



Jefferson

Philadelphia University +
Thomas Jefferson University

CDU Curriculum: Hypoglycemia

By: Mike Rotstein

Epidemiology

- 200,000 to 300,000 patients seen in ED due to hypoglycemic episodes in the US(10.2 per 1,000 adults with diabetes)
- 71.0% were treated and released, 22.3% were admitted to the hospital, and <0.1% died
- 50,000-60,000 admissions annually for hypoglycemia (2.5 per 1,000 adults with diabetes)
- Most commonly a result of treatment of diabetes
- Frequency is greater with those who have type 1 DM, especially in patients receiving intensive therapy, where risk of severe hypoglycemia is increased more than 3 fold
- Increased incidence among African Americans, women, those with less than high school education, and the elderly

Hypoglycemia Defined

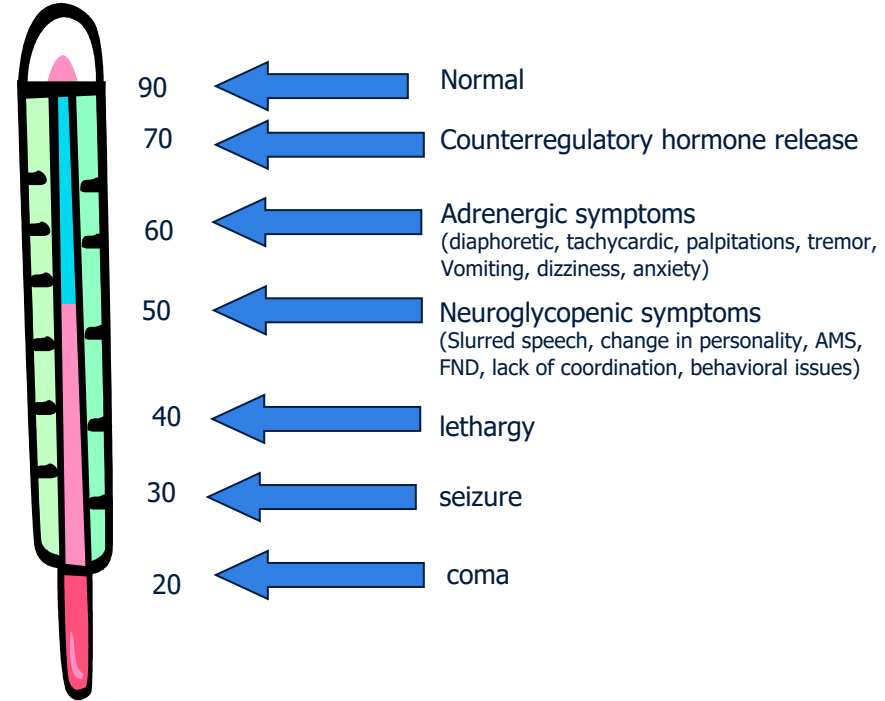
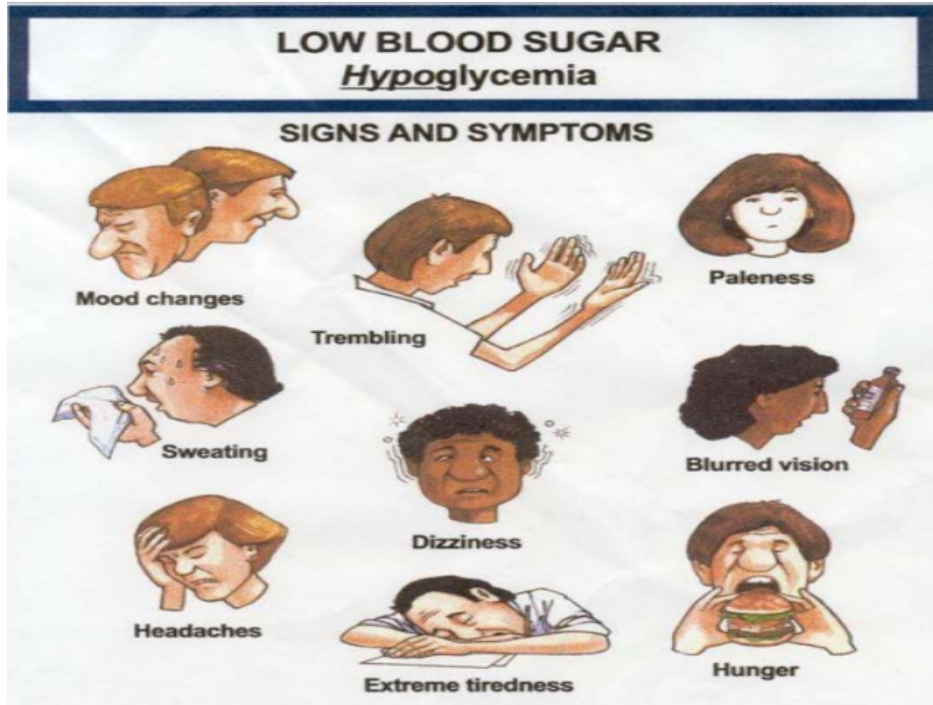
- In a diabetic patient, hypoglycemia is defined as a self-monitored (acceptably, self-reported) blood glucose level $\leq 70\text{mg/dL}$ (with or without symptoms) that expose the individual to harm
- All other patients must have a documented experience of Whipple's triad for the diagnosis of hypoglycemia to be made:
 - Signs or symptoms consistent with hypoglycemia
 - A low plasma glucose ($<70\text{ mg/dL}$)
 - Resolution of symptoms after plasma glucose concentration is raised
- Note: Whipple's triad was identified by Allen Whipple in 1938, the American surgeon who also coined the Whipple procedure. Experts agree that all patients presenting with severe hypoglycemia (blood glucose $\leq 40\text{mg/dL}$) should undergo evaluation and treatment, even in the absence of associated signs and symptoms

