Waikato District Health Board	Type: Drug Guideline	Document reference: 6422	Manual Classification: Waikato DHB Drug Guidelines
Title: **Insulin for Hyperkalaemia in Neonates**			Effective date: **25 January 2022**
Facilitator sign/date *Kerrie Knox* ***Pharmacist***	Authorised sign/date *Jutta van den Boom* ***Clinical Director NICU***	Authorised sign/date *John Barnard* ***Chair Medicines & Therapeutics***	Version: **1** / Page: **1 of 3** Document expiry date: **25 January 2025**

BRIEF ADMINISTRATION GUIDE

For detailed information refer to The Australasian Neonatal Medicines Formulary **insulin for hyperkalaemia** guideline

Critical Note: there are minor variations between the ANMF and Waikato DHB best practice within this drug guideline – see yellow shaded text

Indications: Hyperkalaemia (consider if serum potassium level > 7mmol/L)

Route: Intravenous or subcutaneous, continuous infusion

- Supplied as insulin regular 100 units per mL (Actrapid®)
  - pH of insulin is 6.6 to 8

Dose: 0.1 – 0.2 units/kg/hr in combination with glucose 5 - 8 mg/kg/min

e.g. glucose 5 mg/kg/min = 0.5 mL/kg/h of glucose 50% **AND** 0.5 mL/kg/h of glucose 10% (=glucose 30%) via CVAD
or 3 mL/kg/h of glucose 10%

Notes:

- **Insulin must be given in combination with glucose when being used to treat hyperkalaemia.**
- Adjust glucose to maintain euglycaemia
- Insulin solution is not generally included in daily total fluid volume

Preparation and administration

Compatible fluids: sodium chloride 0.9%, glucose 5%, glucose 10%, glucose in sodium chloride solutions

- Select the concentration of insulin required based on the weight of the infant and in the context of any fluid restrictions (refer to appendix for assistance) and dilute the appropriate volume of insulin injection using compatible fluid in accordance with the below table:

Final Insulin Concentration	0.2 unit/mL	0.5 unit/mL	1 unit/mL
Volume of insulin 100 unit/mL	0.1 mL	0.25 mL	0.3 mL
Volume of compatible fluid	49.9 mL	49.75 mL	29.7 mL
Total volume	50 mL	50 mL	30 mL

- Ensure solution is well mixed
- Administer at the prescribed rate by continuous infusion using a syringe driver with Guardrails settings **Note**: Do not filter insulin or bolus other medications through the insulin line.
- Insulin binds to the plastic of the fine bore tubing. When a new sterile fine bore tubing set is used for the first time, **before attaching the infusion to the infant**, prime the fine bore tubing by slowly injecting 5mL of the diluted insulin through the tubing and if there is time leave this prime to dwell in the tubing for up to 30 minutes (e.g. prepare insulin infusion first if setting up multiple infusions). Just before attaching the tubing to the infant slowly inject a further 3mL of the diluted insulin to flush out the initial prime. When replacing a nearly empty syringe with a new full syringe, if the old fine bore tubing is not being replaced then there is no need to allow for a dwell time as the plastic will already be saturated with insulin.

$$\text{Rate (mL/hr)} = \frac{\text{Dose (units/kg/hour) x Weight (kg)}}{\text{Concentration (units/mL)}}$$

- Administer insulin in conjunction with glucose
- Prepare glucose concentration according to prescription and administer at prescribed rate

Monitoring

- Monitor blood glucose every 20 minutes for the first hour, every 30 minutes for the second hour and every 2-4 hours thereafter. Increase frequency during weaning.
- Measure serum potassium within 30-60 minutes of commencing infusion, then 4 hourly until it normalises, then as clinically indicated.
- Cardiorespiratory monitoring is recommended.

Storage and Stability

- Prepare a fresh solution at least every 72 hours
- The insulin vial can be accessed for 24 hours after first opening

Competency for Administration

This procedure is carried out by, or under, the direct supervision of a registered nurse/registered midwife who holds current Waikato DHB Generic Medicine Management and IV certification plus Guardrails competency (if administering IV) as well as Neonatal specific competency NCV/NAC (if administering via CVAD).

