next to the dose of insulin. Abbreviations such as "U" or "IU" must not be used

Monitor serum potassium and ensure close monitoring of blood glucose

Dosage:

Start at 0.05 units/kg/hour

Check blood glucose 1 hr after starting insulin and 1 hr after every change in infusion rate

Continue to check glucoses hourly until within goal range for at least 6-hours with no dosing adjustments required. Once this criteria is met, may space glucose checks to every 4 hours while on stable drip dosing
If a change to either insulin dose or glucose infusion rate is made, the glucose should be checked hourly for at least 6 hours as above

Blood Glucose	**Insulin Infusion Rate**
>8mmol	Increase infusion rate in steps of 0.05 – 0.1 unit/kg/hr. Rate of increase will be dependent on rate of fall in blood glucose
6 – 8mmol/l	Maintain at current rate
>4 - <6mmol	Reduce infusion rate in steps of 0.05 – 0.1 unit/kg/hr to maintain blood glucose above 4mmol/l. Rate of reduction will be dependent on rate of fall in blood glucose
4mmol/l or less	Stop infusion and re- check blood glucose after 1 hour

Dose required Unit/kg/hr	Infusion Rate (ml/kg/hr) **NB - Multiply number by weight (kg)**	
	Single Strength	**Double Strength**
0.05	0.5 (x weight)	0.25 (x weight)
0.1	1 (x weight)	0.5 (x weight)
0.15	1.5 (x weight)	0.75 (x weight)
0.2	2 (x weight)	1 (x weight)
0.25	2.5 (x weight)	1.25 (x weight)
0.3	3 (x weight)	1.5 (x weight)
0.35	3.5 (x weight)	1.75 (x weight)
0.4	4 (x weight)	2 (x weight)

Route: IV/UVC

Preferably given via peripheral iv as incompatible with dopamine, also need to be aware of dead space in line if given via a long line

Do not administer a bolus infusion via line insulin is running on

Compatibility: Sodium Chloride 0.9%

Incompatibility: Incompatible with digoxin, **dopamine**, noradrenaline, ranitidine, rocuronium
Insulin can be added to a line containing midazolam or morphine

Storage: Unopened Insulin vials should be kept refrigerated. Once opened should be kept at room temperature and can be stored for 4 weeks. Each vial should be for single patient use. Prepare a new solution every 24 hours

Reference:

Semin Fetal neonatal Med.2005 Aug;10(4):377 – 87. Hyperglycaemia and the very preterm baby. Hey E
Neonatal Formulary: Drug Use in Pregnancy and the First Year of Life (6th Edn) London: Wiley-Blackwell;2011
Guy's and St Thomas', Kings College and University Lewisham Hospitals Paediatric Formulary (9th Edn) London: Guy's and St Thomas' NHS Foundation Trust ; 2012. Available online at http://www.guysandstthomas.nhs.uk/resources/publications/formulary/paediatric-formulary-9th-edition.pdf [accessed 24.08.15]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 24.08.15]
Trissel, L.A. Handbook of Injectable drugs. Available at http://www.medicinescomplete.com/mc/hid/current/ [Accessed 24.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

INSULIN (soluble)

Indications for use:

Hyperkalaemia

Refer to addendum 2 and full guidelines on intranet

Ensure ECG monitoring is in situ

Hyperglycaemia – see previous entry

Use prescription label

Preparation:

100 units in 1 ml – available as 10 ml vial Human Actrapid® insulin

Step 1:

Draw 1ml of 100units in 1ml Human actrapid® insulin into an insulin syringe and make up to 10ml using 0.9% sodium chloride to give 10 unit in 1ml solution.

Step 2:

Add 5 units (0.5ml of 10units/ml) solution to 500mls of 10% glucose. Run 10ml/kg of this solution over 10 minutes

Dose:

0.1unit/kg with 1g/kg of glucose simultaneously over 10 minutes

Insulin prescriptions must include the term 'units' next to the dose of insulin. Abbreviations such as "U" or "IU" must not be used

Blood sugars **must** be monitored before, during and after infusion. Check blood sugar level 5 mins after completing the infusion, then every 15 mins for the first hour, then hourly for a further 3 hours if stable. Watch for late hypoglycaemia and refer to senior medical staff if any concerns.

Potassium levels should be re-checked immediately post infusion and at regular intervals for four to six hours

Route:

IV/UVC

Compatibility:

Sodium Chloride 0.9%

10% glucose

Insulin can be added to a line containing midazolam or morphine

Incompatibility:

Incompatible with digoxin, **dopamine**, noradrenaline, ranitidine, rocuronium

Storage:

Unopened Insulin vials should be kept refrigerated. Once opened should be kept at room temperature and can be stored for 4 weeks. Each vial should be for single patient use.

Interactions:

Reference:

Birmingham Children's Hospital Injectable Medicine Guide. R Isaac. Version 1.0.2 May 2012
Neonatal Formulary: Drug Use in Pregnancy and the First Year of Life (6th Edn) London: Wiley-Blackwell;2011
Guy's and St Thomas', Kings College and University Lewisham Hospitals Paediatric Formulary (9th Edn) London: Guy's and St Thomas' NHS Foundation Trust ; 2012. Available online at http://www.guysandstthomas.nhs.uk/resources/publications/formulary/paediatric-formulary-9th-edition.pdf [accessed 25.08.15]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 25.08.15]
Trissel, L.A. Handbook of Injectable drugs. Available at http://www.medicinescomplete.com/mc/hid/current/ [Accessed 25.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

ISOPRENALINE HYDROCHLORIDE

Indications for use:

Bradyarrhythmia or heart block

Preparation:

Isoprenaline **sulfate** 50microgram/ml - 20 x 2.15ml amps
50microgram isoprenaline sulfate = 44.5microgram isoprenaline hydrochloride

Care as other strengths exist

Most texts express doses in terms of isoprenaline **hydrochloride**. Therefore this guide advises how to dilute isoprenaline sulfate to equivalent strengths of isoprenaline hydrochloride.
Isoprenaline sulfate 1.125mg is equivalent to isoprenaline hydrochloride 1mg.

Dose:

50-500 nanograms/kg/min (0.05-0.5 microgram/kg/min) isoprenaline hydrochloride by continuous IV infusion
Titrate infusion rate according to clinical response and/or side effects. May increase dose every 2-3 minutes until appropriate response obtained.

Take**……ml** Isoprenaline sulfate **50micrograms/ml** (wt in Kgs x 6.75)
and make up to 50 ml with 10% glucose (also compatible with glucose 5% and sodium chloride 0.9%)
Run at 0.5-5 ml/hour (i.e 50-500 nanograms/kg/min of isoprenaline hydrochloride
Signed……Date……

Preparation takes conversion from sulfate to hydrochloride into account.

Route:

Central line

Compatibility:

Adrenaline, Dobutamine, Dopamine, Morphine, Midazolam, Noradrenaline

Incompatibility:

Furosemide

Storage:

Protect unopened ampoules from light.

Other:

Example calculation for 2kg baby demonstrating conversion from sulfate to hydrochloride salt

Take **13.5ml** Isoprenaline sulfate 50micrograms/ml =675micrograms isoprenaline sulfate
and make up to 50 ml with diluent =13.5micrograms/ml isoprenaline sulfate
Run at 0.5-5 ml/hour =6.75-67.5micrograms/hour isoprenaline sulfate
=3.375-33.75micrograms/kg/hour isoprenaline sulfate
=3375-33750nanograms/kg/hour isoprenaline sulfate
=56.25-562.5nanograms/kg/min isoprenaline sulfate

50microgram isoprenaline sulfate = 44.5microgram isoprenaline hydrochloride
=50-500nanongrams/kg/min isoprenaline hydrochloride

Possible Adverse Effects

1. Hypotension
2. Arrhythmias
3. Decreased perfusion to kidney, heart, brain.
4. Tremors, irritability.
5. Gastrointestinal disturbances (nausea, vomiting and diarrhoea).
6. Myocardial necrosis.

Special Considerations

1. Titrate infusion rate according to clinical response and/or side effects. May increase dose every 2-3 minutes until appropriate response obtained.
2. Hypovolaemia, metabolic acidosis should be corrected before infusion commences.
3. Simultaneous administration with adrenaline may lead to serious arrhythmias.

Monitoring:	Continuous heart rate, ECG and blood pressure Monitor for hypoglycaemia – stimulates insulin secretion
Reference:	http://www.adhb.govt.nz/newborn/DrugProtocols/IsoprenalinePharmacology.htm NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 11.04.17] Guy's and St Thomas', Kings College and University Lewisham Hospitals Paediatric Formulary (9th Edn) London: Guy's and St Thomas' NHS Foundation Trust ; 2012. Available online at http://www.guysandstthomas.nhs.uk/resources/publications/formulary/paediatric-formulary-9th-edition.pdf [accessed 24.07.15] Neonatal Formulary: Drug Use in Pregnancy and the First Year of Life (6th Edn) London: Wiley-Blackwell;2011

Written by: Louise Whitticase (Lead Pharmacist-Women's Services)
Checked by: Gemma Holder

JOULIES PHOSPHATE

Indications for use:

Prevention of osteopenia of prematurity as per guideline below

- Prescribe for all babies≤30 weeks gestation and/or <1500g receiving unfortified breast milk (no routine supplementation required for those babies receiving fortified breast milk or preterm/specialist formula)
- Regardless of feed type, send paired P3 and urine for urinary tubular phosphate reabsorption (TRP) at the following phosphate levels:
- ≤33+6 weeks at birth: phosphate <1.8mmol
- 34 weeks or greater at birth: phosphate <1.4mmol
  If TRP >95% start phosphate supplementation
- Babies at particular risk of osteopenia include those receiving long term diuretics, steroids or PN >4 weeks duration

Preparation:

approx 1mmol per ml (Unlicensed Product)

Administration:

Dosage:

Start supplementation when babies are 7 days old or receiving at least 50% enteral feeds (whichever is later).

Initially 0.5mmol/kg 8 hourly

Dose should be increased if phosphate remains low and TRP >95%.

Increase to 0.75mmol/kg 8 hourly (max 1mmol/kg 8 hourly)

Stop prior to discharge if phosphate >1.4 and TRP >95%

Routes:

Oral/NG

Prescribe at 06.00, 14.00 and 22.00

Compatibility:

Prescribe at different times to Calcium supplements

Other:

If baby is started on Human Milk Fortifier/ pre-term formula joulies phosphate should be reviewed and discontinued if phosphate is in therapeutic range

Note PN contains phosphate, routine joulies supplementation should be started when on Vamin <50ml/kg/day. If phosphate low, may be commenced when on at least 30mls/kg/day feed and confident feed is being absorbed

Reference:

Adapted from ESPGHAN. Enteral Nutrient Supply for Preterm Infants: Commentary from European Society for Paediatric Gastroenterology, Hepatology and Nutrition Committee on Nutrition. JPGN 2010; 50:1-9

Harrison CM et al. Osteopenia in preterm infants *Arch Dis Child Fetal Neonatal Ed* 2013;**98**:F272-F275

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

LaBiNIC® (PROBIOTICS)

Indications for use:

- All babies born < 32 weeks gestation should be commenced on LaBiNIC® when receiving 20mls/kg/day enteral feeds, unless they have a stoma.
- In babies with stomas, LaBiNIC® should be commenced when receiving 50mls/kg/day enteral feeds
- LaBiNIC® should be discontinued if enteral feeds are stopped for any reason and restarted when the baby is receiving 20mls/kg/day enteral feeds (unless they have a stoma)
- LaBiNIC® should be stopped when the baby reaches 34 weeks corrected gestational age

Preparation:

LaBiNIC® drops

Liquid formulation containing lactobacillus acidophilus, bifidobacterium infantis and bifidobacterium bifidum 1.5 million colony forming units (cfu) per 0.16ml

Although this is classed as a foodstuff and not a licensed medication, it should be prescribed on the drug chart and be checked by 2 trained nursing staff prior to administration

Dosage:

0.16ml once daily immediately followed by milk feed

Administration:

Always shake the bottle prior to use

Prescribe at 18.00

LaBiNIC is considered a food supplement and not a drug, and therefore does not undergo the same QC/QA processes as drugs.

Details of administration MUST be recorded in the LaBiNIC® folder on the drug trolley to detail the batch given at each dose

Routes:

Oral/NG

Compatibility:

Do not mix with other medicines

Other:

As LaBiNIC is an oily suspension a milk feed should be given straight after to 'flush' the dose through the NGT and prevent blockage

Only give to babies tolerating milk

Reference:

Probiotics for prevention of NEC in preterm infants. Al Faleh K, Anabrees J Cochrane Database of Systematic Reviews 10/4/2014

Newcastle Hospitals NHS Foundation Trust. LaBiNIC Probiotic Information Pack. October 2016

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

LACTULOSE

Indications for use:	Constipation (may take up to 48 hours to act)
Preparation:	3.1 – 3.7 g in 5 ml solution – supplied as 300 ml pack
Administration:	
Dosage:	0.5ml/kg (max 2.5ml) 12 – 24 hourly for up to 5 days, then increase to 1ml/kg 12 hourly (max 2.5ml) if required
Routes:	Oral / NG
Other:	No dose for lactulose for neonates in either BNF for Children or the Northern Neonatal Formulary for infants less than 1 month These doses have been used effectively and with no side effects

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

LIDOCAINE HYDROCHLORIDE

Indications for use:

See seizure treatment algorithm

4nd line anticonvulsant for babies receiving therapeutic hypothermia unresponsive to other drug treatment. **Consultant decision only**

Preparation:

Injection 2%: lidocaine hydrochloride 20mg/ml

Take **100mg/kg** (5mls/kg) of 2% Lidocaine hydrochloride 20mg/ml and make up to 50mls with Glucose 5%. **1ml of solution is equal to 2mg/kg** of Lidocaine hydrochloride.

License status:

Not licensed for use in children under 1 year

Administration:

Dosage:

Weight 2 – 2.5kg:

Initially run at **6ml/hr for 10 minutes** (1ml or 2mg/kg received over 10 mins)

Change rate to **3 ml/hr for 3.5 hours** (6mg/kg/hr)

Reduce rate to **1.5 ml/hr for 12 hours** (3 mg/kg/hr)

Reduce rate to **0.75 ml/hr for 12 hours** (1.5 mg/kg/hr)

Then STOP

Weight ≥ 2.5 – 4.5kg:

Initially run at **6 ml/hr for 10 minutes** (1ml or 2mg/kg received over 10 mins)

Change rate to **3.5 ml/hr for 3.5 hours** (7mg/kg/hr)

Reduce rate to **1.75 ml/hr for 12 hours** (3.5mg/kg/hr)

Reduce rate to **0.88 ml/hr for 12 hours** (1.75mg/kg/hr)

Then STOP

Monitor for hypotension and bradycardia/ arrhythmias and **discontinue infusion if either develops**

Routes :

IV/ LL/UVC

Compatability:

Glucose 5%

Sodium Chloride 0.9%

Sodium chloride 0.45%

Dopamine, dobutamine, morphine

Incompatibility:

Amphotericin, fentanyl, phenytoin, sodium bicarbonate

Other:

USE WITH CAUTION IN THOSE BABIES WHO HAVE RECEIVED PHENYTOIN DUE TO RISK OF CARDIOTOXICITY- MUST BE DISCUSSED WITH CONSULTANT

Must have continuous ECG monitoring

Increased risk of lidocaine toxicity if administered with propranolol.

Neuromuscular blockade enhanced and prolonged when lidocaine given with suxamethonium

Action of lidocaine antagonised by hypokalaemia caused by furosemide or chlorothiazide

Use with caution in hepatic and renal impairment

Contraindicated in sino-atrial disorders, AV block and severe myocardial depression

Levels may be considered if toxicity suspected

References

Van den Broek MPH, Rademaker CMA, van Straaten HLM et al. Anticonvulsant treatment of asphyxiated newborns under hypothermia with lidocaine: efficacy, safety and dosing. *Arch Dis Child Fetal neonatal Ed 2013;98:F341 – F345*
BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 25.08.15]
Trissel, L.A. Handbook of Injectable drugs. Available at http://www.medicinescomplete.com/mc/hid/current/ [Accessed 25.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

MAGNESIUM SULFATE

Indications for use:

Hypomagnesaemia

For babies at risk of seizures (including those receiving therapeutic hypothermia, maintain magnesium levels within normal limits (>1mmol/L)

Reducing pulmonary hypertension – please see Congenital Diaphragmatic Hernia management guideline

Preparation:

USUALLY PROVIDED AS MAGNESIUM SULFATE 10%; PLEASE CHECK PREPARATION

Magnesium Sulfate 10% (approximately 0.4mmol/ml of Magnesium; 100mg/ml of Magnesium Sulfate)

Magnesium Sulfate 50% (approximately 2mmol/ml of Magnesium; 500mg/ml of Magnesium Sulfate)

For bolus:
Use ready prepared 10% if available or dilute 50% preparation to 10% (100mg/ml Magnesium Sulfate)

For continuous infusion:

Make as per sticker:

Take 500mg/kg i.e……..mg of Magnesium Sulfate and make up to 20mls with ……
Run at 0.8 – 3mls/hr (20 – 75mg/kg/hr)

Signed…… Date……..

Up to 20% solution may be given in fluid restriction.
Rate of administration should not exceed 10mg/kg/min of Magnesium Sulfate.

Administration:

By iv injection/infusion. See below.