Hypoglycemia

- Can occur in non-diabetic patient:
 - ETOH ingestion
 - Toxic Salicylate ingestion
 - Malnourished states
 - Insulin-producing tumors

- Patients on beta-blockers susceptible

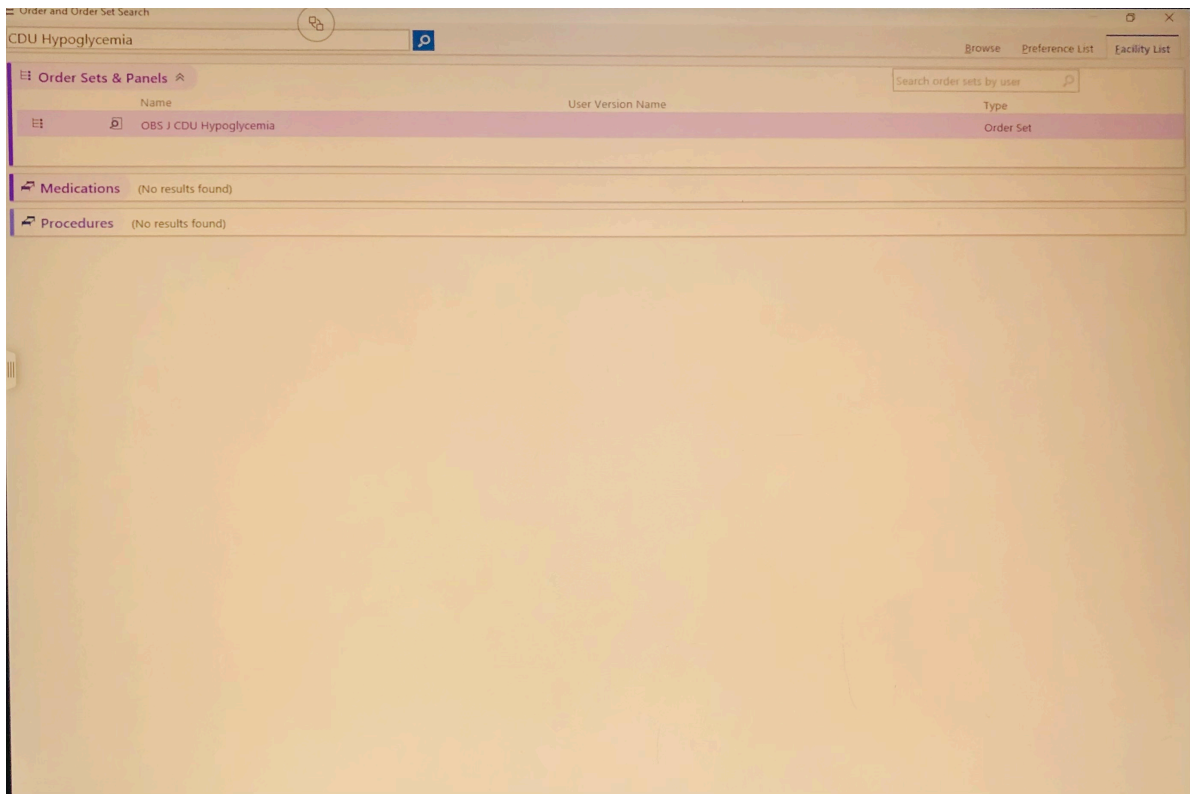
Signs/symptoms



Brief ED management, info about diagnostic testing

- **History**
 - Irritability, sweating, jitteriness, lethargy, tachypnea, +/- hypothermia, +/- sepsis
- **Physical Exam**
 - Hypotonia, lethargy, apneic, tachycardic, pallor, vomiting, tremulousness, seizure, hypothermic, diplopia, signs of CVA
- **Evaluation**
 - Labs: FSG, Chem 7, LFTs, serum insulin, UA (ketones), C-peptide (low in exogenous insulin, high in insulinoma or sulfonylureas); tox screen if indicated
- **Treatment**
 - Glucose Replacement
 - PO: Glucose paste/gel, juice, complex carbs (Classic ED Turkey Sandwich) (preferred in awake/alert patients)
 - Adults: Ampule of D50W (25g/50mL) or IV bolus 100ml of 10% Dextrose in Water (D10W)
 - Infants: IV bolus: 10% dextrose at 2mL/kg followed by infusion @ 6-9mg/kg/min
 - Children: IV bolus: 10% dextrose at 5mL/kg followed by infusion at 6-9mg/kg/min
 - Intramuscular: Glucagon 0.03-0.1mg/kg/dose SC q20min prn

CDU Hypoglycemia Order Set



CDU Hypoglycemia Order Set

OBS J CDU Hypoglycemia

General

▼ Admission

- Admit to
- Place to Extended Recovery
- Place to Observation Status
Order details

▼ Code Status

- Full Code
- DNR/DNI
- Limited Code

▼ Diet / Nutrition

- Diet
Diet effective now
- Diet with Supplement Panel
- NPO
Diet effective now
- NPO at Midnight Panel
- Tube Feed without Tray
Diet effective now, Routine
- Tube Feed with Tray Panel

▼ Activity