Guardrails

Insulin is Guardrail profiled on the CC pump for NICU. Following are the guardrail limits:

Guardrails Drug Name	**Insulin (HyperK)**
Concentration (unit/mL)	
Minimum	0.1
Maximum	1
Administration Rate (unit/kg/h)	
Default	0.1
Soft minimum	0.09
Soft maximum	0.21
Hard maximum	0.22

Associated Documents

- Non-oliguric hyperkalaemia. Waikato DHB NICU protocol #3121
- Subcutaneous insulin infusion in NewBorn Intensive Care. Waikato DHB NICU protocol #0392

References

- Australian Neonatal Medicines Formulary. Insulin – Hyperkalaemia Drug Guideline, 2019. Available from: https://www.slhd.nsw.gov.au/rpa/neonatal/NeoMedPaperCopy.html
- Truven Health Analytics Inc. Pediatrics and Neofax®. 2019. Insulin monograph. Accessed 3.4.20. Available from: http://www.micromedexsolutions.com.
- New Zealand Formulary for Children (NZFC). Insulin (human neutral). Accessed 13.9.21. Available from https://nzfchildren.org.nz/nzf_3643
- Phelps SJ, Hagemann TM, Lee KR, Thompson AJ. The Teddy Bear Book: Pediatric Injectable Drugs. 11th edition. American Society of Health-System Pharmacists; 2018.
- The Royal Children's Hospital Melbourne. Paediatric Injectable Guidelines. Accessed 13.9.21. Available from https://pig.rch.org.au.
- Auckland DHB Newborn Services. Insulin Drug Protocol. January 2020. Available from https://starship.org.nz/guidelines/insulin-neutral-for-the-newborn-intensive-care/
- Canterbury DHB Neonatal Services. Insulin - Hyperkalaemia Drug Information Sheet. March 2016.

Available from https://cdhb.health.nz/wp-content/uploads/01a4954a-insulin20hyperkalaemia.pdf

Note: **Printed copies are only valid on the day of printing – they are not controlled and may not be the current version in us. Please refer to the online version.**

Appendix

Infusion tables to assist concentration selection

Table 1: Infusion rates when using insulin concentration **0.2 unit/mL**

Rate (mL/hr)	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
Weight (kg)	**Approximate units/kg/hour**									
0.5	0.04	0.08	0.12	0.16	0.2	0.24	0.28	0.32	0.36	0.4
1	0.02	0.04	0.06	0.08	0.1	0.12	0.14	0.16	0.18	0.2
1.5	0.01	0.03	0.04	0.05	0.07	0.08	0.09	0.11	0.12	0.13
2	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.1

Table 2: Infusion rates when using insulin concentration **0.5 unit/mL**

Rate (mL/hr)	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
Weight (kg)	**Approximate units/kg/hour**									
0.5	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
1	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5
1.5	0.03	0.07	0.1	0.13	0.17	0.2	0.23	0.27	0.3	0.33
2	0.03	0.05	0.08	0.1	0.13	0.15	0.18	0.2	0.23	0.25
2.5	0.02	0.04	0.06	0.08	0.1	0.12	0.14	0.16	0.18	0.2
3	0.02	0.03	0.05	0.07	0.08	0.1	0.12	0.13	0.15	0.17
3.5	0.01	0.03	0.04	0.06	0.07	0.09	0.1	0.11	0.13	0.14
4	0.01	0.03	0.04	0.05	0.06	0.08	0.09	0.1	0.11	0.13
4.5	0.01	0.02	0.03	0.04	0.06	0.07	0.08	0.09	0.1	0.11
5	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.1

Table 3: Infusion rates when using insulin concentration **1 unit/mL**

Rate (mL/hr)	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
Weight (kg)	**Approximate units/kg/hour**									
1	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
1.5	0.07	0.13	0.2	0.27	0.33	0.4	0.47	0.53	0.6	0.67
2	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5
2.5	0.04	0.08	0.12	0.16	0.2	0.24	0.28	0.32	0.36	0.4
3	0.03	0.07	0.1	0.13	0.17	0.2	0.23	0.27	0.3	0.33
3.5	0.03	0.06	0.09	0.11	0.14	0.17	0.2	0.23	0.26	0.29
4	0.03	0.05	0.08	0.1	0.13	0.15	0.18	0.2	0.23	0.25
4.5	0.02	0.04	0.07	0.09	0.11	0.13	0.16	0.18	0.2	0.22
5	0.02	0.04	0.06	0.08	0.1	0.12	0.14	0.16	0.18	0.2