Dosage:

Hypomagnesaemia/ Magnesium <1mmol/L in those at risk of seizures :
0.4mmol/kg Magnesium (100mg/kg Magnesium Sulfate) 6-12 hourly over at least 10 minutes
May be repeated as tolerated if effective, to keep magnesium at upper limit of normal range
Recheck serum magnesium level at least daily

****Pulmonary Hypertension** (see Diaphragmatic Hernia Guidelines)
Initially 200mg/kg over 20-30 minutes; if response occurs then by continuous intravenous infusion of 20-75mg/kg/hour given for up to 5 days to maintain plasma-magnesium concentration between 3.5-5.5mmol/litre.
May cause hypotension. Should only be used with active management of systemic blood pressure

Routes:

IV (IM rarely indicated in neonates)

Compatibility:

Glucose 5%, Glucose 10%, Sodium Chloride 0.45%
Sodium Chloride 0.9%, Glucose 4% + Sodium Chloride 0.18%, Glucose 10% + Sodium Chloride 0.18%

Incompatibility:

Due to potential physical incompatibilities, Magnesium Sulfate should not be mixed with Sodium Bicarbonate or TPN in the same syringe or line.
Incompatible with amphotericin, calcium salts, dobutamine, hydrocortisone and phosphates preparations

Caution:

Renal failure-avoid or reduce dose; increased risk of toxicity-Refer to BNF-C and consult product literature
Monitor blood pressure, renal function, electrolytes and blood glucose

References:

** BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]
*Neonatal Formulary: Drug Use in Pregnancy and the First Year of Life (6th Edn) London: Wiley-Blackwell;2011
Guy's and St Thomas', Kings College and University Lewisham Hospitals Paediatric Formulary (9th Edn) London: Guy's and St Thomas' NHS Foundation Trust ; 2012. Available online at http://www.guysandstthomas.nhs.uk/resources/publications/formulary/paediatric-formulary-9th-edition.pdf [accessed 25.08.15]
Trissel, L.A. Handbook of Injectable drugs. Available at http://www.medicinescomplete.com/mc/hid/current/ [Accessed 25.08.15]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 25.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

MEROPENEM

Indications for use:

Broad spectrum antibiotic with activity against aerobic & anaerobic gram positive and gram negative organisms.

Must be approved by a consultant before use

Criteria for meropenem use on NICU

- **Use meropenem;**
  - For very unwell babies with late-onset sepsis
  - For babies known to have colonisation with gentamicin resistant Gram negative bacilli organism and showing signs of sepsis
- **Do not use meropenem**
  - For babies with low index of suspicion of late-onset sepsis or babies colonised with serratia, enterobacter or other gram negatives and is sensitive to gentamicin, use flucloxacillin+gentamicin. Change to meropenem only if lack of clinical response or baby very unwell.
- Review of all meropenem prescriptions:
  - Should take place on a daily basis
  - If blood culture is negative at 48 hrs, review and if antibiotic is still indicated, change to flucloxacillin+gentamicin for the rest of the course

Preparation:

500 mg vial

Hickma brand:

Reconstitute 500mg vial with 9.5ml of water for injection to give solution containing **50mg/ml**

Take 2ml of 50mg/ml solution and dilute to 5ml with 0.9% sodium chloride or glucose 5% to give 20mg/ml solution

Take required dose and infuse over 15- 30 mins

License status:

Not licensed for use in children under 3 months

Administration:

Dosage:

Less than 7 days old:

20 mg/kg every 12 hours

Over 7 days old :

20 mg/kg every 8 hours

(In severe infections / meningitis see BNFc)

Indication for use must always be documented

Prescribe in dedicated antibiotic section on new prescription chart

Review culture results after 36 hours (where possible) and at most 48 hrs and ensure regular review is undertaken and the outcome documented as stipulated on prescription chart.

Routes:

Intravenous infusion

Caution:

In liver or renal impairment refer to BNFc for specific advice/ discuss with pharmacist

Other:

Give first dose as soon as possible

For subsequent doses, prescribe 12hrly doses at 02.00/14.00, 06.00/18.00 or 12.00/23.59

Prescribe 8 hrly doses 02.00/10:00/18.00

Discard after use

Incompatibility:

Aciclovir, amphotericin, calcium gluconate, sodium bicarbonate, zidovudine

Reference:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]
Trissel, L.A. Handbook of Injectable drugs. Available at http://www.medicinescomplete.com/mc/hid/current/ [Accessed 25.08.15]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 25.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

METRONIDAZOLE

Indications for use:	Infection –refer to Antibiotic Guidelines Antibiotic with good activity against anaerobic bacteria and protozoa
Preparation:	5mg in 1 ml (supplied as 100ml Ecoflac bottle)
Administration:	
Dosage and Frequency:	<26 weeks CGA: 15mg/kg as a single loading dose followed after 24 hours by 7.5mg/kg daily 26-34 weeks CGA: 15mg/kg as a single loading dose followed after 12 hours by 7.5mg/kg every 12 hours >34 weeks CGA AND < 56 days of age: 15mg/kg as a single loading dose followed after 8 hours by 7.5mg/kg every 8 hours > 34 weeks CGA AND >56 days old: 7.5mg/kg every 8 hours Infuse over 20 - 30 mins **Indication for use must <u>always</u> be documented** **Prescribe in dedicated antibiotic section on new prescription chart** **Review culture results after 36 hours (where possible) and at most 48 hrs and ensure regular review is undertaken and the outcome documented as stipulated on prescription chart.**
Routes:	IV infusion
Other:	Prescribe first dose to be administered as soon as possible Subsequent doses should be prescribed 12 hrly at 02.00/14.00, 06.00/18.00 or 12.00/23.59 or 8 hrly at 02.00/10.00/18.00 Discard after use Use cautiously if liver function impaired, may require an increase in dose interval. Refer to BNF-C and product literature
Incompatibility:	Amphotericin
Reference:	BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15] Trissel, L.A. Handbook of Injectable drugs. Available at http://www.medicinescomplete.com/mc/hid/current/ [Accessed 25.08.15] NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 25.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

MICONAZOLE (DAKTARIN®)

Indications for use:

Treatment of oral and perineal candidiasis

Preparation:

Oral Gel: 24 mg/ml

Cream: 2% preparation miconazole nitrate

License status:

Oral gel-Not licensed for use in children under 4 months of age or during first 6 months of life of an infant born pre-term

Cream- licensed for use in children

Administration:

Dosage:

Oral: 1 mls smear around the inside of the mouth 2-4 times daily after feeds; continue for at least 1 week after lesions have healed or symptoms have cleared.

Perineal: Apply twice daily to buttocks; continue for at least 10 days after lesions have healed

Usually both are prescribed together

Routes:

Oral / Topical

References:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

MIDAZOLAM

CONTROLLED DRUG

Indications for use:

Seizure control – as alternative to intravenous Clonazepam which is no longer available. Please see guideline for Therapeutic Hypothermia as Neuroprotective Intervention for Neonatal Hypoxic Ischaemic Encephalopathy

Preparation:

1mg/ml solution for injection 5ml ampoules (as Midazolam hydrochloride)

1mg/ml solution for infusion 50ml vial

For bolus: Take required amount and administer as a slow bolus over 5 mins

For Intravenous Infusion:
Withdraw 50ml of the midazolam 50mg in 50ml into syringe, giving a 1mg in 1ml (1000microgram/ml) solution. A rate of (0.06ml/kg/hr provides a dose of 60 micrograms/kg/hr

Administration:

By bolus over 5 mins followed by intravenous infusion

Dosage:

Bolus dose: 150 – 200 micrograms/kg

Infusion should be started at 60microgram/kg/hour [rate ml/hr = 0.06 x weight of baby (kg)]

and increased in steps of 60 micrograms/kg/hr only after consultant review to a maximum of

300 microgram/kg/hr [rate ml/hr = 0.3 x weight of baby (kg)]

It should be stopped if no response after 24hours.

Frequency:

Bolus dose followed by intravenous infusion

Routes:

IV / UVC

Preferably administer via a central venous access device to avoid potential venous irritation as the preparation has a low pH.

Infusion can be given via a peripheral vein but use the largest bore vein available. The insertion site should be monitored closely for phlebitis

Do not mix with any other medicines or infusion fluids

If difficult venous access please check compatibilities with pharmacist

Compatability:

Adrenaline, dopamine, insulin soluble, milrinone, morphine sulfate, vancomycin,

Other:

Review continuous infusion after 24 hour period. Benzodiazepines can suppress aEEG but does not affect recovery.

Flumazenil should always be available

Midazolam is a Schedule 3 Controlled Drug

Order via the ward CD requisition book

Store in the Controlled Drugs Cupboard and record administration and destruction in the CD record book

Reference:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 10/03/2016]]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 25/10/2017]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

MILRINONE

Indications for use:

Congestive Heart Failure

Low cardiac output following cardiac surgery (eg post PDA repair)

Babies with Diaphragmatic Hernia (see guideline)- do not give a loading dose

DO NOT GIVE IF SEVERELY HYPOVOLAEMIC

Preparation:

Milrinone 1mg/ml

10mg in 10ml ampoule

Take 10ml of 1mg/ml solution and make up to 50 ml with glucose 5% or sodium chloride 0.9% to give a solution of 200 microgram/ml

License status:

Not licensed for use in children under 18 years

Administration:

Dosage:

Loading dose

50micrograms/kg (0.25ml/kg of 200 microgram/ml solution) over 30 mins

Reduce or omit this dose if at risk of hypotension

Do not give a loading dose in babies with Congenital Diaphragmatic Hernia

Maintenance Infusion

30 – 45 micrograms/kg/hr (0.15 – 0.23 ml/kg/hr of 200 microgram/ml solution) for 2 – 3 days (usually for 12 hours after cardiac surgery)

Monitor blood pressure, heart rate, ECG, central venous pressure (if possible), fluid and electrolyte status, renal function, platelet count and hepatic enzymes

Routes:

IV/ UVC / CVL

Compatibility:

Sodium Chloride 0.9%

Glucose 5%

Incompatibility:

Reduce dose to 50 – 75% if impaired renal function (eGFR <50ml/min/1.73m^2)

Other:

References:

Paediatric Formulary Committee. *BNF for Children* (online) London: BMJ Group, Pharmaceutical Press, and RCPCH Publications <http://www.medicinescomplete.com> [Accessed on [18.05.2017]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

MORPHINE SULFATE (INTRAVENOUS)

CONTROLLED DRUG

Indications for use:

Pain relief and sedation of ventilated babies

Pain relief and sedation in those babies receiving therapeutic hypothermia

Treatment of opiate withdrawal (See 'Oramorph')

Preparation:

Injection: 10 mg in 1 ml

Prepare as per prescription label:

MORPHINE LOADING DOSE

Unit Number…….

Name…….

Step 1: **Prepare Stock Solution of morphine 1 milligram**

(1000micrograms) per millilitre

Add 0.5mls of morphine sulfate 10mg/ml (i.e. 5mg) to 4.5mls of 0.9% sodium chloride to make a solution of 1 milligram per millilitre

Step 2: The dose in millilitres is (0.05 x weight in kilograms)….. millilitres of Stock Solution. This is a dose of (50 x weight in kilograms) micrograms (i.e. 50 micrograms per kilogram). Make up to 2 millilitres with 0.9% sodium chloride. Infuse over 20 mins

Signed……Date……

Prepare as per prescription label (NOTE: Single, double and quadruple strength labels are available. Please select correct label)

MORPHINE MAINTENANCE DOSE

Unit Number…….

Name…….

Step 1: **Prepare Stock Solution of morphine 1 milligram**

(1000micrograms) per millilitre

Add 0.5mls of morphine sulfate 10mg/ml (i.e. 5mg) to 4.5mls of 0.9% sodium chloride to make a solution of 1 milligram per millilitre

Step 2: To make the infusion solution take (1 x weight in kilograms) ….. millilitres of Stock Solution. This is (1000 x weight in kilograms)…….. micrograms of morphine, and make up to 50mls with ……

This solution gives 20 micrograms per kilogram per ml. Run at 0.25 – 1 ml per hour (i.e. 5–20 micrograms per kilogram per hour.

Signed……Date……

Administration:

Dosage:

IV loading dose:	50 microgram/kg over 20 mins
Maintenance :	5 - 20 microgram/kg/hr

For babies receiving therapeutic hypothermia:

Discontinue after 24 – 48 hours to lessen risk of accumulation and toxicity

Routes:

IV / UVC

Compatibility:

Sodium Chloride 0.9%

Sodium chloride 0.45%

Glucose 10%

Glucose 5%

May be infused with dopamine, dobutamine, adrenaline, noradrenaline

Incompatibility:

Aciclovir, amphotericin, furosemide, phenytoin, heparin, sodium bicarbonate

Other:

NALOXONE IS A SPECIFIC MORPHINE ANTAGONIST

Order via the ward CD requisition book

Store in the Controlled Drugs Cupboard and record administration and destruction in the CD record book

Reference:

Neonatal Formulary: Drug Use in Pregnancy and the First Year of Life (7th Edn) London: Wiley-Blackwell;2014
* Local Guideline: Therapeutic Hypothermia as a Neuroprotective Intervention for Neonatal Hypoxic Ischaemic Encephalopathy – Procedural Document. 2010. Dr Archana Mischra, Dr Melanie Sutcliffe
Trissel, L.A. Handbook of Injectable drugs. Available at http://www.medicinescomplete.com/mc/hid/current/ [Accessed 25.08.15]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [25.08.15]
BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

MORPHINE SULFATE ORAL SOLUTION (previously known as 'Oramorph')

CONTROLLED DRUG

Indications for use: Management of opioid withdrawal in babies

Preparation: 100 micrograms/ml (unlicensed) Newcastle RVI 60ml bottle- DO NOT FURTHER DILUTE

*If unavailable use 10mg/5ml

Prepare as per prescription label below

DRUG APPROVED NAME MORPHINE SULFATE ORAL SOLUTION	**DOSE**	**FREQUENCY**
Take 0.1ml of stock soln (10mg/5ml) dilute to 2ml with water to give 0.1mg/ml (=100 micrograms/ml) Give required dose	ROUTE	
Prescriber Signature	**Date Commenced**	**Date Cancelled**

License status: Not licensed for use in children under 1 year

Administration:

Dosage:

Starting dose 0.04mg/kg 4 hrly (40microgram/kg)

1st reduction 0.03mg/kg 4 hrly (30microgram/kg)

2nd reduction 0.02mg/kg 4 hrly (20microgram/kg)

3rd reduction 0.01mg/kg 4 hrly (10microgram/kg)

Dose reduced 24 hrly if the baby is feeding well and settles between feeds.

Routes: Oral/NG

Other:

NALOXONE IS A SPECIFIC MORPHINE ANTAGONIST

Order via the ward CD requisition book

Store in the Controlled Drugs Cupboard and record administration in the CD record book

Reference:

Local Guideline: Michele Emery and Dr Imogen Morgan; Opiate Dependant Mothers – Care of Baby 2008

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

NALOXONE HYDROCHLORIDE

Indications for use:	Reversal of respiratory depression caused by opiates administered to the mother during labour
Preparation:	400 micrograms in 1 ml – supplied as 1ml ampoule
Administration:	
Dosage:	IM: 200 micrograms (60 micrograms/kg) as single dose at birth
Routes:	IM
Other:	Refer to BNF-C for IV dose DO NOT GIVE TO BABIES OF MOTHERS DEPENDANT ON OPIATES AS MAY PRECIPITATE FITS/ WITHDRAWAL
Reference:	BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

NITRIC OXIDE

Indications for use:	To improve pulmonary blood flow in babies with persistent pulmonary hypertension. Usually used with high frequency oscillatory ventilation
	PLEASE SEE GUIDELINES ON INTRANET FOR FULL DETAILS OF USE
Preparation:	Medical physics are required to set up Nitric Oxide machine Please call early if use is anticipated
Administration:	
Dosage:	**PLEASE SEE GUIDELINES ON INTRANET**
Routes:	Inhaled Inline suctioning must be used
Other:	Must be prescribed on Prescription Chart and recorded on Daily Observation Chart

Written by: Gemma Holder (Neonatal Consultant)

NORADRENALINE (NOREPINEPHRINE)

Indications for use:

Hypotension

Preparation:

Noradrenaline **base 1mg/ml** (as noradrenaline tartrate 2mg/ml)

Prescribe in terms of base to prevent ambiguity

Prepare as per prescription label

Noradrenaline

Take……micrograms Noradrenaline base (wt in Kgs x600 micrograms (base)) and make up to 50 mls with …….... i.e. 0.1 ml/hr provides 0.02micrograms (base)/kg/min

Run at …… ml/hour (i.e.…… micrograms(base)/kg/min)

Route……..

Signed……Date……

Dose should always be expressed as base

License status:

Not licensed for use in children

Dosage:

0.02 – 0.1 microgram (base)/kg/min adjusted according to response.