- OOB; Ad lib; Ambulate/VTE Prevention; 5-10 minutes TID
Ongoing, Routine
- OOB; With assistance; Ambulate/VTE Prevention; 5-10 minutes TID
Ongoing, Routine
- Bedrest
Ongoing, Routine

▼ Nursing

▼ Vital Signs

- Vital Signs: Per Unit Policy
Per Unit Policy, Starting today at 1958, Until Specified
- Cardiac Monitoring Panel

CDU Hypoglycemia Order Set

▼ IV Fluids

▼ IV Fluid Infusions

- dextrose 5 %-0.45 % sodium chloride infusion (\$2.00)
100 mL/hr, intravenous, Continuous
- dextrose 10 % infusion (\$3.00)
50 mL/hr, intravenous, Continuous

▼ Medications

▼ Analgesics for Mild Pain

- acetaminophen (TYLENOL) tablet (\$0.07)
650 mg, oral, Every 4 hours PRN, mild pain (pain scale 1-3/10)

▼ Analgesics for Moderate Pain

- ibuprofen (ADVIL,MOTRIN) tablet (\$0.09)
600 mg, oral, Every 6 hours PRN, moderate pain (pain scale 4-6/10)

▼ Nursing

▼ Nursing Communication

- Nursing Communication
Routine, PRN

▼ Quality Measures

▼ TJU STANDARD BLOOD GLUCOSE

- Glucose, POC (Point-of-Care)
PRN, Starting today at 1957, Until Tue 5/4/21, For 100 days, Routine
- Notify Provider for Blood Glucose less than 70 or greater than 350
Routine, PRN, Starting today at 1957, Until Specified
Blood Glucose less than 70 or greater than 350
- Hypoglycemia Protocol
PRN, Starting today at 1957, Until Specified
- POCT Glucose Critical Value Verification Protocol
PRN, Starting today at 1957, Until Specified
- dextrose (GLUCOSE) 40 % gel 15 g (\$0.35)
15 g, oral, As needed, blood glucose < 70 mg/dL, see Hypoglycemia Management Protocol, Starting today a
For 365 days
Hypoglycemia Management Protocol

Hypoglycemia definitions (POC Glucose or Blood Glucose)

