

Hypoglycemia

Aliases: None

Patient Care Goals

Limit morbidity from hypoglycemia by:

1. Describing appropriate use of glucose monitoring.
2. Treating symptomatic hypoglycemia.

Patient Presentation

Inclusion Criteria

1. Adult or pediatric patient with blood glucose less than 60 mg/dL with symptoms of hypoglycemia
2. Adult or pediatric patient with altered level of consciousness [[See Altered Mental Status Guideline](#)]
3. Adult or pediatric patient with stroke symptoms (e.g. hemiparesis, dysarthria) [[see Suspected Stroke/Transient Ischemic Attack guideline](#)]
4. Adult or pediatric patient with seizure [[see Seizures guideline](#)]
5. Adult or pediatric patient with history of diabetes and other medical symptoms
6. Patient with suspected alcohol ingestion
7. Patients with metabolic disorders (glycogen storage disease, fatty oxidation or organic acid disorders, maple syrup urine disease).
8. Adult patient who appears to be intoxicated

Exclusion Criteria

1. Patient in cardiac arrest
2. Patient with normal mental status in absence of inclusion criteria listed above

Patient Management

Assessment

1. Monitoring:
 - a. Check blood glucose level
2. Secondary survey pertinent to altered blood glucose level:
 - a. Evaluate for presence of an automated external insulin delivery device (insulin pump).
 - b. Constitutional: assess for tachycardia and hypotension
 - c. Eyes: assess for sunken eyes from dehydration
 - d. Nose /mouth/ears: assess for dry mucus membranes or tongue bite from seizure
 - e. Neurologic:
 - i. Assess GCS and mental status.
 - ii. Assess for focal neurologic deficit: motor and sensory.

Treatment and Interventions

1. Assess state of consciousness; if altered level of consciousness or stroke, treat per [Altered Mental Status](#) or [Suspected Stroke/Transient Ischemic Attack](#) guidelines accordingly.
2. Assess glucose level; if blood glucose is 60 mg/dL or less administer one of the following:
 - a. Conscious patient with a patent airway:
 - i. **Glucose**(in form of glucose tablets, glucose gel, tube of cake icing, etc.) **Adult 15-25 grams PO, Pediatric 0.5-1g/kg PO (Max 25g)**
 - b. Unconscious patient, or patients who are unable to protect their own airway:
 - i. **Dextrose IV [AEMT]**—administer in incremental doses until mental status improves or maximum field dosing is reached
 - Refer to **Medication Protocol**
 - ii. **Glucagon**

- **1mg IM/IN** (adult or greater than 20kg) *[EMT]*
 - **0.5mg/kg IM/IN** (if less than 20kg) *[EMT]*
- c. If Patient has Insulin Pump
 - i. Leave it alone if patient able to take PO glucose or IV established and administering IV dextrose
 - ii. If Patient unconscious and not improving with IV treatment remove or disable insulin pump
 3. Reassess vital signs and mental status.
 4. Repeat check of blood glucose level if previous hypoglycemia and mental status has not returned to normal.
 - a. It is not necessary to repeat blood sugar if mental status has returned to normal.
 5. If maximal field dosage of dextrose solution does not achieve euglycemia and normalization of mental status:
 - a. Initiate transport to closest appropriate receiving facility for further treatment of refractory hypoglycemia.
 - b. Evaluate for alternative causes of altered mental status.
 - c. Continue treatment of hypoglycemia using dextrose solutions as noted above.
 6. Implement disposition.
 - a. If hypoglycemia with continued symptoms, transport to closest appropriate receiving facility.
 - b. If hypoglycemia with seizure transport to the hospital regardless of their mental status and response to therapy
 - c. If hypoglycemia resolves after treatment, consider release without transport **only** if **all** of the following are true:
 - i. Repeat glucose is greater than 80 mg/dL.
 - ii. Patient returns to normal mental status, with no focal neurologic signs/symptoms after receiving glucose/dextrose.
 - iii. Patient can promptly obtain and will eat a carbohydrate meal.
 - iv. Patient or legal guardian refuses transport and EMS providers agree transport not indicated.
 - v. A reliable adult will be staying with patient.
 - vi. No major co-morbid symptoms exist, like chest pain, shortness of breath, seizures, intoxication.
 - vii. A clear cause of the hypoglycemia is identified (e.g. missed meal).