Max dose 1 microgram (base)/kg/min

Routes:

Must be infused centrally, tissue extravasation can be dangerous

UVC / CVL

Compatibility:

Glucose 10% *

Glucose 5%

Glucose 4% + Sodium chloride 0.18%

0.9% Sodium chloride

Incompatibility:

Sodium Bicarbonate and alkaline solutions, insulin, ranitidine, furosemide and omeprazole

Other:

Monitor limb perfusion, urine output and central vascular pressures (where possible) at high doses

References:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]
Trissel, L.A. Handbook of Injectable drugs. Available at http://www.medicinescomplete.com/mc/hid/current/ [Accessed 25.08.15]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 25.08.15]
*local practice

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services

NYSTATIN

Indications for use:

Prophylaxis of fungal infections in babies <26+0 weeks gestation

This acts locally in the buccal mucosa and should be given even if the baby is nil by mouth

Preparation:

Nystatin oral suspension 100 000 units per ml

License status:

Dosage:

1ml (100 000 units) three times daily

If receiving buccal colostrum, administer after the colostrum is given

Should be continued until baby tolerating full feeds and long line is removed

Routes:

To be smeared over buccal mucosa

If baby too small to tolerate full buccal dose, smear small amount round mouth and administer the rest via NG tube

Compatibility:

Incompatibility:

Other:

(Some) MUST be administered into the mouth as not systemically absorbed

References:

Neonatal Formulary: Drug Use in Pregnancy and the First Year of Life (7th Edn) London: Wiley-Blackwell;2014

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

OMEPRAZOLE

Indications for use:

Gastro-oesophageal reflux disease

Preparation:

Capsule 10mg

Losec MUPS® 10mg

For administration via enteral feeding tubes:

Dissolve contents of capsule in 10mls of water, or in 10ml of 8.4% sodium bicarbonate solution. Leave to stand for 10mins before administration. This gives 1mg/ml solution.

For oral administration:

Disperse 10mg Losec MUPS® in 10mls of water. Do not crush granules This gives 1mg/ml solution.

Suspension available (unlicensed preparation available to order on a named patient basis): contact Pharmacy

Intravenous infusion: Powder for reconstitution (as sodium salt) 40mg vial

Take 5ml of 5% glucose or 0.9% sodium chloride from 100ml bag. Add to vial of omeprazole powder and mix well until completely clear. Withdraw the contents of the vial and return to the 100ml bag of 5% glucose or 0.9% sodium chloride. This solution gives 400 micrograms in 1ml.

Take required amount and infuse over 20 – 30 mins

License status:

Not licensed for use in children

Administration:

Note: The iv infusion is from 1 month of age.

Dosage:

IV: 500micrograms/kg once daily, increase to 2mg/kg once daily if necessary

By mouth: 700 micrograms/kg once daily, increased if necessary after 7- 14 days to 1.4mg/kg; some neonates may require up to 2.8mg/kg once daily

Routes:

NG/Oral/ IV

Compatibility:

5% glucose

0.9% sodium chloride

Do not infuse with any other medicines

Other:

Progressive drug accumulation might occur if a baby less than 3 months old is given more than 1.4mg/kg daily
Hepatic impairment: max 700 micrograms/kg/day
MHRA/ CHM advice: Proton pump inhibitors (PPIs): very low risk of subacute cutaneous lupus erythematous (September 2015)

Reference:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 25.08.15]
Drug Use in Pregnancy and the First Year of Life (6th Edn) London: Wiley-Blackwell;2011

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

PALIVIZUMAB (SYNAGIS®)

Indications for use:

Prevention of RSV (Respiratory Syncytial Virus) infection in selected babies at high risk of RSV

Selection criteria:

- The groups recommended for immunisation with Palivizumab by the JCVI
- The groups within "clinical judgement" encompassing those outlined in section 6.3: Updated 2011 Eligibility Criteria of the Commissioning Policy- The Use of Palivizumab to reduce the risk of Respiratory Syncytial Virus (RSV) in high risk infants, version 4 September 2012

Preparation:

100mg/ml solution for injection, available as 50mg and 100mg vials

Administration:

15mg/kg monthly during RSV season (October – March)

Dosage:

Up to a maximum of 5 doses

Routes:

IM preferably in the anterolateral aspect of the thigh. Injection volumes over 1 ml (100mg) should be given as a divided dose between 2 or more sites.

Other:

Store in the fridge and protect from light

Note for prescriber: Before prescribing you must confirm that the patient is eligible for this vaccine-meets the set criteria and have discussed this with the appropriate consultant.

A Blueteq approval form must also be completed and approval granted in order to proceed.

Reference:

Department of Health Green Book. Respiratory Syncytial Virus, Chapter 27a. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/148494/Green-Book-Chapter-27a-dh_130131.pdf [accessed 25.08.15]

Southern West Midland Newborn Network/Staffordshire Shropshire, Black Country Newborn Network/Central Newborn Network; Commissioning Policy THE USE OF PALIVIZUMAB TO REDUCE THE RISK OF RESPIRATORY SYNCYTIAL VIRUS (RSV) IN HIGH RISK INFANTS Version 4 –September 2012

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

PARACETAMOL

Indications for use:

Pain relief (see cautions below)
Pyrexia
Prophylaxis of post immunisation pyrexia withMen B routine vaccinations

Preparation:

Oral: 120 mg in 5 ml suspension
Rectal: 30mg and 60 mg suppositories
Intravenous: 10mg in 1ml ampoules (10ml ampoules). Give undiluted. Withdraw calculated dose from ampoule into a 5ml syringe and administer using a syringe pump.
***due to the risk of accidental overdose the 50ml and 100ml preparations must not be used for patients weighing ≤10kg (BBraun communication 16/5/17 agreed with MHRA)**

License status:

Not licensed for children under 2 months by mouth; not licensed for children under 3 months by rectum; intravenous infusion not licensed in preterm neonates and in infants with body-weight <10kg. Not licensed for use as prophylaxis of post-immunisation pyrexia following immunisation with meningococcal group B vaccine

Administration:

Dosage:

Oral:
28 - 32 weeks CGA: 20 mg/kg as single dose, then 10 – 15 mg/kg 8 – 12 hourly; max 30mg/kg in 24 hours

More than 32 weeks CGA:20 mg/kg as single dose, then 10 – 15 mg/kg 6 – 8 hourly; max 60 mg/kg in 24 hours

Rectal:
28 – 32 weeks CGA: 20mg/kg as single dose, then 10-15mg/kg every 12 hours as necessary; max 30mg/kg in 24 hours

More than 32 weeks CGA: 30mg/kg as single dose, then 15-20mg/kg every 8 hours as necessary; max 60mg/kg in 24 hours

Please note suppositories available in 30mg/ 60mg strength -ensure sensible doses are prescribed e.g 15mg/ 30mg (half / full suppository)

Intravenous:

Preterm (<37 weeks) : 7.5mg/kg 8 hourly infused over 15 mins

>37 weeks and < 3/12 CGA:10mg/kg 4 – 6 hourly infused over 15mins. max 30mg/kg/day

Routes:

Oral / NG / Rectal/ IV

Oral/NG,rectal and IV should NEVER be prescribed interchangeably ie PO/IV

Caution:

Use with caution in liver impairment
Due to limited pharmacokinetic and safety data in extreme preterms, the intravenous route should only be used in those babies who are NBM post surgery
New 2015**JCVI have recommended that paracetamol should be given prophylactically when 4CMenB is given with the routine vaccines in infants under one year of age. Three doses of paracetamol should be given orally, with the first dose provided as soon as possible after vaccination, and two subsequent doses in accordance with their gestation.

MHRA alert: Intravenous Paracetamol (Perfalgan: Risk of accidental overdose) July 2010

Reference:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

Department of Health Green Book. Meningococcal, Chapter 22. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/448875/2904185_Green_Book_Chapter_22_v3_0W_July2015.PDF [accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

PARACETAMOL (for PDA Closure)

Indications for use:

Closure of haemodynamically significant patent ductus arteriosus in preterm newborn infants when ibuprofen is contraindicated e.g. In those babies receiving prophylactic hydrocortisone

Preparation:

Intravenous: 10mg in 1ml ampoules (10ml ampoules). Give undiluted. Withdraw calculated dose from ampoule into a 5ml syringe and administer using a syringe pump.

***due to the risk of accidental overdose the 50ml and 100ml preparations must not be used for patients weighing ≤10kg (BBraun communication 16/5/17 agreed with MHRA)**

License status:

Intravenous infusion not licensed in preterm neonates and in infants with body-weight <10kg.

Administration:

Dosage:

Intravenous (all intravenous infusions should be infused over 15 mins)

Maintenance dose to commence SIX hours after loading dose

23+0 - 25+6 and ≤ 7days old at the time of treatment:

20mg/kg loading dose followed by 12.5mg/kg 6 hourly for total 5 days

23+0 – 25+6 and > 7 days old at the time of treatment:

20mg/kg loading dose followed by 15mg/kg 6 hourly for total 5 days

≥26+0 gestational age *at birth*:

20mg/kg loading dose followed by 15mg/kg 6 hourly for total 5 days

Check Paracetamol trough level immediately before 3rd dose

Desired Level 15 – 25mg/L

INITIAL dose adjustment if level outside of target range 15 – 25mg/L

23+0 - 25+6 and ≤ 7days old at the time of treatment:

Level (mg/L)	Action
<15	Increase dose to 15mg/kg every 6 hours
15 – 25	Continue same dose 12.5mg/kg every 6 hours
26 - 34	Decrease dose to 10mg/kg every 6 hours
35 - 40	Decrease dose to 10mg/kg every 8 hours
>40	STOP

If the maintenance dose has been increased to 15 mg/kg every 6 hours, check a paracetamol trough level, just before the third maintenance dose – desired level = 15-25 mg/L

Level (mg/L)	Action
<25	Continue same dose 15mg/kg every 6 hours
26 - 40	Decrease dose to 12.5mg/kg every 6 hours
>40	STOP

Whenever there has been a change in dose, check a paracetamol trough level, just before the third new maintenance dose – desired level = 15-25 mg/L

23+0 – 25+6 and > 7 days old at the time of treatment:

Level (mg/L)	Action
<25	**Continue same dose 15mg/kg every 6 hours**
26 - 34	**Decrease dose to 12.5mg/kg every 6 hours**
35 - 40	**Decrease dose to 10mg/kg every 6 hours**
>40	**STOP**

Whenever there has been a change in dose, check a paracetamol trough level, just before the third new maintenance dose – desired level = 15-25 mg/L

>26+0 gestational age *at birth*

Level (mg/L)	Action
<25	**Continue same dose 15mg/kg every 6 hours**
26 - 34	**Decrease dose to 12.5mg/kg every 6 hours**
35 - 40	**Decrease dose to 10mg/kg every 6 hours**
>40	**STOP**

Whenever there has been a change in dose, check a paracetamol trough level, just before the third new maintenance dose – desired level = 15-25 mg/L

FURTHER dose adjustments if level outside of target range 15 – 25mg/L

Level (mg/L)	Action
<25	**Continue current dose**
26 - 34	**Decrease dose by 20%**
35 - 40	**Decrease dose by 30%**
>40	**STOP**

IV

Caution:

Use with caution in liver impairment
Due to limited pharmacokinetic and lack of long term safety data in extreme preterms paracetamol should not be used for routine first line treatment of patent ductus arteriosus.

Do not give with any other preparation containing paracetamol

Doses higher than the recommended entail the risk of very serious liver damage. Clinical signs and symptoms of liver damage are not usually seen until 2-6 days after administration.

MHRA alert: Intravenous Paracetamol (Perfalgan: Risk of accidental overdose) July 2010

Compatibility:

Sodium Chloride 0.9%
Glucose 5%

Incompatibility:

All other IV fluids and infusions

Other information:

DO NOT GIVE ANY OTHER DRUG CONTAINING PARACETAMOL
Clinical signs and symptoms of liver failure not usually seen until 2 – 6 days after administration

References:

Ohlsson, A, Shah,P. Paracetamol (acetaminophen) for patent ductus arteriosus in preterm or low birth weight infants. Cochrane Database of Systematic Reviews 2015
Bardanzellu F, Neroni P, Dessi A et al. Paracetamol in Patent Ductus Arteriosus Treatment – Efficacious and Safe? Biomed research International. Vol 2017 Article ID 1438038
West of Scotland Neonatal Parenteral Drug Monograph- Paracetamol for PDA Treatment June 2018

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services

PARALDEHYDE (RECTAL)

Indications for use:
Status epilepticus

Preparation:
Paraldehyde 50% mixed with olive oil 50% for rectal administration (30ml)

License status:
Unlicensed product
Not licensed for use in children as an enema

Administration:
- Attach a rectal tube/straw or kwill or an oral syringe.
- Draw required dose into a syringe immediately prior to administration.
- Dip the rectal tube/straw/ kwill into some lubricating gel and administer immediately.
- Do not delay administration as the paraldehyde will “melt” the plastic syringe.

Dosage:
0.8ml/kg of premixed solution

Routes:
RECTAL

Caution:
Contraindicated in gastric disorders, colitis
Bronchopulmonary disease

Monitoring/Other:
Do not use the solution if it has a brownish colour or smells of acetic acid/ vinegar.
Prescribe on the once only section of the drug chart

Reference:
Paediatric Formulary Committee. *BNF for Children* (online) London: BMJ Group, Pharmaceutical Press, and RCPCH Publications <http://www.medicinescomplete.com> [Accessed on 20.12.17]

Written by: Louise Whitticase (Lead Pharmacist-Women’s Services)
Checked by: Gemma Holder (Neonatal Consultant)

PARENTERAL NUTRITION (Unlicensed Products)

Refer to Parenteral Nutrition Guidelines

Composition (ml)	Start up		Preterm Maintenance 12	Preterm Maintenance 15	Term baby	Preterm Maintenance 12 + peditrace	Preterm Maintenance 15 + peditrace	Term baby + peditrace
Per volume (ml)/kg	**90**	**100**	**100**	**110**	**100**	**100**	**110**	**100**
Nitrogen (g)	0.49	0.54	0.56	0.56	0.49	0.56	0.56	0.49
Protein(g)	3.06	3.40	3.49	3.49	3.06	3.49	3.49	3.06
Glucose (g)	9	10	12	15	15	12	15	15
Nitrogen calories (Kcal)	12.23	13.58	13.97	13.97	12.23	13.97	13.97	12.23
Non-nitrogen calories (Kcal)	36	40	48	60	60	48	60	60
Total calories (Kcal)	48.23	53.58	61.97	73.97	72.23	61.97	73.97	72.23
Sodium (mmol)			5.004	5	4.95	5.004	5	4.95
Potassium (mmol)			2	2.5	2.5	2	2.5	2.5
Calcium (mmol)			2.016	2.016	1.5165	2.016	2.016	1.5165
Magnesium (mmol)			0.2	0.2	0.2	0.2	0.2	0.2
Phosphate (mmol)			1.9	1.9	1.5	1.9	1.9	1.5
Acetate (mmol)			1.804			1.804		
Chloride (mmol)			1.8	3.7	4.45	1.8	3.7	4.45
Zinc (micromol)			4	4	4	3.056	3.82	3.82
Selenium (nanomol)			25	25	25	20.24	25.3	25.3
Copper (micromol)						0.252	0.315	0.315
Manganese (nmol)						14.56	18.2	18.2
Fluoride (micromol)						2.4	3	3
Iodide (nmol)						6.304	7.88	7.88
Max Peditrace in Neo 12 =0.8ml/kg/day						peditrace ltd by vaminolact amount*		

Indication for use:

Start Up – Use as initial infusion fluid for up to 24 hours of life. Other uses include when central access is temporarily unavailable in a baby already established on PN or if electrolyte free PN is required.
Preterm Maintenance 12 - initial maintenance PN to be infused for at least 48 hours; when glucose tolerance established move to Preterm Maintenance 15 (see below). Prolonged use may be required in infants with glucose intolerance or acidosis (contains acetate). Please note this does not provide adequate nutrition for long term growth.
Preterm Maintenance 15 - standard maintenance PN for all preterm infants.
Term Baby – for use in preterm infants over 2.5kg and/or infants born from 37 weeks onwards.

If Parenteral Nutrition is being commenced after a baby has previously tolerated enteral feeds they do not require a start up bag and should commence on the appropriate maintenance bag of vamin. They can start at maximum volume of lipid.

For infants likely to require PN for longer than 14 days- consider ordering bags with Peditrace to ensure recommended micronutrient intakes are met. Discuss with Nutrition Lead, Pharmacist or Dietitian.

Intralipid

Usually prescribe (refer to guidelines for further details):

Note the slight difference in dose when prescribing an intralipid / SMOFlipid® syringe or intralipid 20% bag due to added vitamin component in the syringes

	g fat/kg/d	Intralipid syringe dose (inc vitamins)	SMOFlipid® syringe dose (inc vitamins)	Intralipid 20% bag dose (no vitamins)
1st day PN (including start up)	2g	12mls/kg/day	12mls/kg/day	10mls/kg/day
2nd day PN	3g	18mls/kg/day	18mls/kg/day	15mls/kg/day
3rd day PN	3.4g	20mls/kg/day	20mls/kg/day	17mls/kg/day

The total volume in an intralipid / SMOFlipid® syringe is 50ml. In a baby weighing more than 2.5kg, where the lipid infusion rate exceeds 2.1ml/hr, prescribe only one syringe per 24 hour period to prevent excessive vitamin administration. An intralipid 20% bag should be prescribed to administer the remaining lipid requirement for the 24 hour period (note differing dose as table above).
Please check with either Dr Holder or Louise Whitticase if unsure

SMOF Lipid

Please refer to guidelines for details. It should be prescribed at the same rate as intralipid syringes as detailed above.

