

Insulin for Hyperglycaemia in neonates

BRIEF ADMINISTRATION GUIDE

For detailed information refer to [The Australasian Neonatal Medicines Formulary \(ANMF\) insulin for hyperglycaemia guideline](#)



Note: Shaded text indicates where Health NZ Waikato practice differs from ANMF

1. Medicine

1.1. Indications

Hyperglycaemia (consider if blood glucose level ≥ 10 mmol/L for two consecutive levels taken four hours apart or a single level >12 mmol/L)

Note: Confirm glucose infusion rate (GIR) is between 4.5-6mg/kg/min or adjust infusions accordingly prior to considering commencing insulin.

1.2. Route and Presentation

Intravenous or subcutaneous, continuous infusion

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

1.3. Dose

0.01 – 0.2 units/kg/hr (starting dose 0.05 units/kg/hr). Titrate to blood glucose level.

Note: very low birth weight neonates during first two weeks of life occasionally require high doses due to insulin resistance, inappropriate insulin secretion and decreased liver sensitivity to insulin effects.

Note: insulin solution is not generally included in daily total fluid volume

2. Preparation and Administration

2.1. Compatible fluids

sodium chloride 0.9%, glucose 5%, glucose 10%, glucose in sodium chloride solutions

2.2. Administration Method

- 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	0.1 unit/mL*	0.2 unit/mL	0.5 unit/mL	0.8 unit/mL*
Volume of insulin 100 unit/mL	Prepare 50mL as per 0.2 unit/mL. Mix well then discard 25mL from syringe.	0.1 mL	0.25 mL	0.24 mL
Volume of compatible fluid		49.9 mL	49.75 mL	29.76 mL
Total volume	Make volume back up to 50ml with compatible fluid.	50 mL	50 mL	30 L

*Please refer to Guardrails section for programming the pump if standard concentration not showing

- 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.
- Adjust dose according to blood glucose levels. Target pre-feed blood glucose is usually 4 to 7 mmol/L (whilst on insulin therapy).
- Recheck blood glucose within 1 to 2 hours of changing the dose, then check every 2 to 4 hours until stable

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

Note: If the insulin is running via a PIV or CVAD with no other fluids infusing administer sodium chloride 0.9% concurrently at 1mL/hr to maintain patency of the line.

2.3. Monitoring

- Monitor blood glucose concentration more frequently until stable, then 4-6 hourly.
- When the infusion is stopped check blood glucose after one hour.

2.4. Storage and Stability

- Prepare a fresh solution at least every 24 hours
- The insulin vial can be accessed for 14 days after first opening

2.5. Competency for Administration

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

2.6. Guardrails

Insulin is Guardrail profiled on the CC pump for NICU, however the programmed concentrations are only 0.2, 0.5 and 1 unit/ml at the time of writing this guideline (these will be updated at the next Guardrails upload).

If using the 0.1 unit/ml or the 0.8 unit/ml concentrations select one of the standard concentrations and then "MODIFY". Then alter the units of the concentration to be either **0.1** unit/ml or **0.8** unit/mL as appropriate.

Following are the guardrail limits:

Guardrails Drug Name	Insulin (Hyperglyc)
Concentration (unit/mL)	
Minimum	0.1
Maximum	1
Dose rate (unit/kg/h)	
Default	0.05
Soft minimum	0.01
Soft maximum	0.21
Hard max	0.8

3. Associated Health NZ Waikato Documents

- [Hypoglycaemia – guidelines for management](#) protocol #3122
- [Subcutaneous insulin infusion in NewBorn Intensive Care](#) protocol #0392

4. References

- Australian Neonatal Medicines Formulary. Insulin for Hyperglycaemia Guideline, 2022. Available from: www.anmfonline.org/wp-content/uploads/2022/09/Insulin-for-hyperglycemia_ANMFv3.0_20220623-1.pdf
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- New Zealand Formulary for Children (NZFC). Insulin (human neutral). Accessed June 2024. 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/>

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- Canterbury DHB Neonatal Services. Insulin - Hyperglycaemia Drug Information Sheet. July 2021. Available from <https://edu.cdhb.health.nz/Hospitals-Services/Health-Professionals/Neonatal-Clinical-Resources/Neonatal-Drug-Information-Sheets/Documents/Insulin%20Hyperglycaemia.pdf>

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Appendix A – Infusion tables to assist concentration selection

Table 1: Infusion rates when using insulin concentration 0.1 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									
0.5	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.20
1	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10

Table 2: 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
2.5	0.01	0.02	0.02	0.03	0.04	0.05	0.06	0.06	0.07	0.08

Table 3: 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 4: Infusion rates when using insulin concentration 0.8 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	0.08	0.16	0.24	0.32	0.40	0.48	0.56	0.64	0.72	0.80
1.5	0.05	0.11	0.16	0.21	0.27	0.32	0.37	0.43	0.48	0.53
2	0.04	0.08	0.12	0.16	0.20	0.24	0.28	0.32	0.36	0.40
2.5	0.03	0.06	0.10	0.13	0.16	0.19	0.22	0.26	0.29	0.32
3	0.03	0.05	0.08	0.11	0.13	0.16	0.19	0.21	0.24	0.27
3.5	0.02	0.05	0.07	0.09	0.11	0.14	0.16	0.18	0.21	0.23
4	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.20
4.5	0.02	0.04	0.05	0.07	0.09	0.11	0.12	0.14	0.16	0.18
5	0.02	0.03	0.05	0.06	0.08	0.10	0.11	0.13	0.14	0.16