Patient Safety Considerations

1. Dextrose 10% can be safely used in all ages of patient.
2. Dextrose 50% can cause local tissue damage if it extravasates from vein, and may cause hyperglycemia. Dextrose 50% carries risk for little clinical gain. EMS systems may consider carrying no more than 25% concentration of dextrose for treating hypoglycemia in adults.
3. For children **less than** 1 years old, dextrose concentration of no more than 25% should be used.
4. For neonates and infants **less than** 1 month of age, dextrose concentration of no more than 10-12.5% should be used.
5. Sulfonylureas (e.g. glyburide, glipizide) have long half-lives ranging from 12–60 hours. Patients with corrected hypoglycemia who are taking these agents are at particular risk for recurrent symptoms and frequently require hospital admission.

Notes and Educational Pearls Key Considerations

- Consider contribution of oral diabetic medications to hypoglycemia.
- Have family/patient turn off insulin pumps, if possible.
- Consider potential for intentional overdose of hypoglycemic agents.
- Avoid overshoot hyperglycemia when correcting hypoglycemia. Administer dextrose-containing IV fluids in small doses until either mental status improves or a maximum field dose is achieved.

Pertinent Assessment Findings

- Concomitant trauma
- Diaphoresis or hypothermia may be associated with hypoglycemia

Quality Improvement

Associated NEMESIS Protocol(s) (eProtocol.01) 9914125—Medical-Hypoglycemia/Diabetic Emergency

Key Documentation Elements

- Document reassessment of vital signs and mental status after administration of glucose or dextrose or glucagon.
- Document point of care glucose level (if in scope of practice) when indicated.

Performance Measures

- When in scope of practice, blood glucose is checked for all patients with symptoms of altered level of consciousness, seizure, stroke, or hypoglycemia.
- If patient released at scene, criteria documented for safe release.

EMS Compass® Measures (for additional information, see www.emscompass.org)

- *PEDS-03: Documentation of estimated weight in kilograms.* Frequency that weight or length-based estimate are documented in kilograms
- *Hypoglycemia-01: Treatment administered for hypoglycemia.* Measure of patients who received treatment to correct their hypoglycemia

References

1. A review of the efficiency of 10% dextrose as an alternative to high concentration glucose in the treatment of out-of-hospital hypoglycemia. *J Emerg Prim Health Care.* 2009;7(3):990341.
2. Desachy A, Vuagnat AC, Ghazali AD, et al. Accuracy of bedside glucometry in critically ill patients: influence of clinical characteristics and perfusion index. *Mayo Clin Proc.* 2008;83(4):400-5.
3. Funk DL, Chan L, Lutz N, Verdile VP. Comparison of capillary and venous glucose measurements in healthy volunteers. *Prehosp Emerg Care.* 2001;5(3):275-7.
4. Hern HG, Kiefer M, Louie D, Barger J, Alter HJ. D10 in the treatment of prehospital hypoglycemia: a 24 month observational cohort study. *Prehosp Emerg Care.* 2017;21(1):63-7.
5. Holstein A, Kuhne D, Elsing HG, et al. Practicality and accuracy of prehospital rapid venous blood glucose determination. *Am J Emerg Med.* 2000;18(6):690-4.
6. Holstein A, Plaschke A, Vogel MY, Egberts EH. Prehospital management of diabetic emergencies – a population-based intervention study. *Acta Anaesthesiol Scand.* 2003;47(5):610-5.
7. Jones JL, Ray VG, Gough JE, Garrison HG, Whitley TW. Determination of prehospital blood glucose: a prospective, controlled study. *J Emerg Med.* 1992;10(6):679-82.
8. Kulkarni A, Saxena M, Price G, O'Leary MJ, Jacques T, Myburgh JA. Analysis of blood glucose measurements using capillary and arterial blood samples in intensive care patients. *Intensive Care Med.* 2005;31(1):142-5.
9. Kumar G, Sng BL, Kumar S. Correlation of capillary and venous glucometry with laboratory determination. *Prehosp Emerg Care.* 2004;8(4):378-83.
10. Moore C, Woollard M. Dextrose 10% or 50% in the treatment of hypoglycaemia out of hospital? a randomized controlled trial. *Emerg Med J.* 2005;22:512–5.
11. Roberts K, Smith A. Outcome of diabetic patients treated in the prehospital arena after a hypoglycemic episode, and an exploration of treat and release protocols: a review of the literature. *Emerg J Med.* 2003;20(3):274-6.
12. Vilke GM, Castillo EM, Ray LU, Murrin PA, Chan TC. Evaluation of pediatric glucose monitoring and hypoglycemic therapy in the field. *Pediatr Emerg Care.* 2005;21(1):1-5.