SMOFlipid® is a blend of soybean oil, medium chain triglycerides, olive oil and fish oils. Fish oil contains primarily omega-3 polyunsaturated fatty acids, which are anti-inflammatory and potentially hepatoprotective, and no phytosterols. SMOFlipid® has been shown to be safe to use in preterm infants, but currently there is no evidence to suggest any benefits of its routine use over Intralipid 20%[6,7] in non-cholestatic infants (direct bilirubin <50 µmol/L). There is a recent study showing that the use of SMOFlipid® improves the liver function tests in those with cholestasis, but does not prevent the development of PNALD. SMOFlipid® should only be considered in babies with a direct bilirubin >50 µmol/L and rising trend.

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

PHENOBARBITAL SODIUM (PHENOBARBITONE)

CONTROLLED DRUG

Indications for use:
Seizure control

Preparation:
Injection: 60mg in 1 ml

Take 60mg of phenobarbital and make up to 10mls with sodium chloride 0.9% or glucose 5% to give solution of **6mg/ml**. Take required amount and infuse over 20mins
Although water for injections is recommended by the manufacturer as a suitable diluent for the infusion, it is rarely used in practice as it is likely to cause haemolyses and hyperkalaemia

Oral solution: Alcohol free 50mg in 5ml solution (special order)
NB 15mg in 5ml contains 38% alcohol

Administration:

Dosage:
Loading dose: 20mg/kg IV over 20mins (no faster than 1mg/kg/minute)

Maintenance dose (if required): 2.5 – 5mg/kg once daily. Dose and frequency adjusted according to response

***Babies receiving therapeutic hypothermia:**
Loading dose:20mg/kg IV over 20mins (no faster than 1mg/kg/minute)
Up to 2 doses can be given within 40 – 60mins
Do not give further doses until plasma levels have been checked
Do not give maintenance dose as high plasma levels may occur

Routes:
Loading dose : IV
Maintenance dose: IV / NG / Oral

Extravasation is likely to cause tissue damage. Preferably administer via a central venous access device to avoid potential venous irritation. If this is not possible, use a large peripheral vein

Compatibility:
Water for injection, sodium chloride 0.9%, glucose 5%

Other:
Do not infuse with any other medicines or infusion fluids

Levels can be measured in 50 micro-litres of plasma
Long half life in neonates means timing of sample not critical, levels may be monitored after 24-48 hours, but note early levels will not necessarily give an accurate reflection of therapeutic levels due to steady state not being reached; serum concentration may continue to rise for up to 4 weeks

Therapeutic trough level 15 – 40mg/L

Caution hepatic and renal impairment-Refer to BNF-C and consult product literature
If necessary loading dose has been repeated safely

Order via the ward CD requisition book

Store in the Controlled Drugs Cupboard and record administration and destruction in the CD record book

References:
BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 26.08.15]
Guy's and St Thomas', Kings College and University Lewisham Hospitals Paediatric Formulary (9th Edn) London: Guy's and St Thomas' NHS Foundation Trust; 2012.
Available online at http://www.guysandstthomas.nhs.uk/resources/publications/formulary/paediatric-formulary-9th-edition.pdf [accessed 26.08.15]
Neonatal Formulary: Drug Use in Pregnancy and the First Year of Life (6th Edn) London: Wiley-Blackwell;2011
* Local Guideline: Therapeutic Hypothermia as a Neuroprotective Intervention for Neonatal Hypoxic Ischaemic Encephalopathy – Procedural Document. 2010. Dr Archana Mischra, Dr Melanie Sutcliffe

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

PHENYTOIN

Indications for use:
Seizure Control

Preparation:
50mg in 1ml – solution supplied in 5ml ampoules

MUST be flushed with 0.9% sodium chloride before and after administration at the same rate as drug infusion

Do not dilute for loading dose.
Oral suspension: 30mg in 5 ml

Dosage:
IV Loading dose into a large vein (preferably central but if not possible then largest bore vein available): 20mg/kg over 20 mins **monitoring ECG and BP**

Maintenance dose if required: 2.5 – 5mg/kg bd adjusting dose according to response and plasma levels. Usual Max dose 7.5mg/kg bd

Do not give maintenance dose if baby receiving therapeutic hypothermia

Enteral feeds should be interrupted for at least one hour before and after giving oral phenytoin.

Routes:
Loading dose: IV
Maintenance dose: NG/oral

Compatibility:
Sodium Chloride 0.9%

Incompatibility:
Lines/solutions containing glucose

Lines should be flushed before and after with 0.9% sodium chloride

Do not infuse or mix phenytoin with any other medicines or infusions as precipitation or crystallisation may occur

Other:
If diluted, use only sodium chloride 0.9% and use a 0.22-0.5 micron in-line filter

Pre-dose levels should be performed (50 microlitres of plasma required)

Neonate-3 months Therapeutic levels 6 – 15 mg/L (therapeutic plasma-phenytoin concentrations reduced in first 3 months because of reduced protein binding)
May have a cardiac depressant effect if used when baby receiving therapeutic hypothermia

IV injection must be given **slowly** at a rate not exceeding **1 mg/kg/minute** to avoid hypotension and arrhythmias.
BP and ECG should be monitored during infusion.
Caution in liver disease and renal impairment.

Monitor carefully when plasma protein binding is altered (e.g. low plasma albumin).

Signs of toxicity: nystagmus, drowsiness, ataxia, dysarthria, lethargy, confusion, tremors, seizures and cardiac arrest

Antidote- intralipid 20% with specialist advice (Poisons centre 0344 892 0111)

Reference:
BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 26.08.15]
Patient Safety Alert: Risk of death and severe harm from error with injectable phenytoin. 9th November 2016

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

POTASSIUM CHLORIDE

Indications for use:

To prevent hypokalaemia in babies on intravenous fluids

To treat hypokalaemia

To replace potassium in babies with excess losses due to stomas or drainage of gastric contents via nasogastric tube

Preparation:

Oral: Potassium chloride 7.5%-1mmol/ml potassium and chloride syrup (Kay-Cee-L®)
IV: Strong Potassium chloride 15% 2mmol in 1ml (10ml ampoules)-MUST BE DILUTED BEFORE USE- ENSURE MIX THOROUGHLY

Ready made 10mmol in 500ml bag 0.9% sodium chloride

Administration:

Enteral: Nasogastric/Oral
As continuous IV infusion in maintenance fluids
10mmol/500ml bag- ml for ml replacement of stoma/NG losses

Dosage:

Oral: 0.5 mmol/kg potassium twice daily (total daily dose may alternatively be given in 3 divided doses), adjusted according to plasma-potassium concentration

Maintenance IV infusion:
Usually given at dose of 2mmol/kg/day

Peripheral infusion:
Max concentration 20mmol potassium /500mls

(this is a 50 fold dilution by volume to prevent venous irritation)

Maximum infusion rate of 0.2mmol/kg/hr

Central administration:
Continuous ECG monitoring required
Higher concentrations than 20mmol/500ml can be used

Maximum infusion rate 0.2mmol/kg/hr

Severe hypokalaemia:

There are rare occasions when the required rate of administration of potassium will need to exceed the recommended 0.2mmol/kg/hr. This should be done ONLY WITH THE ADVICE OF A CONSULTANT

Continuous ECG monitoring is essential
Higher concentrations than 20mmol/500ml must be administered centrally

Maximum concentration is 1mmol/ml

DO NOT EXCEED RATE OF 0.4mmol/kg/hour

Check potassium level during infusion hourly for the 1st 3 hours, then at least 2 hourly whilst the infusion is running

Ensure preparation is thoroughly mixed prior to administration to prevent layering.

Potassium solutions must be administered using a suitable administration pump.

See worked example below:

Weight of baby: 1.7kg
Total daily amount of fluid: 150mls/kg/day = 150 x 1.7 = 255mls
Amount of potassium chloride to be given in 24 hours: 2mmol/kg/day
= 2 x 1.7 = 3.4mmol

Therefore 255mls of fluid needs to contain 3.4mmol of potassium chloride.
A 500ml bag of 5% or 10% glucose will need to contain 500/255 x 3.4mmol
= 6.67mmol potassium chloride to deliver 2mmol/kg/day to baby
Strength of 15% potassium chloride is 2mmol/ml. Therefore you need to add 6.67/2 =3.33ml 15% potassium chloride

Replace stoma/NG losses:
10mmol per 500ml bag 0.9% sodium chloride (premade bags are available)

Withdraw 50mL from the bag into a syringe to run through a syringe pump
The 500ml bag containing 10mmol/500ml should not be infused directly into the patient. Discard the bag immediately.

Routes: NG/Oral/UVC/LL/IV

Incompatibility: Amphotericin, phenytoin

Other: You must determine the cause of the hypokalaemia e.g. inappropriate infusion, diuretics, exceptional losses, hyperaldosteronism due to hypoalbuminaemia.

If running in addition to PN take potassium content of any concurrent parenteral nutrition into account. It may be administered simultaneously with the PN providing it does not exceed a maximum concentration 200mmol/L- including amounts provided by amino acid, trace element solutions and lipid emulsions.

Storage: The oral solution is stored in the cupboard below 25 degrees.

Order via the ward CD requisition book

Store in the Controlled Drugs Cupboard and record administration in the CD record book

References:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

Guy's and St Thomas', Kings College and University Lewisham Hospitals Paediatric Formulary (9th Edn) London: Guy's and St Thomas' NHS Foundation Trust ; 2012. Available online at http://www.guysandstthomas.nhs.uk/resources/publications/formulary/paediatric-formulary-9th-edition.pdf [accessed 026.08.15]

NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 26.08.15]

Fresenius Kabi Ltd - Stability Statement

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Amar Iqbal (Lead Pharmacist-Women's Services)

PROSTAGLANDIN E2 (DINOPROSTONE)

Indications for use: Maintaining patency of ductus arteriosus

Preparation: 1mg in 1ml – solution supplied as 0.75mg/0.75ml vial (Prostin®)

License status: Not licensed for use in children

Prepare as per prescription label:

Prostaglandin E2

Take 0.5ml of 1mg/ml solution and add to 500mls of ……..i.e. 1microgram per 1ml.
Withdraw 50ml from the bag into a syringe and infuse at rate of ……mls/hour (0.3 x weight in kg) to give 5 nanogram/kg/min
Signed……Date……

Administration: Continuous intravenous infusion

Dosage: Use starting dose 5 nanograms/kg/min increasing as necessary in 5 nanogram/kg/min increments up to a maximum of 20 nanograms/kg/min.

If more than 20 nanograms/kg/min are necessary please consult cardiologist.

Routes: IV / UVC

Compatibility:
Glucose 10% *
Glucose 5%
Sodium chloride 0.9%

Incompatibility: Prostaglandin E2 should never be infused simultaneously through the same line as any other drug

Other: May cause apnoea

NB: The above doses are suitable for maintaining duct patency. Higher doses will be required to reopen the duct

Doses up to 100nanograms/kg/min have been used but are associated with increased side effects

The 500ml bag containing Dinoprostone should NEVER be infused directly into the patient. Follow preparation instructions above to run through syringe pump. Discard the bag immediately.

References:
BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 26.08.15]
*local practice

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

RANITIDINE

Indications for use:

Gastric irritation
Inhibits gastric acid secretion
Gastro-oesophageal reflux

Preparation:

Injection: 25 mg in 1 ml - solution supplied in 2ml ampoules
Prepare as per prescription label:

RANITIDINE INJECTION **25 mg in 1 ml**	Dose	Frequency TDS
	Route IV	Pharmacy
Other Directions Dilute 0.2mls to 5 ml with water (= 1 mg in 1 ml). Take required dose and infuse	Infuse over 20 minutes	
Prescriber Signature	Date Commenced	Date Cancelled

Oral solution: 15 mg in 1 ml (note Rosemont brand contains 8% w/v alcohol)

License status:

Oral preparations not licensed for use in children under 3 years; injection not licensed for use in children under 6 months

Administration:

Dosage:

IV: 0.5 – 1 mg/kg every 6 – 8 hours
Oral: 1 - 3mg/kg tds
IV and oral doses are NOT equivocal as oral dose poorly absorbed

Routes:

IV / NG / Oral

Compatibility:

Sodium Chloride 0.9%
Sodium Chloride 0.45%
Glucose 10%
Glucose 5%
Glucose 4% + sodium chloride 0.18%

Incompatibility:

Amphotericin, cephalosporins, insulin, midazolam, noradrenaline, phenobarbital

Caution:

Use with caution in renal impairment-Refer to BNF-C and consult product literature
Rapid administration must be avoided as it could cause cardiac arrhythmia

References:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 26.08.15]
Trissel, L.A. Handbook of Injectable drugs. Available at http://www.medicinescomplete.com/mc/hid/current/ [Accessed 26.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

RETINOPATHY OF PREMATURITY SCREEN

DATE OF SCREEN ……

BIRTH WEIGHT ……Grams
BIRTH GESTATION ……Weeks
CORRECTED G A ……..Weeks

BABY ID STICKER HERE

Please ensure sucrose is given as prescribed before drops and immediately before examination
Not to be given if less than 28 weeks gestation

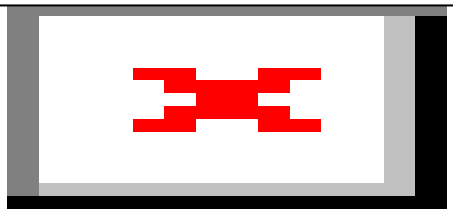
SUCROSE 24%(circle appropriate dose below)		Time	Date	Signatures
<31 weeks gestation or <1000g	0.1ml			/
>31 weeks gestation and 1000 – 2000g	0.2ml			
>2000g	0.5ml			/

Both drops to be given 1 hour prior to eye examination	Time	Date	Signatures
CYCLOPENTOLATE 0.5% - ONE DROP TO EACH EYE			/
PHENYLEPHRINE 2.5% - ONE DROP TO EACH EYE			/

Prescriber Signature: _____ Date: _____

One of these drugs to be administered by ophthalmologist prior to examination	Time	Date	Signatures
PROXYMETACAINE 0.5% - 1 – 2 DROPS TO EACH EYE			/
TETRACAINE 0.5% - 1 – 2 DROPS TO EACH EYE			/

Prescriber Signature: Date:



RIGHT	**LEFT**
HIGHEST GRADE: None / I / II / III / IV / V	HIGHEST GRADE: None / I / II / III / IV / V
TOTAL CLOCK HOURS: _____	TOTAL CLOCK HOURS: _____
PLUS DISEASE (+/-) _____	PLUS DISEASE (+/-) _____
DILATATION: good / moderate / poor	DILATATION: good / moderate / poor
MEDIA CLEAR: Y / N	MEDIA CLEAR: Y / N

COMMENT……
……
……
……
……
FOLLOW UP: _____
EXAMINER: _____
PRINT NAME: _____

ROCURONIUM BROMIDE

Indications for use: When paralysis is required to aid effectiveness of mechanical ventilation

Preparation: 5 ml vials with concentration 10mg/ml
Prepare as per prescription label

Rocuronium Bolus:
Take 1ml of 10mg/ml solution and make up to 10ml with 0.9% sodium chloride to give solution of 1mg (1000microgram)/ml.
Give ……mg (weight (kg) x 0.6)
Signed……Date……..

Rocuronium Infusion:
Take 4mls of 10mg/ml solution and make up to 40mls with …… to give solution of **1 mg/ml**. Run at …….ml/hour (i.e. ….....mg/kg/hour)
NB Preset volume for 24hrs then stop infusion unless Consultant advises otherwise. Observe for movements before restarting
Signed…….Date……..

License status: Not licensed for use in children for assisted ventilation in intensive care

Administration:

Dosage:
Loading dose: 600 microgram/kg (0.6 mg/kg) (as IV bolus)
Maintenance: 300 - 500 microgram/kg/hour (0.3 -0.5mg/kg/hour) initially (as continuous infusion)

Routes: IV / UVC

Compatibility:
Sodium Chloride 0.9%
Glucose 5%

Incompatibility: Insulin, furosemide, SMOFlipid®, vancomycin

Interactions:
Aminoglycoside antibiotics:
May increase length of time neuromuscular blockade lasts for

Other:
Rocuronium is cumulative if there is renal impairment and in liver impairment (e.g. in babies with conjugated hyperbilirubinaemia)

DOSE SHOULD BE REDUCED IF THERE IS A RAISED CREATININE OR ABNORMAL LFTs- Refer to BNF-C and product literature

Reference:
BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

NPPG message board correspondence Anna Burgess, Noah's Ark Children's Hospital for Wales, Cardiff. 02.03.17

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

SODIUM BICARBONATE

Indications for use:

Treatment of acidosis

It is important that the underlying cause of acidosis is identified and managed appropriately

NB If a baby has a chronic on going loss of bicarbonate and requires oral supplementation, please discuss dose and preparation to use with pharmacist

Preparation:

4.2% sodium bicarbonate contains 0.5mmol of sodium bicarbonate in 1 ml – supplied as 10 ml ampoules
8.4% sodium bicarbonate contains 1mmol of sodium bicarbonate in 1 ml – supplied as 10 ml ampoules

Administration:

Dosage:

Calculate dose in mmol using formula:

$$\text{½ correction(mmol)} = \frac{\text{base deficit x wt in kg x F}}{2}$$

F: In neonates <37 weeks 0.5
In neonates >37 weeks 0.4
(in infants and children 0.3 is used. The different multiplication factors relate to the amount of extracellular fluid in these age groups)

Bolus should be avoided except during resuscitation

Ideally infuse over at least 6 hours with regular blood gases

Prolonged infusions should not be routinely needed.

