University Hospitals of Derby and Burton NHS Foundation Trust

NICU: Insulin

<table>
<tr><td>Presentation:</td><td>Soluble Insulin (Human Actrapid) Vial 100 units/mL</td></tr>
<tr><td>Indication:</td><td>Control of hyperglycaemia</td></tr>
<tr><td>Dose:</td><td>Dosed via sliding scale IV infusion

<table>
<tr><th>Blood glucose (mmol/l)</th><th>Dose Units/kg/hr</th><th>Rate mL / Kg / hour</th></tr>
<tr><td>>20</td><td>0.2</td><td>2</td></tr>
<tr><td>15.1-20</td><td>0.15</td><td>1.5</td></tr>
<tr><td>12.1-15</td><td>0.1</td><td>1</td></tr>
<tr><td>10.1-12</td><td>0.05</td><td>0.5</td></tr>
<tr><td>8-10</td><td>0.02</td><td>0.2</td></tr>
<tr><td><8</td><td>Stop</td><td>Stop</td></tr>
</table>
The dosing chart for double and quadruple strength insulin is in the additional comments.

NB in true neonatal diabetes mellitus (rare), it is advisable to continue the insulin infusion even when the BMs are <8mmol/L, at a rate of 0.01unit/kg/hr to prevent ketoacidosis.</td></tr>
<tr><td>Route of administration:</td><td>Intravenous continuous infusion</td></tr>
<tr><td>Instructions for preparation and administration:</td><td><u>Single Strength</u>

<u>Step 1</u>
Dilute 1mL (100 units) of Soluble Insulin to 10mL with sodium chloride 0.9%.
This syringe now contains 10 units in 1mL.

<u>Step 2</u>
Dilute 0.5mL (5 units) of the solution prepared in step 1 to 50mL with sodium chloride0.9%.
This syringe now contains 0.1 units in 1mL

If fluid restricted, consider double or quadruple strength Insulin and prepare as below.

<u>Double Strength</u>

<u>Step 1</u>
Dilute 2mL (200 units) of Soluble Insulin to 10mL with sodium chloride 0.9%
This syringe now contains 20 units in 1mL

<u>Step 2</u>
Dilute 0.5mL (10 units) of the solution prepared in Step 1 to 50mL with sodium chloride 0.9%
This syringe now contains 0.2 units in 1mL

<u>Quadruple Strength</u>
<u>Step 1</u>
Dilute 4mL (400 units) of Soluble Insulin to 10mL with sodium chloride 0.9%
This syringe now contains 40 units in 1mL

<u>Step 2</u>
Dilute 0.5mL (20 units) of the solution prepared in step 1 to 50mL with Sodium Chloride 0.9%
This syringe now contains 0.4 units in 1mL</td></tr>
</table>

	Infuse through a polyethylene (Non PVC) set as insulin adheres to PVC reducing the dose available, alternatively, prime the administration line with diluted insulin solution and leave for 10 minutes then flush the line through with 10mL insulin solution before connecting to the patient. Repeat procedure when lines are changed. **Syringes in use must be changed every 24 hours.**
Prescribing	QHB- Prescribe on Meditech RDH- Prescribe on paper chart as instructed below May need dose reduction in renal impairment as insulin requirements fall. Please ensure the sliding scale rates are adjusted accordingly. Example of the rate calculation on the **inside** of the chart below for a **1.5kg** neonate on single strength insulin: (For Double/Quadruple strength please prescribe on separate chart)

Insulin Scale & Rate Prescription		This calculation is for single strength only (i.e 0.1 unit per ml)						
Blood glucose (mmol / L)	Dose units/kg/hr	Dose of units per hr			Rate calculation mls/hr			Prescriber Print name & sign (incl. bleep) A. Prescriber
		Dose (multiple by)	Weight	units per/ hr	Mls (multiple by)	Weight	rate (ml/hr)	Pharm.
> 20	0.2	0.2 x	1.5kg	0.3	2 x	1.5kg	3 ml/hr	This is only a rate guide, administration is only vaild from the prescribed infusion on the back page
15.1 - 20	0.15	0.15 x	1.5kg	0.23	1.5 x	1.5kg	2.25 ml/hr	
12.1 - 15	0.1	0.1 x	1.5kg	0.15	1 x	1.5kg	1.5 ml/hr	
10.1 - 12	0.05	0.05 x	1.5kg	0.08	0.5 x	1.5kg	0.75 ml/hr	
8 - 10	0.02	0.02 x	1.5kg	0.03	0.2 x	1.5kg	0.3 ml/hr	
< 8	0	ZERO STOP INFUSION						