CDU Hypoglycemia Order Set

15 g, oral, As needed, blood glucose < 70 mg/dL, see Hypoglycemia Management Protocol, Starting today at 1957 For 365 days

Hypoglycemia Management Protocol

Hypoglycemia definitions (POC Glucose or Blood Glucose)

- ≤ 70 mg/dL (hypoglycemia)
- ≤ 54 mg/dL (clinically significant hypoglycemia)
- < 40 mg/dL (critical value - TJUH)

ABLE to take oral

- Give 15 grams fast-acting carbohydrates (e.g. 4 oz orange juice PO or 1 tube dextrose gel PO/SL)

UNABLE to take oral / ALTERED mental status

- IV access: Give D50W x 25 mL (12.5 grams) once IV push over 3 - 5 minutes
- NO IV access: Glucagon 1 mg IM/SC once

Recheck POC Glucose in 15 minutes

glucagon (human recombinant) injection 1 mg (\$46)

1 mg, subcutaneous, As needed, blood glucose < 70 mg/dL, see Hypoglycemia Management Protocol, Starting today at 1957, For 365 days

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ABLE to take oral

- Give 15 grams fast-acting carbohydrates (e.g. 4 oz orange juice PO or 1 tube dextrose gel PO/SL)

UNABLE to take oral / ALTERED mental status

- IV access: Give D50W x 25 mL (12.5 grams) once IV push over 3 - 5 minutes
- NO IV access: Glucagon 1 mg IM/SC once

Recheck POC Glucose in 15 minutes

IV push only in an emergency situation in the immediate presence of a physician.

dextrose 50 % injection 25 mL (\$7.70)

25 mL (12.5 g), intravenous, As needed, blood glucose < 70 mg/dL, see Hypoglycemia Management Protocol,

Starting today at 1957, For 365 days

Hypoglycemia Management Protocol

Hypoglycemia definitions (POC Glucose or Blood Glucose)

- ≤ 70 mg/dL (hypoglycemia)
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HYPOGLYCEMIA

INCLUSION CRITERIA

- Probability of discharge within 24 hrs >80%

EXCLUSION CRITERIA

- Meets criteria for inpatient admission
- Intentional overdose
- Intake of large amount of long-acting oral medications
- Altered mental status

TYPICAL OBSERVATION MANAGEMENT

- Review ED diagnostic tests, labs, imaging
- Serial labs
- Serial blood glucose monitoring
- Administration of glucose

DISPOSITION

Home

- Observation course stable
- Clinical improvement
- Tolerating medications
- Follow up arranged
- Sustained blood glucose of > 80 mg/dl
- Precipitating factors addressed
- Home care coordination as needed

Hospital

- Unable to maintain a sustained blood glucose > 80 mg/dl
- Not tolerating PO
- Unable to adequately address precipitating factors
- No improvement in clinical condition
- Unstable vital signs, suspect SIRS/sepsis
- LOS exceeds 23 hrs

Typical CDU Plan

- Review ED diagnostic tests, labs, imaging
- Serial FSG and lab measurements
- Electrolyte monitoring and administration as indicated
- Dextrose administration
- IV fluid administration as indicated
- Adjustment of prandial insulin doses to account for alterations in oral intake
- Octreotide (75ug SQ should be used if glucose administration is required when sulfonylureas are implicated, with monitoring 12 hours post administration (not necessary in all cases of sulfonylurea cause when PO diet suffices)
- Endocrine/Diabetic counseling as indicated
- Maintain sustained blood glucose of > 80 mg/dl with identification/addressing of precipitating factors

References

Cyer P, Axelrod L, Grossman A, Heller S, Montori V, et al. Evaluation and management of adult hypoglycemic disorders: An endocrine society clinical practice guideline. J Clin Endocrinol Metab. 2009; 94(3):709-728.

Diabetes Public Health Resource. Number of emergency department visits (in thousands) with hypoglycemia as a first-listed diagnosis and diabetes as a secondary diagnosis, adults aged 18 years or older, United States, 2007-2009. Centers for Disease Control and Prevention. Available from: <http://www.cdc.gov/diabetes/statistics/hypoglycemia/fig1.htm>

<https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf>

Lipska K, Ross J, Wang Y, et al. National trends in US hospital admissions for hyperglycemia and hypoglycemia among Medicare beneficiaries, 1999 to 2011. JAMA Intern Med 2014;174:1116-1124

Tintinalli's Emergency Medicine Manual, 8th ed., McGraw Hill Education, 2018.



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