Dilute to a maximum concentration of 0.1mmol/ml for peripheral infusion with 5% or 10% glucose or 0.9% sodium chloride. (i.e. 8.4% sodium bicarbonate 1ml made up to 10ml or 4.2% sodium bicarbonate 1ml made up to 5ml). Sodium bicarbonate 4.2% may be given undiluted ONLY over a short period for emergency peripheral administration. Extravasation can cause severe tissue damage
max rate 0.5mmol/kg/min

Routes:

IV / UVC

Incompatibility:

MUST RUN SEPARATE TO OTHER INFUSIONS VIA ITS OWN LINE.
Do not infuse with any other medicines or infusion fluids

Caution:

Ensure baby is adequately ventilated to prevent hypercapnoea
Extravasation can cause severe tissue necrosis. If given via a peripheral line observe closely. Use of a dilute preparation reduces the risk of serious tissue damage
Use with caution in hypokalaemia

References:

Guy's and St Thomas', Kings College and University Lewisham Hospitals Paediatric Formulary (9th Edn) London: Guy's and St Thomas' NHS Foundation Trust ; 2012. Available online at http://www.guysandstthomas.nhs.uk/resources/publications/formulary/paediatric-formulary-9th-edition.pdf [accessed 26.08.15]
Neonatal Formulary: Drug Use in Pregnancy and the First Year of Life (6th Edn) London: Wiley-Blackwell;2011
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 26.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

SODIUM CHLORIDE

Indications for use:
Sodium supplementation (added to feeds or maintenance fluids)

Preparation:
Oral: 1mmol per ml oral solution
IV: 30% sodium chloride 5mmol/ml

Administration:
Concentrations of sodium chloride exceeding 1.8% (0.3mmol/ml) should always be administered via a central venous access device due to high osmolarity.

Dosage:

Oral Supplementation:

Oral supplementation should only be used when a baby is tolerating 50ml/kg/day milk feeds

When required, initially commence 3mmol/kg/day in 3 divided doses ie 1mmol/kg/dose at 02.00, 10.00 and 18.00

In bigger babies, where a larger volume may be required, the dose 3 mmol/kg/day may be given in 4 divided doses (ie 0.75mmol/kg/dose prescribed at 06.00, 12.00, 18.00, 23.59)

No routine sodium chloride is required for babies on fortified breast milk (180mls/kg/day fortified breast milk provides approx 4.9 mmol/kg/day sodium)

Babies with 'ostomies':
Measure urine electrolytes Monday and Thursday
Na:K ratio in urine should be at least 2:1
Add sodium as required to ensure this is achieved even if serum Na is normal

IV Supplementation:
Requirement usually 3mmol/kg/day

Remember
10% glucose +0.18% sodium chloride contains 0.03mmol/ml sodium
0.45% Sodium Chloride contains 0.075mmol/ml sodium
0.9% Sodium Chloride contains 0.15mmol/ml sodium
150mls/kg/day 10% glucose +0.18% sodium chloride provides 4.5mmol/kg/day sodium

If supplemental parenteral sodium is required it would be preferable to use either 0.45% sodium chloride or 0.9% sodium chloride. If higher amounts of sodium are required, add to a plain bag of glucose. See worked example below:

Weight of baby: 1.7kg
Total daily amount of fluid: 150mls/kg/day = 150 x 1.7 = 255mls
Amount of sodium chloride to be given in 24 hours: 3mmol/kg/day
= 3 x 1.7 = 5.1mmol
Therefore 255mls of fluid needs to contain 5.1mmol of sodium chloride.
A 500ml bag of 5% or 10% glucose will need to contain 500/255 x 5.1mmol
= 10mmol sodium chloride to deliver 3mmol/kg/day to baby
Strength of 30% sodium chloride is 5mmol/ml. Therefore you need to add 10/5 =2ml 30% sodium chloride

Reference:
NHS Injectable Medicines Guide, Medusa. Accessed at http://medusa.wales.nhs.uk/ [Accessed 26.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

SODIUM FEREDETATE (SYTRON® or SODIFER®)

Indications for use:

Iron supplementation in babies less than 1500g and/or 33+6 weeks gestation or less

Preparation:

Both these formulations contain Sodium Feredetate 190mg (Equivalent to 27.5mg iron) /5ml

The formulation supplied will depend on availability from manufacturer

License status:

Not licensed for prophylaxis of iron deficiency

Administration:

Dosage:

Please prescribe as ' Sodium Feredetate 190mg/5ml' rather than brand name as formulation supplied will depend on availability from manufacturer

Supplements should be commenced when babies are 28 days old or 34 weeks gestation, whichever is earlier, providing they are tolerating 50% of enteral feed

Breast milk, term formula and peptijunior, Monogen, Pregestimi lipil:
< 1.5kg: 0.5ml once daily
≥ 1.5kg: 1ml once daily

Fortified Breast milk:
< 1.5kg: 0.5ml once daily
≥ 1.5kg: 1ml once daily

Preterm formula (Nutriprem/ SMA Gold Prem 1), infatrini/ infantrini peptisorb**:**

No supplementation required

Routes:

Oral / NG

Other:

Prescribe at 14.00

Reference:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

Adapted from ESPGHAN. Enteral Nutrient Supply for Preterm Infants: Commentary from European Society for Paediatric Gastroenterology, Hepatology and Nutrition Committee on Nutrition. JPGN 2010; issue 1: pg 85-91

Written by: Gemma Holder (Neonatal Consultant),
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services), Sara Clarke (Neonatal Network Dietitian)

SORE BOTTOMS

Indications for use:	Range of preparations for use when nappy area red, inflamed and/or broken If the rash has an appearance of candida, swab and commence miconazole (see separate entry)
Preparations:	Sudocrem® Orabase® Metanium®
Administration:	
Dosage:	1 application with nappy changes
Frequency:	With nappy changes
Routes:	Topically to nappy area

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

SPECIAL FEEDS

Only to be commenced on advice of neonatal or paediatric dietitian

Ensure neonatal dietitian or paediatric dietitian is aware of any infant on specialised feeds.

Commonly used feeds:

SMA Pro Gold Prem 1® (order from NHS Supplies for specific baby)	Preterm formula, Partially hydrolysed formula, with MCT fats, low lactose, liquid preparation	MCT requirement i.e. in conjugated hyperbilirubinaemia or evidence of fat malabsorption For babies <2kg
Hydrolysed nutriprem 1	Preterm formula Hydrolysed formula LCT Liquid preparation	Whole protein intolerance for babies <2kg
Cow & Gate Protein Supplement® (order from NHS Supplies for specific baby)	Protein only supplement	Used in addition to BMF to enhance protein intake of infants <1000g with serum urea persistently <4 mmol/L
Pregestimil Lipil® (order from Pharmacy for specific baby)	Term formula Hydrolysed casein with MCT fats, clinically nil lactose	Disaccharide and /or whole protein intolerance in conjunction with MCT requirement i.e. in conjugated hyperbilirubinaemia or evidence of fat malabsorption
Peptijunior® (stock item)	Term formula Hydrolysed whey with MCT fats, clinically nil lactose	Disaccharide and /or whole protein intolerance in conjunction with MCT requirement i.e. in conjugated hyperbilirubinaemia or evidence of fat malabsorption
Monogen® (order from Pharmacy for specific baby)	Term formula Whole protein with 84% MCT fats	Primary fat malabsorption e.g. babies with chylothorax or chylous ascites
Infatrini® (order from Pharmacy for specific baby)	Term nutrient dense infant formula, liquid preparation	To improve catch up growth in term infants with poor weight gain. For babies>2kg (N.B. Discuss with dietician if required)
Infatrini Peptisorb® (order from Pharmacy for specific baby)	Term nutrient dense infant formula. Extensively hydrolysed protein, nil lactose, MCT fats liquid preparation	To improve catch up growth in term infants with poor weight gain in conjunction with disaccharide and /or whole protein intolerance +/- MCT requirement i.e. in conjugated hyperbilirubinaemia or evidence of fat malabsorption For babies >2kg (N.B. Discuss with dietician if required)
Carobel® (stock item)	Feed thickener	For thickening feeds and the prevention of reflux/vomiting

Use scoop provided with each tin (scoop size varies between formulas)

There may be situations when more concentrated feeds are indicated. See dietitian recipe in blue nursing folder.

Rarely, other feeds or supplements may be indicated. These will be detailed in the dietitian instruction sheets which will be filed in the blue nursing folder. These need to be prescribed on prescription chart as per dietitian instructions.

Written by: Gemma Holder (Neonatal Consultant)/ Sara Clarke (Network Dietician)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

SPIRONOLACTONE

Indications for use:	Chronic lung disease Congenital heart disease
Preparation:	There are five different strengths available. **Please check carefully.** Pharmacy usually dispenses either 5mg/5ml or 50mg/5ml
License status:	Not licensed for reduction of hypokalaemia induced by diuretics
Administration:	
Dosage:	1 mg/kg
Frequency:	Start once daily and monitor electrolytes and effect. May be increased to twice daily if required
Routes:	Oral/NG
Caution:	Renal impairment Check potassium for hyperkalaemia
Other:	Usually prescribed with Chlorothiazide
References:	BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

STOMA CARE

Indications for use:	For babies with ostomies following surgical procedure
Preparation:	ConvaTec Orahesive® Powder ConvaTec Orahesive® Paste
Administration:	
Dosage:	Apply around stoma as advised by Stoma Care Nurse/ Surgical Liaison Nurse
Frequency:	As required
Routes:	Topically to skin
Other:	This is not available from pharmacy, but from general stores

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

SUCROSE

Indications for use:

Short term procedural pain
Please refer to 'Pain Guideline' on intranet

PRE-PRINTED ON DRUG CHART
CIRCLE APPROPRIATE DOSE AND SIGN
NOT TO BE USED IN INFANTS:
<28 weeks gestation corrected gestational age
At high risk of NEC
Nil by mouth
Sedated or on other pain medications
Of diabetic mothers until blood sugars have stabilised
With known carbohydrate malabsorption or enzyme deficiency

Preparation:

Sucrose 24%

Administration:

Must be used in conjunction with environmental and behavioural measures to relieve pain e.g. swaddling, containment holding
Dose can be repeated up to 3 times per procedure

Max 8 doses of sucrose may be given on one day

Dosage:

< 31 weeks CGA and <1000g:	0.1ml (max 0.3ml per procedure)
≥31 weeks CGA and 1000 – 2000g:	0.2ml (max 0.6ml per procedure)
>2000g:	0.5ml (max 1.5ml per procedure)

Routes:

Drop prescribed dose onto pacifier and place in baby's mouth
Or
Give prescribed dose onto the tongue or buccal membrane

Reference:

Pain Assessment and Management Guideline ; Neonatal Guidelines 2013 – 15 – Southern West Midlands Newborn Network

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

SUXAMETHONIUM CHLORIDE

Indications for use:	Short acting depolarising muscle relaxant used for short duration paralysis prior to intubation Prescribe on dedicated Preintubation drug chart
Preparation:	50mg/ml Take 50mg (1ml) of suxamethonium chloride and dilute to 10mls with 0.9% sodium chloride to give 5mg/ml. Take required amount and administer as iv bolus Flush with 1ml 0.9% sodium chloride over 1 minute to ensure no muscle relaxant remains within the line
Administration:	
Dosage:	2mg/kg slow bolus Prescribe on dedicated Preintubation drug chart
Frequency:	Above dose produces 5 – 10 mins of paralysis. It cannot be reversed WARNING: staff must never paralyse a baby unless they are confident they can keep the airway open and hand ventilate the baby Dose can be repeated if required.
Routes:	IV/UVC
Other:	Bradycardia may occur which can be reduced by administering atropine prior to the dose Effects of suxamethonium can be enhanced by vancomycin and gentamicin Contraindicated in hyperkalaemia (may increase plasma potassium concentrations) Prolonged apnoea may occur in severe liver disease because of reduced hepatic synthesis of pseudocholinesterase
References:	BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15] Neonatal Formulary: Drug Use in Pregnancy and the First Year of Life (6th Edn) London: Wiley-Blackwell;2011

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

(THAM) TROMETAMOL

Indications for use:

Correction of acidosis, particularly in babies with high serum sodium precluding the infusion of Bicarbonate

Preparation:

(Unlicensed Special Product)

1ml of THAM 7% is approx equivalent to 1mmol bicarbonate

Administration:

Dosage:

Calculate dose in ml THAM for half correction of base deficit using formula:

F = 0.5 in neonates < 37 weeks gestation
0.4 in neonates >37 weeks gestation

$$\text{½ correction (ml of THAM)} = \frac{\text{F x base deficit (mmol/L) x weight (kg)}}{2}$$

Give half correction first and recheck blood gas prior to giving further doses. Do not exceed total dose of 15mmol/kg/24 hours

Dilute at least 1 in 2 (equal volumes of THAM and diluent) with 5% glucose or water for injection

Do not exceed administration rate of 0.5mmol/kg/min

Routes:

IV / long line

Incompatibility:

MUST BE GIVEN VIA A SEPARATE LINE.
Do not infuse with any other medicines or infusion fluids

Other:

Can be given undiluted in fluid restricted patients via central or long line

Extravasation can cause serious tissue damage

Contraindicated in anuria, chronic respiratory acidosis

If access difficulties UVC may be used, although with caution as liver necrosis has been reported when giving via this route

Cautions:

Renal impairment, may cause hyperkalaemia,

References:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

Guy's and St Thomas', Kings College and University Lewisham Hospitals Paediatric Formulary (9th Edn) London: Guy's and St Thomas' NHS Foundation Trust ; 2012. Available online at http://www.guysandstthomas.nhs.uk/resources/publications/formulary/paediatric-formulary-9th-edition.pdf [accessed 09.06.14]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

TRIMETHOPRIM

Indications for use:	Prophylaxis, for prevention of Urinary Tract Infection
Preparation:	Suspension 50 mg in 5 ml
License status:	Not licensed for use in children under 6 weeks
Administration:	
Dosage:	Prophylaxis for UTI: 2 mg/kg
Frequency:	Prophylaxis for UTI: 24 hourly at night
Routes:	Oral / NG
References:	BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

URSODEOXYCHOLIC ACID AND FAT SOLUBLE VITAMINS

Indications for use:

Cholestasis (persistent conjugated hyperbilirubinaemia >50)

Babies requiring this regime should be referred to the Nutrition Team for review

Preparation:

Ursodeoxycholic acid Suspension 250mg in 5mls.

Vitamin A drops (Abvit® 10 000 units/ml)
Vitamin D drops-alfacalcidol (One-Alpha®) 1 drop =100 nanograms. Must be stored in the fridge.

License status:

Ursodeoxycholic acid not licensed for use in children

Administration:

Dosage:

10mg/kg 8 hrly

Routes:

NG/oral

Other:

Fat soluble vitamins may also be required. The doses are:
Vit A: <37 weeks gestation CGA 1000units/kg/day
≥ 37 weeks gestation and < 1yr 5000 units/day (note NOT per kg)

Vit D alfacalcidol: <37 weeks gestation: 50 nanogram/kg/day
≥ 37 weeks gestation: 25 – 50 nanograms/kg/day
(n.b. 1 drop = 100 nanograms, prescribe dose to nearest drop as below)

Dose Range nanograms/day	Dose to be prescribed
80-100 nanograms	1 drop once daily
65-79 nanograms	1 drop on weekdays only (Monday to Friday)
50-64 nanograms	1 drop every 48 hours (i.e. alternate days)
30-49 nanograms	1 drop every 72 hours (i.e. every third day)
<29 nanograms	1 drop every 96 hours (i.e. every fourth day)

Vit E: <37 weeks gestation 10mg/kg once daily
≥37 weeks gestation and <1yr 50mg/day (note NOT per kg)

Vit K (Phytomenadione): 1mg od

Abidec should be discontinued if baby is started on Ursodeoxycholic acid and liver vitamin regime until review by nutrition team.

If baby on PN do not commence fat soluble vitamins until on <10ml/kg/day intralipid/ SMOFlipid® syringe

Monitor Vitamin A, D and E levels. These MUST be done at commencement and then as a minimum 4 weekly or as directed by levels or nutrtition team.
Results and outstanding levels should be recorded on BADGER to allow follow up.