Example prescription for single strength insulin for a 1.5 kg baby on the **back** of the chart

Drug		Drug amount in syringe		Diluent		Total volume (ml)	Route
Insulin		*5 units*		*Sodium Chloride 0.9%*		*50ml*	*IV*
Start date	Drug concentration per ml		Infusion range	Min		Max	Name, Sig, Bleep
14/4/20	*0.1 unit / mL*		Dose/kg/time	*0 units/kg/hr*		*0.2 units/kg/hr*	*A.Doctor*
Pharm			ml/hr	*0 mL/hr*		*3 mL/hr*	*#1234*

Known compatibility issues	See separate Y- site compatibility chart
SMART pump directions	Load Syringe, prime line using the pump for accurate dosing. • Open 'NICU' folder then open 'Insulin – 0.1Units/ml' programme. • Enter the Baby's weight in kg and confirm • Enter/confirm the dose in Units/kg/h • Visually confirm the rate (ml/h) against the prescribed dose (Units/kg/h) • Perform STOP moment with medical team (Pump against prescription) • Connect to Baby • Press start button For Emergency Rate: • Open 'NICU' folder then go to 'U-Z' and select Emergency drug (Neonates) • Enter the rate required (round down to the nearest 2 decimal places)
Additional Comments:	**SIDE EFFECTS** Monitor: blood glucose, blood pressure, electrolytes, ketones, bicarbonate, and venous pH Prescriptions must not include abbreviations for units like 'U' or 'IU'. 'Units' should be written in full.

Dosing table for **double strength** insulin syringe (0.2 units per 1mL)

Blood glucose (mmol/l)	Dose Units/kg/hr	Rate mL / Kg / hour
>20	0.2	1
15.1-20	0.15	0.75
12.1-15	0.1	0.5
10.1-12	0.05	0.25
8-10	0.02	0.1
<8	Stop	Stop

Dosing table for **quadruple strength** insulin syringe (0.4 units per 1mL)

Blood glucose (mmol/l)	Dose Units/kg/hr	Rate mL / Kg / hour
>20	0.2	0.5
15.1-20	0.15	0.375
12.1-15	0.1	0.25
10.1-12	0.05	0.125
8-10	0.02	0.05
<8	Stop	Stop

Note: The contents of this monograph should be read in conjunction with information available in the BNFC and Medusa

References:

BMJI Books (2015). *Neonatal Formulary*, 7th Ed. UK: Wiley Blackwell
British National Formulary for Children, accessed via bnfc.nice.org.uk 10/01/2024
Trissel LA, Handbook on Injectable Drugs, accessed via www.medicinescomplete.com 10/01/2024
Medusa Injectable Medicines Guide, national and local paediatric monograph accessed via: medusaimg.nhs.uk (accessed on 10/01/2024)
NUH monograph. Insulin soluble (Actrapid) for Hyperglycaemia. Available from: Accessed: 10/01/2024
Q-Pulse UHDB soluble insulin 0.1unit in 1mL sodium chloride 0.9% 50 mL syringe neonatal/paediatric worksheet

Document control sheet

GUIDELINE NUMBER	CH PH N 14
AREA IN WHICH THIS MONOGRAPH APPLIES	NICU

DIVISIONAL AUTHORISATION	
GROUP	**DATE**
Paediatric monograph review group	February 2024

AUTHORS		
Author	Position	Date
Written by: Julie Vanes	Senior Pharmacist, Paediatrics	Apr 2005
Checked by: Lisa Taylor	Senior Pharmacist, Paediatrics	Oct 2008

If review:

	Position	Date
Updated by :	Lamia Ahmed Advanced Pharmacist- Women's and Children's	January 2024
Checked by: Ellie Cheale	Ellie Cheale Specialist pharmacist W&C	January 2024

Change history:

Changes Reference	Change details	Date
	Removal of option to use pre-prepared syringe from pharmacy. Replacement of old table in line with new guidelines. Addition of prescribing instructions. Addition of instructions for preparing double and quadruple strength syringes. Addition of dosing tables for double and quadruple strength solutions	January 2024
	Changed 0.1ml/kg/hr for true neonatal DM to 0.01unit/kg/hr to prevent errors if using different strength insulin	January 2024