⚠ This guideline serves as a guide and does not replace clinical judgment.

Clinical Guideline

Critical Illness Hyperglycemia Insulin Infusion

Pediatric Critical Care Medicine

Purpose: To manage pediatric critical illness-induced hyperglycemia in non-diabetic Pediatric ICU patients using a safe and effective nursing-driven insulin infusion protocol.

Inclusion Criteria
- Age: 1 year to 18 years
- Critically ill in PICU, not previously diagnosed with diabetes
- Persistent hyperglycemia defined as Blood Glucose (BG) ≥ 200 mg/dL on 2 consecutive readings, 1 hour apart (confirm accurate sampling)

Exclusion Criteria
- Known diabetes mellitus (Type 1 or Type 2)
- Diagnosed or suspected Diabetic Ketoacidosis (DKA) or Hyperglycemia Hyperosmolar Syndrome (HHS)
- Severe hepatic failure
- Hypoglycemia (<70 mg/dL) within past 6 hours
- Goal of care does not align with insulin administration

1. ***Initial Assessment***
   - Confirm hyperglycemia (≥200 mg/dL ×2 checks, 1 hour apart)
   - Check baseline basic metabolic panel (BMP), magnesium, phosphorus, lactate, and Hemoglobin bA1c (HbA1c)
   - Assess feeding status (NPO vs. enteral/parenteral nutrition)
   - Establish reliable IV access

2. ***Initiate Insulin Infusion***
   - Start insulin infusion at 0.03 units/kg/hr (max dose of 10 units/hour)
   - Use Regular Insulin diluted in 0.9% NaCl (e.g., 1 unit/mL)
   - Do not bolus unless instructed otherwise by the Pediatric Endocrine team.

3. ***Titration***
   - The registered nurse (RN) will titrate insulin infusion as noted in the table below.

Insulin Infusion Titration Table

Blood Glucose (mg/dL)	Action	Change in Infusion Rate
> 251 (x2, 1 hour apart) **OR** ↑ > 50 rise from prior check	Persistent hyperglycemia* – Increase infusion	↑ by 0.02 units/kg/hr
201 – 250 (x2, 1 hour apart)	Mild hyperglycemia – Increase infusion	↑ by 0.01 units/kg/hr
130 – 200	**Target range**	**No change in infusion**
100 – 129	Mild hypoglycemia – Decrease infusion	↓ by 0.01 units/kg/hr
80 – 99	At risk for critical hypoglycemia – Decrease infusion	↓ by 0.02 units/kg/hr
< 79	Critical hypoglycemia	Repeat glucose immediately. If confirmed < 79, stop infusion, treat immediately with appropriate prn D10% bolus

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4. ***Monitoring:***

- Blood Glucose Point of care test (POCT)
  - BG every 1 hour until x3 readings are within target range of 130 – 200 mg/dL
  - Once x3 readings within target range, space POCT BG to every 2 hours provided BG remains within target
  - May be able to space further if within goal per medical team discretion
- BMP, Magnesium, Phosphorus every 6–12 hrs
- Notify Provider Criteria
  - BG less than 100 mg/dL
  - Rate exceeds **0.1 units/kg/hr**
  - BG greater than 300 mg/dL for 2 consecutive hours
  - Change in blood sugar by +/- 50 mg/dL in an hour

*Consider Pediatric Endocrinology consult for persistent hyperglycemia or high insulin needs

5. ***Discontinuation***

- Patient is clinically improving
- Tolerating goal nutrition (enteral vs. parenteral)
- Insulin gtt 0.03 units/kg/hr or less and BG within goal of 130-200 mg/dL without upward titration in gtt for 6–12 hours, discuss discontinuation of insulin infusion with medical team

Executive Summary

Critical Illness Hyperglycemia Insulin Infusion

Pediatric Critical Care Medicine

Children's Hospital of Richmond at VCU: Critical Illness Hyperglycemia Workgroup

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References

Mehta NM, Skillman HE, Irving SY, et al. Guidelines for the Provision and Assessment of Nutrition Support Therapy in the Pediatric Critically Ill Patient: Society of Critical Care Medicine and American Society for Parenteral and Enteral Nutrition. *Journal of Parenteral and Enteral Nutrition*. 2017;41(5):706-742. doi:10.1177/0148607117711387.

American Diabetes Association Professional Practice Committee. Introduction and Methodology: Standards of Care in Diabetes—2024. *Diabetes Care*. 2024;47:S1-S4. doi:10.2337/dc24-SINT.

Intensive versus Conventional Glucose Control in Critically Ill Patients. *New England Journal of Medicine*. 2009;360(13):1283- 1297. doi:10.1056/nejmoa0810625.

Vlasselaers D, Milants I, Desmet L, et al. Intensive insulin therapy for patients in paediatric intensive care: a prospective, randomised controlled study. *The Lancet*. 2009;373(9663):547-556. doi:10.1016/S0140-6736(09)60044-1.

Macrae D, Grieve R, Allen E, et al. A Randomized Trial of Hyperglycemic Control in Pediatric Intensive Care. *New England Journal of Medicine*. 2014;370(2):107-118. doi:10.1056/nejmoa1302564.

Srinivasan V. *Stress Hyperglycemia in Pediatric Critical Illness: The Intensive Care Unit Adds to the Stress!* Vol 6.; 2012. www.journalofdst.org.

Nayak P, Lang H, Parslow R, Davies P, Morris K. Hyperglycemia and insulin therapy in the critically ill child. *Pediatric Critical Care Medicine*. 2009;10(3). doi:10.1097/PCC.0b013e318198b012.

Mesotten D, Preiser JC, Kosiborod M. Glucose management in critically ill adults and children. *The Lancet Diabetes and Endocrinology*. 2015;3(9):723-733. doi:10.1016/S2213-8587(15)00223-5.

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