References:

BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

BCH Liver Unit guidelines for managing cholestatic liver disease

HEFT, Neonatal Formulary December 2014
Email correspondence Sara Clarke and Sue Breath October 2016

Written by: Gemma Holder (Neonatal Consultant), Sara Clarke (Neonatal Network Dietitian)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

VACCINATIONS

Vaccine	Dose	Route	
Hepatitis B Immunoglobulin	200 units	IM	Give at different site to vaccine
Hepatitis B recombinant vaccine	0.5ml (10 micrograms)	IM thigh	Engerix B® See handbook for schedule
Diptheria, tetanus, acellular pertussis, inactivated polio, Hib, Hep B DTaP/IPV/HiB/HepB (6 in 1)	0.5ml	IM thigh	Infanrix hexa ®
BCG * live vaccine see section below Live attenuated vaccines	0.05ml	Intradermal	SSI brand No further injections in left arm for 3/12 post administration
Pneumococcal Vaccine	0.5ml	IM thigh	Prevenar 13®
Rotavirus * live vaccine see section below Live attenuated vaccines	1.5ml	By mouth	Rotarix®
Meningococcal group B vaccine	0.5ml	IM left thigh (ideally on own)	Bexsero®

VACCINE SCHEDULE

Age at administration	Viruses covered
2 months (2 injections and 1 oral vaccine)	• Diptheria, tetanus, pertussis (acellular), polio (inactivated), haemophilus influenza type B, hepatitis B • *Rotavirus (provided baby is <104 days of age) • Meningococcal group B**
3 months (2 injection and 1 oral vaccine)	• Diptheria, tetanus, pertussis (acellular), polio (inactivated), haemophilus influenza type B, hepatitis B • Pneumococcal conjugate Vaccine • *Rotavirus (provided baby is <167 days of age)
4 months (2 injections)	• Diptheria, tetanus, pertussis (acellular), polio (inactivated), haemophilus influenza type B, hepatitis B • Meningococcal group B**

*Rotavirus vaccine should be given according to the routine vaccine schedule in preterm babies. It is likely to carry a low incidence of transmission if standard infection control measures are maintained.
The rotavirus vaccine is highly attenuated and does not revert back to a high virulence strain. **However**, if the vaccines are delayed for any reason, the initial Rotavirus vaccine **should not** be given if the baby is over 104 days of age.
If this has occurred, or there is a delay in administering the 3 month vaccinations, it should be ensured that the 2nd rotavirus dose is given at least 4 weeks after the first and before the baby is 167 days of age.

Although the vaccine is a live attenuated virus, with the exception of severe combined immune-deficiency (SCID), the benefit from vaccination may exceed any risk in other forms of immunosuppression. Therefore, there are very few infants who cannot receive rotavirus vaccine. Breast feeding and medications for gastro-oesophageal reflux are not contraindications for rotavirus vaccination. The rotavirus vaccine can also be administered before, at the same time as, or after administration of any blood product, including those containing antibody/immunoglobulin. Where there is doubt, appropriate advice should be sought from an immunisation coordinator or consultant in health protection rather than withholding vaccination.

Rotarix® should not be given to:
 infants with a confirmed anaphylactic reaction to a previous dose of rotavirus vaccine;
 infants with a confirmed anaphylactic reaction to any components of the vaccine;
 infants with a previous history of intussusception;
 infants aged 24 weeks and zero days of age or older;
 infants with Severe Combined Immunodeficiency (SCID) disorder;
 infants who have a malformation of the gastrointestinal tract that could predispose them to intussusception;
 infants with rare hereditary problems of fructose intolerance, glucose-galactose malabsorption or sucrase-isomaltase insufficiency.
 children born of mothers who were on immunosuppressive biological therapy during pregnancy (see section below)

Administration of rotavirus vaccine should be postponed in infants:
 suffering from acute severe febrile illness;
 suffering from acute diarrhoea or vomiting. This is to make sure that the vaccine is not regurgitated or passed through the intestines too quickly, which could reduce the effectiveness of the vaccine.

There is a potential for transmission of live attenuated vaccine in Rotarix® from the infant to severely immunocompromised contacts through faecal material for at least 14 days.
Those in close contact with recently vaccinated infants should observe good personal hygiene.

**JCVI have recommended that paracetamol should be given prophylactically when 4CMenB is given with the routine vaccines in infants under one year of age. Three doses of paracetamol should be given orally, with the first dose provided as soon as possible after vaccination, and two subsequent doses in accordance with their gestation.

Oral:

28 - 32 weeks CGA:20 mg/kg as single dose, then 10 – 15 mg/kg 8 – 12 hourly; max 30 mg/kg in 24 hours

More than 32 weeks CGA:20 mg/kg as single dose, then 10 – 15 mg/kg 6 – 8 hourly; max 60 mg/kg in 24 hours

Should fever persist following the third dose and provided that the child appears otherwise well, additional doses of paracetamol may be administered for up to 48 hours.

Live attenuated vaccines: avoid use in those who are clinically immunosuppressed

Healthcare professionals should ensure that clinically significant immunosuppression in a patient is identified before administration of a live attenuated vaccine. Drug Safety Update volume 9 issue 9, April 2016: 7.

- children born of mothers who were on immunosuppressive biological therapy during pregnancy will not be eligible to receive rotavirus vaccine (and will need to defer BCG, if indicated, for 6 months). If there is any doubt as to whether an infant due to receive a live-attenuated vaccine may be immunosuppressed due to the mother's therapy, including exposure through breastfeeding, specialist advice should be sought.

Please see Junior Doctor Handbook for Guidelines for Administration of Vaccines

References:
Green Book Chapter 27B: Rotavirus Accessed online:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/193107/Green_Book_Chapter_27b_v1_0W.pdf
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/193055/130429_Rotavirus_tripartite_letter_FINAL.pdf
Department of Health Green Book. Meningococcal, Chapter 22. Available at:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/448875/2904185_Green_Book_Chapter_22_v3_0W_July2015.PDF [accessed 19.08.15]
Department of Health Green Book. Meningococcal, Chapter 6. Available at:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/655225/Greenbook_chapter_6.pdf [accessed 20.12.17]
The routine immunisation schedule from Autumn 2017. Available at:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/633691/Childhood_imm_schedule_2017.pdf

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services

VANCOMYCIN - CONTINUOUS INFUSION

(Hospira brand)

Indications for use:

Infection – please refer to Antibiotic Guidelines

Preparation

Available 500mg and 1g vials containing powder for reconstitution

Dosage:

Loading dose: 15mg/kg administered over 1 hour

Maintenance continuous infusion to be commenced immediately after the loading dose using 125mg in 30ml infusion solution.

Serum creatinine (µmol/L)	Corrected gestational age	Dose over 24 hrs	Infusion Rate (ml/hr)
<50	≥ 40 weeks	50mg/kg/day	0.5 x weight
<50	< 40 weeks	40mg/kg/day	0.4 x weight
50-70	all	30mg/kg/day	0.3 x weight
>70	all	20mg/kg/day	0.2 x weight

IF THE INFUSION IS INTERRUPTED, RE-START AT THE SAME DOSE AS SOON AS THIS IS POSSIBLE

Indication for use should ALWAYS be documented
Prescribe for 24 hours only initially
Review culture results after 36 hours (where possible) and at most 48 hours; either discontinue antibiotic or rewrite prescription documenting length of course and reason for course duration

NB: If changing from a bolus regimen to a continuous regimen, do not give a loading dose. Start continuous infusion straight away and repeat level after 12 hours.

Administration:

Loading Dose
Reconstitute each 500mg of Vancomycin with 10ml water for injection. The resultant solution is 50mg/ml.

Dilute to a concentration of 5mg/ml.
Take 1ml (50mg) of the reconstituted solution, dilute to 10ml with diluent to give a solution containing 5mg/ml.
Take the required dose and administer over 60 minutes
Maintenance dose
Reconstitute each 500mg of Vancomycin with 10ml water for injection. The resultant solution is 50mg/ml.
Take 2.5ml (125mg) of this solution and make up to 30ml with glucose 5%. Run this infusion solution at the prescribed rate specified as per the table (above).

Monitoring & Dose Adjustment:

Target range 15-25mg/L

- Take a sample approx. 12 hours after starting the infusion or approx 12 hours after any dose change (see notes below regarding timing of levels)
- Follow monitoring as per page 2 of vancomycin prescription chart.

DOSE ADJUSTMENT BASED ON LEVELS	
Vancomycin concentration	**Suggested dose alteration**
<10mg/L	Increase the daily dose and rate by 50%
10 to <15mg/L	Increase the daily dose and rate by 25%
15 to 25mg/L	No change
>25 to 30mg/L	Decrease the daily dose and rate by 25%
>30mg/L	Stop until <25mg/L then restart at a lower dose

Although the dose over 24 hours and the rate will change the concentration of the infusion always remains 125mg/30ml

$$\text{Rate in ml/hour} = \frac{\text{dose(mg/kg/day)} \times \text{weight}}{100}$$

e.g. If dose is 62.5mg/kg/day: -

$$\text{Rate (ml/hour)} = \frac{62.5\text{mg/kg/day} \times \text{weight}}{100}$$

Routes: UVC/ LL or CVL

Other: Levels – levels are done in Microbiology at BCH at 10.30 and 16.00. They need to reach the BWH lab by 12.00 to ensure they make the 16.00 run. Levels are usually telephoned through to the NNU by 17.00
URGENT requests may be taxied to BCH on request of Consultant with shift leader authorisation

Please take levels with morning bloods whenever possible (even if this is slightly earlier/ substantially later than 12 hours after starting/changing the infusion)

Ototoxic and nephrotoxic. Increased toxicity risk when co-prescribed with gentamicin, furosemide, ibuprofen or Ambisome®

Compatibility: Solution compatibility with sodium chloride 0.45% and 0.9%; Glucose 5% and 10%.

Y- site compatibility with TPN, Intralipid, sodium chloride 0.45% and 0.9%; Glucose 5% and 10%, gentamicin, insulin, fluconazole, aciclovir, amiodarone, caffeine citrate, calcium gluconate, fentanyl, magnesium sulfate, meropenem, midazolam, morphine, potassium chloride, ranitidine

Incompatibility: Albumin, amphotericin, benzylpenicillin, cefotaxime, ceftazidime, dexamethasone, flucloxacillin, furosemide, heparin, phenobarbital, phenytoin, rocuronium, sodium bicarbonate

Reference:
Addenbrookes Trust NICU protocol for use of continuous vancomycin infusion Feb 2012
Yorkhill Hospital NICU protocol for use of continuous vancomycin infusion Aug 2011.
SPC Vancomycin (Hospira) viewed online 14.02.2014
Handbook on Injectable Drugs (viewed on Medicines Complete 14.02.2014)
Violeta Raverdy, Els Ampe, Jean-Daniel Hecq and Paul M. Tulkens, Stability and compatibility of vancomycin for administration by continuous infusion, Journal of Antimicrobial Chemotherapy Advance Access published January 9, 2013 Accessed online 14.02.2014

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

VANCOMYCIN (INTERMITTENT REGIME)

Indications for use:
Infection – please refer to Antibiotic Guidelines

Preparation:
500mg vial
Prepare as per prescription label:

DIRECTIONS
Dissolve VANCOMYCIN 500mg powder in 10mls water to give 50mg/ml.
Take 1ml and dilute to 10ml with glucose 5% or sodium chloride 0.9% to give a solution containing 5mg/ml
Take required amount and Give over 1 hour

Dosage:
15 mg/kg

NB: If changing from a continuous regimen to an intermittent regimen, give intermittent dose straight away (providing loading dose not given in preceding 8/12/18 hours depending on CGA)
If serum level was done within last 12 hours and was low/within acceptable range there is no need to do predose level. In all other circumstances, take level before giving dose and adjust dose/frequency when level available

Frequency:
*Less than 29 wk CGA 18hourly
29 – 35 wk CGA 12 hourly
More than 35 wk CGA 8 hourly

Indication for use should ALWAYS be documented
Prescribe for 48 hours only initially

Review culture results after 36 hours (where possible) and at most 48 hours; either discontinue antibiotic or rewrite prescription documenting length of course and reason for course duration

Routes:
IV/UVC

Other:
Levels – levels are done in Microbiology at BCH at 10.30 and 16.00. They need to reach the BWH lab by 12.00 to ensure they make the 16.00 run. Levels are usually telephoned through to the NNU by 17.00

Please take pre dose levels on the morning dose where ever possible
URGENT requests may be taxied to BCH on request of Consultant with shift leader authorisation

Take trough levels pre 3rd (N.B. pre 4th dose may be more appropriate depending on time of day and when level likely to be available)
Aim for levels 10 – 15mg/L

If level LOW increase the frequency of administration
If level HIGH decrease the frequency of administration

Caution rapid IV infusions may cause severe hypotension (including shock and cardiac arrest), dyspnoea, urticaria pruritis, flushing of the upper body ('red man' syndrome),pain and muscle spasm of back and chest

Caution in renal impairment-Refer to BNF-C and consult product literature

Incompatibility:
Incompatible with some drugs including albumin, amphotericin, aminophylline, dexamethasone, phenytoin, benzylpenicillin, heparin, phenobarbital, cefotaxime, ceftazidime, ceftriaxone, cefuroxime, omeprazole, flucloxacillin, furosemide, rocuronium, sodium bicarbonate

Vancomycin may be added (terminally) to insulin, midazolam or morphine

Reference:
BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]
Trissel, L.A. Handbook of Injectable drugs. Available at http://www.medicinescomplete.com/mc/hid/current/ [Accessed 09.06.14]
*Dose for babies <29 weeks based on clinical experience at BWH

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

VITAMIN K (PHYTOMENADIONE)

Indications for use:
Neonatal prophylaxis of vitamin-K deficiency bleeding

Preparation:
Konakion® MM Paediatric
2mg/0.2ml (suitable for oral and IM administration)

Administration:

Dosage:
*IM:
< 36 weeks gestation: 400micrograms/kg (max 1mg)
≥ 36 weeks gestation: 1mg

**Oral (if ≥ 36 weeks gestation):
2mg at birth and 2nd dose of 2mg within 1st week of life (at 4-7 days)
3rd dose of 2mg needs to be given at 1 month of age if exclusively breast feeding

We do not routinely administer vit K IV as it does not create a depot store and give the prolonged protection provided by IM depot injection

**Bleeding vit K deficiency:
1mg by slow iv injection. Can be repeated 8 hourly if required

Routes:
IM
Sick term or preterm babies and term babies who's mothers are taking anti convulsant medication, rifampicin or warfarin should ALWAYS receive IM vitamin K
Note: babies who may have a coagulation deficiency should **not** receive IM injections

Oral
IV (in bleeding thought to be secondary to Vit K deficiency)-given very slowly as risk of vascular collapse

Other:
For all babies receiving oral vitamin K, 'Konakion® MM Paediatric 2mg' must be prescribed as a TTO if baby discharged before 4 days old to ensure the baby receives 2nd dose within first week of life.

The 3rd dose will be prescribed by GP if the baby is exclusively breastfed.

References:
*Based on local practice which has been found to be effective

** BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

ZIDOVUDINE

Indications for use:

Prophylaxis in babies whose mother is known to be HIV Positive.

Follow plan in mother's notes.

Preparation:

Suspension: 50 mg in 5 ml

Injection: 10 mg in 1 ml (20ml vial)

Take 10mg of solution and make up to 5 mls with 5% glucose to give a solution of **2mg/ml.** Take required amount and infuse over 60 mins –

Administration:

Dosage:

Greater 34 weeks:
Oral: 4mg/kg 12 hourly within 4 hours of delivery until baby 4 weeks of age
If certain strict criteria are met, baby may only require 2 weeks PEP
Check the plan in mother's notes

Round dose to the nearest whole milligram for ease of administration.
IV: 1.5 mg/kg 6 hourly infused over 60 mins

30 - 33+6 weeks:
Oral: 2 mg/kg 12 hrly for 2 weeks then 2mg/kg 8hrly for 2 weeks
IV: 1.5mg/kg 12hrly infused over 60 mins for 4 weeks

<30 weeks:
Oral: 2mg/kg 12 hrly for 4 weeks
IV: 1.5mg/kg 12 hrly infused over 60 mins for 4 weeks

Routes:

IV infusion/ Oral / NG

Location:

Two 200ml bottles of Zidovudine Syrup 50mg in 5ml are kept on delivery suite. Bottles are stored in the emergency drug cupboard

Reference:

BHIVA guidelines for management of HIV infection in pregnant women 2012; HIV Medicine 2012;13(suppl 2)87 – 157

Above guidelines available via www.bhiva.org/documents/Guidelines/Pregnancy/2012/hiv1030_6.pdf
BNF for Children London: BMJ Group, Pharmaceutical Press and RCPCH Publications Limited; 2014 – 2015 Available at https://www.medicinescomplete.com/mc/bnfc/current/index.htm [Accessed 19.08.15]

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

ADDENDUM 1
SUMMARY VITAMIN REQUIREMENTS

Abidec and Sodium feredetate (Sytron®) - For babies with a birth weight less than 1500g and/or 33+6 weeks gestation or less.

Joulies phosphate- For babies with a birth weight less than 1500g and/or 30 weeks gestation or less.

Abidec® and Joulies phosphate should be commenced when baby 7 days old or on 50% feeds (whichever is later).

Note PN lipid syringes contain vitamins, abidec should be started when on intralipid/SMOFlipid® <10ml/kg/day

Sodium feredetate (Sytron®) to be commenced at 28 days old or 34 weeks gestation (whichever is earlier), providing they are tolerating 50% of enteral feed

Type of Milk	**Supplements**
Unfortified Breast Milk and term formula Peptijunior/ Monogen/ Pregestimil lipil/	ABIDEC®: 0.6mls od JOULIES PHOSPHATE: 0.5mmol/kg tds (only if ≤30/40 and/or <1500g) SYTRON®: <1.5kg 0.5ml od ≥1.5kg 1ml od
Fortified Breast Milk	ABIDEC® **:** 0.3mls od ≥2kg discuss with dietician or Nutrition Support Team; to review continued use of HMF (see Human Milk Fortifier page) SYTRON®: <1.5kg 0.5ml od ≥1.5kg 1ml od
Nutriprem 1 + 2/ SMA Pro Gold Prem 1/ infatrini/ infantrini peptisorb	ABIDEC®: 0.3mls od

Prior to discharge if plasma phosphate >1.4 and TRP>95% then joulies phosphate should be stopped

Sytron® should be continued until 6-12 months of age (until tolerating balanced weaning diet)
Abidec® should be continued until 1 year of age (N.B. PHE advice that all children <5 years old should receive multi vitamins containing vitamins A, D + E)

Nutriprem 2 should not be continued beyond 6 months of age

Cholestasis (persistent conjugated hyperbilirubinaemia >50)

Fat soluble vitamins required. See ursodeoxycholic acid page for doses

Abidec should be discontinued if baby is commenced on Ursodeoxycholic acid and liver vitamin regime until review by nutrition team

If baby on PN do not commence fat soluble vitamins until on <10ml/kg/day intralipid/ SMOFlipid® syringe

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services), Sara Clarke (Neonatal Network Dietitian)

ADDENDUM 2

HYPERKALAEMIA

Full joint network guidelines available on Intranet

Serum potassium >7.0 mmol/L without ECG changes

- Give salbutamol 4 microgram/kg IV in glucose 10% over 5–10 min: effect evident within 30 min but sustained benefit may require repeat infusion after at least 2 hr
    - Take 0.2ml/kg of salbutamol solution (5mg/5ml) and dilute to 50ml of 10% glucose. Give 1ml of this solution over 10mins.
- give furosemide 1 mg/kg IV
- If serum potassium still >7.0 mmol/L, give insulin IV in glucose 10% (see Insulin page in formulary): very effective and has an additive effect with salbutamol
- Check blood sugar immediately before commencing the insulin infusion, 5 mins after completing the infusion then every 15 mins for the first hour after the infusion is complete. The blood sugar should then be monitored hourly for a further 3 hours if stable. Watch for late hypoglycaemia and refer to senior medical staff if any concerns
- Aim for blood glucose 4–7 mmol/L
- Repeat U&E
- Repeat insulin infusion as necessary until K+ <7 mmol/L

Serum potassium >7.5 mmol/L with ECG changes
As above, but first institute emergency measures below:

- Give 10% calcium gluconate 0.11mmol/kg (0.5ml/kg) IV over 5–10 min
- Flush line with sodium chloride 0.9% or preferably use a different line
- Give IV sodium bicarbonate (1 mmol/kg over 2 min) This is effective even in babies who are not acidotic (2 mL of sodium bicarbonate 4.2% = 1 mmol)

Further treatments: discuss with consultant

A cation-exchange resin, such as calcium resonium 500 mg/kg rectally, with removal by colonic irrigation 8–12 hrly, repeat every 12 hr. Dose can be doubled at least once to 1 g/kg in severe hyperkalaemia). Useful for sustained reduction in serum potassium but takes many hours to act and is best avoided **in sick preterms who are at risk of necrotising enterocolitis (NEC)**

SUBSEQUENT MANAGEMENT

- Recheck serum K+ 4–6 hrly; when arrhythmias present with renal failure, monitor hourly
- Monitor urine output and maintain good fluid balance
- If urine output <1 mL/kg/hr, unless baby volume depleted, give furosemide 1 mg/kg IV until volume corrected
- Treat any underlying cause (e.g. renal failure)

Reference: Based on Neonatal Guidelines 2013-15; Southern West Midlands Newborn Network

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services)

ADDENDUM 3

20% ALBUMIN SOLUTION DOSE CALCULATION

There is much controversy surrounding whether it is beneficial to replace albumin in babies who are significantly hypoalbuminaemic. There are certain circumstances when this may be felt to be desirable, but this should always be at the discretion of the Consultant on call.

The formula to calculate how much albumin to infuse is:

20% albumin required (ml)= deficit x wt(kg) x0.85

3.75mls/kg/day of 20% Albumin is equivalent to giving 15mls/kg/day of colloid which would usually be the maximum colloid dose given per day

Must be given slowly to prevent vascular overload, traditionally given over 3 hours
Record the batch number and expiry date from each unit used in the patient's case notes or drug chart.

Incompatible: Do not mix with other medicines, whole blood or packed red cells, parenteral nutrition solutions or solutions containing alcohol. Do not dilute with water for injections as this may result in potentially life threatening haemolysis

Reference: Based on local practice which has been found to be effective

Written by: Gemma Holder (Neonatal Consultant)

ADDENDUM 4

BABY-OSCAR STUDY SOLUTION

Indications for use:	Babies 23+0 - 28+6 weeks gestation with a large PDA confirmed using echocardiography with confirmed eligibility enrolled in the OSCAR trial.
Preparation:	4 x 2ml single-use ampoule pack containing a clear sterile preservative-free solution of either: Ibuprofen 10mg in 2ml **(Pedea®)** or Sodium chloride 0.9% **(placebo).**
Dosage:	Please use the Oscar Study Stickers for prescribing 1 dose every 24 hours to give a total of 3 doses: calculated using birth weight 1st dose 2ml/kg 2nd & 3rd dose 1ml/kg at 24 and 48 hours after initial dose, respectively. Give undiluted Flush the infusion line before and after administration over 15 minutes, with 1.5-2mL sodium chloride 0.9% or glucose 5%, to avoid contact with any acidic solution
Routes:	IV infusion over 15 minutes
Interactions:	Refer to Appendix 1 of BNF for Children for full list of drug interactions with NSAIDs
Compatibility:	Sodium Chloride 0.9% 5% Glucose **Do not infuse with any other medicines or infusion fluids**

Other:

DO NOT ADMINISTER IF THE PATIENT HAS:

- Low platelets (<50 000)
- Active bleeding (intracranial or GI bleeding)
- Coagulopathy
- Renal failure
- NEC
- Life threatening infection
- Marked unconjugated hyperbilirubinaemia
- Pulmonary Hypertension

IF PLATELETS ARE <50 AND URINE OUTPUT <0.5ML/KG/HR AND/OR SERUM CREATININE >100µmol/L, DISCUSS WITH CONSULTANT PRIOR TO GIVING DOSE.

As Ibuprofen reduces gut flow acutely, omit feed before and after infusion.

INCREASE DOSE INTERVAL FOR RENALLY SECRETED AMINOGLYCOSIDES SUCH AS GENTAMICIN AND VANCOMYCIN BY 6 HRS

Monitor weight, electrolytes and urine output.

Eligibility:

Babies will be considered <u>eligible</u> for inclusion into the trial if:

- Born at 23+0 to 28+6 weeks of gestation
- Less than 72 hours old
- Confirmed by echocardiography as having a large PDA which is
  - at least 1.5 mm in diameter (determined by gain optimised colour Doppler)

  and

  has unrestrictive pulsatile left to right flow (ratio of flow velocity in PDA. Maximum (Vmax) to Minimum (Vmin) > 2:1)

In addition

- The responsible clinician is uncertain about whether the baby might benefit from treatment to close the PDA
- Written informed consent has been obtained from the parent(s)

Babies will be <u>excluded</u> from participation in the trial if they have:

- No realistic prospect of survival
- Severe congenital anomaly
- Clinical or echocardiography suspicion of congenital structural heart disease that contraindicates treatment with ibuprofen
- Other conditions that would contraindicate the use of ibuprofen (clinically significantly intracranial or gastrointestinal haemorrhage, coagulopathy, thrombocytopenia (platelet count <50,000), renal failure, pulmonary hypertension, known or suspected necrotising enterocolitis (NEC))
- Indomethacin, ibuprofen, or paracetamol administration after birth

Other:

Additional contra-indication to Ibuprofen therapy is:

- Proven or suspected infection that is untreated

Additional caution to Ibuprofen therapy is

- Elevated total bilirubin.

If anuria or marked oliguria (<0.6 ml/kg/hr) or clearly significant bleeding is evident at the scheduled time of the second or third dose, no additional dosage should be given until laboratory studies indicate that renal function has returned to normal, or bleeding has stopped.

Open treatment with indomethacin or ibuprofen or other non-steroidal anti-inflammatory drugs (NSAIDs) should be avoided unless the criteria for rescue treatment is met (see protocol).

Administer carefully to avoid extravascular injection or leakage, as solution may be irritating to tissue

Unblinding:

In the event of an emergency, a baby's treatment allocation may be unmasked by contacting the NPEU CTU during working hours, or calling an out of hours help line.

9:00 am to 5.00 pm NPEU CTU: 01865 617 965
5.00 pm to 9.00 am and weekends: 0800 138 5451

Wherever possible, the unmasking of a baby's treatment allocation should be discussed with the Chief Investigator or delegate in advance.

Reference:

Baby-OSCAR protocol Version 6, 17 Nov 2016

Written by: Gemma Holder (Consultant Neonatologist)
Checked by: Hammara Sattar (Clinical Trials Pharmacist),
Approved by: Prof. Samir Gupta (Chief Investigator)

ADDENDUM 5

COAGULATION PROBLEMS

Clotting should be performed in the following circumstances:-

- When a UAC is inserted.
- In any shocked and unwell baby.
- In thrombocytopenia.
- When a baby has >15% bruising.
- When necrotising enterocolitis is suspected

1. Give 10ml/kg fresh frozen plasma if:

   i. Significant coagulopathy without need for plasma expansion
   PT >2.5 Control
   PTT > 2.5 Control

   ii. Significant coagulopathy with need for plasma expansion
   PT > 1.8 Control
   PTT > 1.8 Control

   iii. Significant bruising (greater than 5% on BBC)
   PT > 1.5 Control
   PTT > 1.5 Control

   iv. Significant bruising greater than 15% on BBC regardless of PT or PTT

2. Consider cryoprecipitate (10 ml/kg over 30minutes) if:-

   i. Fibrinogen < 1.0 as the only coagulation abnormality
   ii. Regardless of fibrinogen, if PT in normal range, but prolonged PTT after FFP given.

(Note if extensive bruising give FFP first).

1. The blood sample for coagulation tests must either be venous or arterial (not capillary).

   If from a line containing heparin, the specimen must be taken with care to "flush" the line first: the labs must be informed and asked to carry out the toludine blue test to detect the presence of heparin in the sample.

2. Repeat coagulation tests after each intervention until normal.

3. Hypotensive/shocked babies – see separate guideline. 10ml/kg FFP given immediately if bruising greater than 15% on BBC (Birmingham Bruising Chart) REGARDLESS OF BP OR COAGULATION RESULTS.

Reference: Based on local practice which has been found to be effective

Written by: Gemma Holder (Neonatal Consultant)

ADDENDUM 6
Privigen liquid (NEONATES)

This is available as:
5g in 50ml = 10% solution
10g in 100ml = 10% solution
20g in 200ml = 10% solution
i.e all sizes are the same concentration

Dose for haemolytic disease of the foetus and newborn (isoimmune haemolytic jaundice in neonates) = 500mg/kg

Administration rates in neonatal patients

	Rate ml/kg/hour
Initial infusion rate	0.15
Rate after 30 minutes	0.3
Rate after 60 minutes	0.6
Max rate after 90 minutes	1.2

Infusion rate table (round down to nearest 100g)

Weight	**0-30 minutes** **0.15ml/kg/hour**	**30-60 minutes** **0.3ml/kg/hour**	**60-90 minutes** **0.6ml/kg/hour**	**Max rate from 90 minutes** **1.2ml/kg/hr**
2000g	0.3 ml/hr	0.6ml/hr	1.2ml/hr	2.4ml/hr
2100g	0.32 ml/hr	0.63 ml/hr	1.26 ml/hr	2.52 ml/hr
2200g	0.33 ml/hr	0.66 ml/hr	1.32 ml/hr	2.64 ml/hr
2300g	0.35 ml/hr	0.69 ml/hr	1.38 ml/hr	2.76 ml/hr
2400g	0.36 ml/hr	0.72 ml/hr	1.44 ml/hr	2.88 ml/hr
2500g	0.38 ml/hr	0.75 ml/hr	1.5 ml/hr	3 ml/hr
2600g	0.39 ml/hr	0.78 ml/hr	1.56 ml/hr	3.12 ml/hr
2700g	0.41 ml/hr	0.81 ml/hr	1.62 ml/hr	3.24 ml/hr
2800g	0.42 ml/hr	0.84 ml/hr	1.68 ml/hr	3.36 ml/hr
2900g	0.44 ml/hr	0.87 ml/hr	1.74 ml/hr	3.48 ml/hr
3000g	0.45 ml/hr	0.9 ml/hr	1.8 ml/hr	3.6 ml/hr
3100g	0.47 ml/hr	0.93 ml/hr	1.86 ml/hr	3.72 ml/hr
3200g	0.48 ml/hr	0.96 ml/hr	1.92 ml/hr	3.84 ml/hr
3300g	0.5 ml/hr	0.99 ml/hr	1.98 ml/hr	3.96 ml/hr
3400g	0.51 ml/hr	1.02 ml/hr	2.04 ml/hr	4.08 ml/hr
3500g	0.53 ml/hr	1.05 ml/hr	2.1 ml/hr	4.2 ml/hr
3600g	0.54 ml/hr	1.08 ml/hr	2.16 ml/hr	4.32 ml/hr
3700g	0.56 ml/hr	1.11 ml/hr	2.22 ml/hr	4.44 ml/hr
3800g	0.57 ml/hr	1.14 ml/hr	2.28 ml/hr	4.56 ml/hr
3900g	0.59 ml/hr	1.17 ml/hr	2.34 ml/hr	4.68 ml/hr
4000g	0.6 ml/hr	1.2 ml/hr	2.4 ml/hr	4.8 ml/hr
4100g	0.62 ml/hr	1.23 ml/hr	2.46 ml/hr	4.92 ml/hr
4200g	0.63 ml/hr	1.26 ml/hr	2.52 ml/hr	5.04 ml/hr
4300g	0.65 ml/hr	1.29 ml/hr	2.58 ml/hr	5.16 ml/hr
4400g	0.66 ml/hr	1.32 ml/hr	2.64 ml/hr	5.28 ml/hr
4500g	0.68 ml/hr	1.35 ml/hr	2.7 ml/hr	5.4 ml/hr
4600g	0.69 ml/hr	1.38 ml/hr	2.76 ml/hr	5.52 ml/hr
4700g	0.71 ml/hr	1.41 ml/hr	2.82 ml/hr	5.64 ml/hr
4800g	0.72 ml/hr	1.44 ml/hr	2.88 ml/hr	5.76 ml/hr
4900g	0.74 ml/hr	1.47 ml/hr	2.94 ml/hr	5.88 ml/hr
5000g	0.75 ml/hr	1.5 ml/hr	3 ml/hr	6 ml/hr

Written by: Louise Whitticase Checked by: Kim Ridout March 2015

ADDENDUM 7

ACTH (Short Synacthen®) TEST

INDICATION

- This test is used as a diagnostic test for the investigation of adrenocortical insufficiency.
- In the adrenal cortex it stimulates the biosynthesis of glucocorticoid, mineralocorticoids and to lesser extent androgens.

CONTRAINDICATIONS

- Patients with allergic disorders e.g. Asthma

DRUG DOSAGE AND ADMINISTRATION

- ***SYNACTHEN® 250 micrograms*** intravenously for children **over** 1 year of age
- ***SYNACTHEN® 125 micrograms*** intravenously for children **under** 1 year of age.

SIDE-EFFECTS

- ***SYNACTHEN®*** may provoke hypersensitivity reactions. This may be in the form of Anaphylactic Shock in children with known sensitivities.
- Local hypersensitivity after the injection can result in pain and redness at the injection site.
- Urticaria, pruritus, flushing, faintness have been noted.

PATIENT PREPARATION

- The patient must be as stress free as possible, but may eat and drink
- They should be on bed rest for at least one hour, after the cannula has been inserted and before the test is commenced

SAMPLE REQUIREMENTS

- Blood to be collected in a glass tube **without** anticoagulant
- 1 ml of blood (0.5 mls serum) is required to measure cortisol.

TEST PLAN

TIME (MINUTES)	0 min	GIVE DRUG	+ 30 mins	+ 60 mins
REQUEST CORTISOL	✓		✓	✓

PROCEDURE

1- Bed rest for patient for 30 minutes prior to test commencing
2- Take venous blood sample for Cortisol at **0** minutes
3- Administer ***Synacthen®*** intravenously **after** 0 minute sample.
4- Take further samples of blood for Cortisol at
   + **30** minutes **most important sample**
   + **60** minutes
   after the administration of ***Synacthen®.***

ADDENDUM 8

ELECTIVE INTUBATION PROCEDURE

Ensure all resuscitation equipment is ready

Position baby ready for intubation; ensure baby is kept warm by covering with A blanket up to the nipple line

Put an appropriately sized ventilator bonnet on baby

Give atropine as bolus

Flush line with 0.6mls sodium chloride 0.9%

Commence prophylactic intermittent positive pressure ventilation using Neopuff and ensure adequate chest expansion is achieved

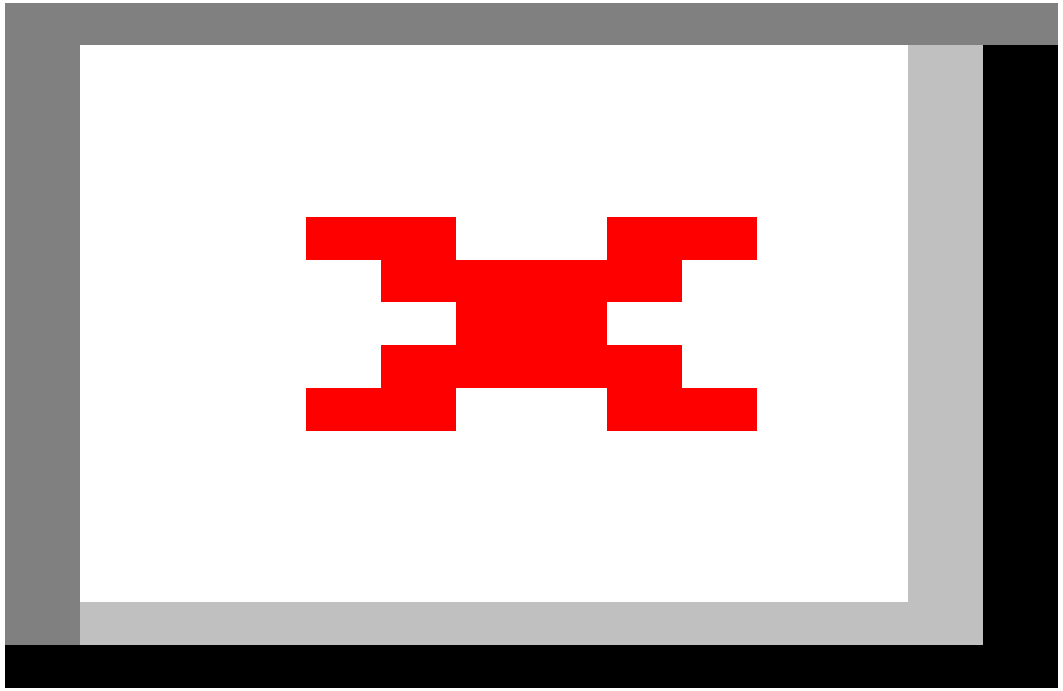
Give the Fentanyl slowly over at least 30 seconds

Flush the line with 0.6mls sodium chloride 0.9%

Wait for 2 minutes for the onset of Fentanyl action

Attempt intubation

If intubation attempts are not successful, further doses of Fentanyl and Atropine are not appropriate due to duration of action



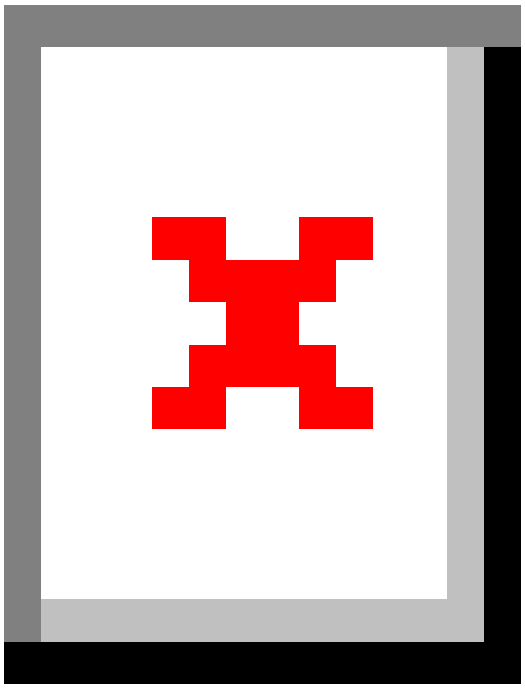
ADDENDUM 9 PALLIATIVE CARE MEDICATION

DRUG	PREPARATION	SINGLE DOSE	DOSE FREQUENCY	INCOMPATIBILITY
MIDAZOLAM	10mg/1mL Buccal Solution (Epistatus®)	***For acute anxiety:***		**Seek specialist advice**
		25 microgram/kg	Buccal STAT	
	1mg/1mL Injection	***For anxiety:***		**Seek specialist advice**
		25 micrograms/kg	SC or IV STAT Repeat at hourly intervals as needed	
		For terminal seizure control:		
		0.5-1mg/kg/24hours Increasing up to 7mg/kg/24 hours if necessary	Continuous SC or IV infusion;	
Notes:	Epistatus® is **unlicensed**. **Controlled Drug** (A licensed preparation [Buccolam®] is available in 2.5mg, 5mg, 7.5mg, and 10mg pre-filled syringes) Recommended SC/IV doses vary enormously in the literature. If in doubt, start at the lowest recommended dose and titrate rapidly.			
doses taken from: APPM Master Formulary, 2017 Edition [Accessed online via: http://www.appm.org.uk/resources/APPM+Master+Formulary+2017+-+4th+edition.pdf]				

DRUG	PREPARATION	SINGLE DOSE	DOSE FREQUENCY	INCOMPATIBILITY
MORPHINE SULFATE **Avoid drug errors! Double check calculations to avoid serious dosing errors.**	Morphine Sulfate 10 mg/5mL Oral Solution May need to dilute preparation – see instructions in formulary monograph. Rectal preparations not stock on NICU only available as special order	**Oral/rectal dose:** **Neonate:** 25 – 50 microgram/kg **Child 1-2 mths:** 50microgram/kg (adjusted according to response)	Every 6-8 hours Every 4 hours	**Seek specialist advice**
		SC or IV injection (over at least 5 mins): **Neonate:** Initially 25 microgram/kg **Child 1-5 mths:** Initially 50-100 micrograms/kg (adjusted according to response)	Every 6 – 8 hours Every 6 hours	**Seek specialist advice**
		SC or IV infusion: **Neonate:** 5microgram/kg/ hour **Child 1-2 mths:** 10microgram/kg /hour (adjusted according to response)	Continuous infusion	**Seek specialist advice**
Notes:	**Controlled Drug** **doses taken from:** APPM Master Formulary, 2017 Edition [Accessed online via: http://www.appm.org.uk/resources/APPM+Master+Formulary+2017+-+4th+edition.pdf]			

Written by: Amar Iqbal (Lead Pharmacist- Women's Services)
Checked by: Louise Whitticase (Lead Pharmacist-Women's Services) and Gemma Holder

Example Discharge TTO prescription



ADDENDUM 10: ELFIN STUDY SOLUTION

Indications for use:	Prophylaxis of late-onset invasive infection in very preterm infants (gestation <32 weeks).
Preparation:	Each treatment pack contains 4 foil sachets each containing 6 individually labelled containers of either 375 mg Lactoferrin or Sucrose (as placebo) (24 containers total). Each pot contains 375mg/5ml solution when reconstituted (75mg/ml).
Dosage:	Enteral administration of 150mg/kg/day (maximum dose of 300mg/day) (2ml/kg/day to a maximum of 4ml/day after reconstitution) **Note:** - Total daily dose to be split into two divided doses if necessary - see dosing chart. (all babies initially will require two daily doses). - Standardised dosing time of 12 noon (and 4 pm if two divided doses). - Not considered as a substitute for a feed - to be given prior to a feed. - Only commence administration when baby on at least 12ml/kg/day enteral feeds. - To continue until 34 weeks corrected gestational age - A maximum of 70 days treatment to be given. - If aspiration is required (NG/OG administration), fully aspirate before dose.
Routes:	Oral/NG/OG administration
Interactions:	Must not be administered with any other medication.
Compatibility:	Must be reconstituted as directed prior to use
Eligibility:	**Babies will be considered <u>eligible</u> for inclusion into the trial if:** • Gestational age at birth is less than 32 weeks • Less than 72 hours old • Written informed parental consent is obtained • NOTE – if infant is receiving antibiotic treatment for suspected infection, they are still eligible for recruitment Note – a baby **must** be randomised into the trial when less than 72 hours old, but the study solution may not necessarily be started within 72 hours of birth (dependant on enteral intake). **Babies will be <u>excluded</u> from participation in the trial if they have:** • No realistic prospect of survival • A severe congenital anomaly • Anticipated enteral fasting of more than 14 days
Other:	Once a pack is randomised to a baby, patient ID labels should be affixed to the outer box, the 4 inner boxes and when the inner boxes are opened - to each pot inside (i.e. wherever an ELFIN trial label is also affixed) in order to comply with clinical trial legislation. Lactoferrin/sucrose powder is stable within unopened pots and may be stored at room temperature. When the infant has completed the course of treatment, either at 34 completed weeks or at death or discharge from hospital, any unused (not reconstituted) product should be

retained for collection by the study team.

Reconstitution Instructions:

The dose will be prepared and administered by neonatal nurses on the neonatal unit.

1. Verify that the Pack ID number on the pharmacy pot matches the Pack ID allocated to the infant and the patient ID label matches the patient details.

2. Add 4 ml of sterile water (supplied in plastic vial) plus 1 ml of either EBM or formula (if EBM is not available) to the pharmacy pot. This will give a 75mg/ml solution.

3. Seal the pot with the lid and shake vigorously by hand for 30 seconds, and label the pot with the patient name, date and time of preparation.
4. Leave the pot to stand at room temperature for 30 minutes.

5. Using a syringe, draw off suspension (2 ml/kg body weight up to a maximum of 4 ml). Remove the label from the pot and apply to this syringe before administration. For naso/oro-gastric or oral administration (via spoon/cup/syringe or bottle)

6. Study medication is normally given once daily. For very small infants, clinicians may choose to administer the daily dose in two aliquots. If these are to be given more than 30 minutes apart, then a fresh dose should be prepared as above for each.

7. If clinically indicated, a dose can be omitted. Whether doses are omitted at other times when the infant is unwell or demonstrates enteral feeds intolerance will be at the discretion of the attending consultant.

Unblinding:

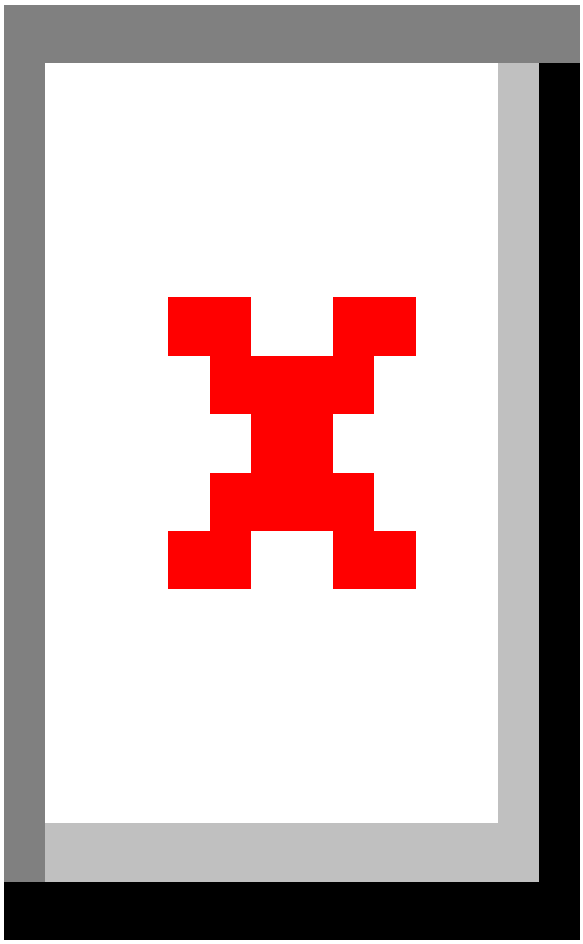
In the event of an emergency, a baby's treatment allocation may be unmasked by contacting the NPEU CTU during working hours, or calling an out of hours help line.

9:00 am to 5.00 pm NPEU CTU: 01865 617 965
5.00 pm to 9.00 am and weekends: 0800 138 5451

Wherever possible, the unmasking of a baby's treatment allocation should be discussed with the Chief Investigator or delegate in advance.

Written by: Kim Ridout (Pharmacist)
Checked by: Gemma Holder (Neonatal Consultant)

ADDENDUM 11 Appropriate use of ENFit syringes



ADDENDUM 12: Methicillin-Resistant Staphylococcus Aureus (MRSA) Decolonisation treatment

Decolonisation treatment is prescribed in an attempt to reduce or eliminate colonisation with MRSA. Reduction in the degree of colonisation with MRSA may decrease the risks of transmission of MRSA, and of colonisation progressing to invasive infection.
Routine decolonisation treatment involves both nasal and skin decolonisation. The basic regimen is a five-day course of treatment, but in some high-risk situations it may be appropriate to prescribe skin decolonisation for longer (Table 1). The Infection Control Team will advise on a case-by-case basis whether or not to prescribe on-going skin decolonisation.

Table 1: Circumstances where prolonged decolonisation treatment may be required

Patient group	Possible regimen	Rationale
Neonates receiving intensive care	Skin decolonisation continued throughout intensive care.	To reduce the high risk of progression to invasive infection
Any patient with MRSA who is being bed space isolated because a single room cannot be identified	Skin ± nasal decolonisation continued during period of bed space isolation	Decolonisation will reduce the risk of transmission

Nasal decolonisation

- Mupirocin 2% nasal ointment (paraffin base – Bactroban® nasal) applied to the anterior nares three times daily for five days.

Skin decolonisation

- Daily bathing with Octenisan® for at least five days. Cx powder® (chlorhexidine acetate 1% antiseptic dusting powder) is a suitable alternative for use in neonates.

Failure of decolonisation treatment

Where a single five-day course of nasal and skin decolonisation treatment has failed, a second course of treatment may be prescribed. Where that also fails, and eradication of MRSA is still considered to be of benefit, the ICT will advise on an alternative regimen (usually involving use of systemic antibiotics) on a case-by-case basis.
Note : ensure screening swabs are collected not less than 48 hours after completion of decolonisation eradication treatment

Refer to the MRSA Control policy for:

- Additional treatments suitable for infection or colonisation of cutaneous sites
- Swabs to Delineate the Extent of Colonisation in Individuals Found to Have MRSA
- Confirmation of permanent eradication of MRSA
- Transfer & Discharge of Colonised or Infected Patients
- Surgery on MRSA-positive patients

Reference: Methicillin-Resistant Staphylococcus Aureus (MRSA) Control Policy, v7 issued 11/11/2015

ADDENDUM 13: MiniDEX TRIAL

Indications for use:

Babies enrolled in Minidex trial for the prevention of bronchopulmonary dysplasia (BPD).

- Born <30 weeks gestation
- ≥10 days to ≤24 days of age

MUST BE RECEIVING CAFFEINE CITRATE

Preparation:

Study medication: a clear and colourless sterile solution in 2 mL vials

Each vial contains either dexamethasone solution (3.3mg/1mL) or sodium chloride 0.9% solution.

Once the vial is opened the drug should be used immediately.
Suggested dilution method:

- Take 0.3mL from vial of study medication (equivalent to either 990micrograms dexamethasone **or** 0.3mL of sodium chloride 0.9%).
- Make up to 10mL with sodium chloride 0.9% to give a concentration of 99 microgram/mL.
- 0.5mL of this solution is equivalent to 49.5micrograms

Dosage:

50 microgram/kg DAILY for 10 days (Days 1 to 10), then 50 microgram/kg on ALTERNATE DAYS (Days 12, 14 and 16); 13 doses in total.

Use weight at randomisation for initial dose calculations. Dose can be increased in line with current working weight.

Dose in mL to be rounded to one decimal place, in the conventional manner.

For IV administration: make up the volume to 1mL with sodium chloride 0.9% (or dextrose 5%) and infuse over 10 –15 minutes.

For NG/Oral administration: make up to 1mL with sodium chloride 0.9% (or dextrose 5%).

Routes :

IV /NG / Oral

Whilst baby has an IV line in-situ (peripheral or central), give each dose as a short IV infusion over 10-15 minutes. Once IV access is removed, give any remaining doses orally or via NG tube.

Compatibility:

Sodium chloride 0.9%, Dextrose 5%

Interactions:

Rifampicin, carbamazepine, phenobarbital and phenytoin enhance metabolism of dexamethasone and reduce its effect. Dexamethasone antagonises the effects of insulin. May cause hypokalaemia, caution if used concurrently with loop diuretics **incompatible with midazolam**

Other:

Monitoring: Measure blood pressure before starting dexamethasone and then daily. If an arterial line is in situ, blood pressure should be monitored continuously, otherwise non- invasive blood pressure should be used.

Blood sugar should be monitored with each gas and urine checked for glucose if blood glucose >11mmol/L.

Treat hyperglycaemia if glycosuria with glucose >11mmol/L

Eligibility:

Babies will be considered eligible for inclusion into the trial if:

- Gestational age at birth is less than 30 weeks
- Aged between 10 and 24 postnatal days
- At high risk for developing BPD: receiving mechanical ventilation via ET tube with at least 30% oxygen with PEEP 4cmH2O and unlikely to be extubated within 48 hrs
- Receiving caffeine citrate
- Written informed parental consent is obtained
- Born to a mother aged 16 or over

Babies will be excluded from participation in the trial if they have:

- Been receiving postnatal steroids for prevention or treatment of respiratory disease
- No realistic prospect of survival
- A severe congenital anomaly affecting lungs, heart or central nervous system
- Had an abdominal surgical procedure or PDA ligation
- Illness or medications for which corticosteroids would otherwise be contra indicated
- Participated in another trial which would otherwise preclude them from inclusion in Minidex

Unblinding:

In the event of an emergency, a baby's treatment allocation may be unmasked by logging into the randomisation website using a single-use access code. The reason for unmasking must be recorded.

As it is best practice not to unmask any participants until any follow up is completed, all other requests for unmasking must be made in writing to the NPEU CTU who along with the Chief Investigator and Principal Investigator will consider the request.

Written by: Gemma Holder (Neonatal Consultant)
Checked by: Alex Coles (Pharmacist)
Reference: MiniDEX Protocol Version 3.0 (07/04/2017)