

Managing Acute Diabetic Complications

Diabetes Mellitus (DM) is a chronic disease that can have very serious acute and life-threatening complications. Use this reference guide to assist you in the management of patients experiencing hypoglycemia (low blood glucose) and hyperglycemic (high blood glucose) emergencies.

Hypoglycemia is reduced plasma glucose to a level that may induce symptoms of altered mental status and/or sympathetic nervous system stimulation. *Mild symptoms* include hunger, diaphoresis, anxiety or drowsiness, and weakness. *Moderate symptoms* are headache; behavior changes; blurred, impaired, or double vision; and irritation, confusion, or difficulty talking. *Severe symptoms* include unresponsiveness and seizures.

Management of Hypoglycemia	
Glucose Level	Treatment
< 70 mg/dL (3.9 mmol/L)	<p>“Rule of 15”</p> <ul style="list-style-type: none"> • Administer 15 gm rapidly digested carbohydrate: <ul style="list-style-type: none"> ○ For patients that can tolerate oral intake: <ul style="list-style-type: none"> ▪ 4 ounces (120 mL) juice or regular soda ▪ 1 tube glucose gel ▪ 3 to 4 glucose tablets ○ For patients that are NPO or cannot tolerate oral intake: <ul style="list-style-type: none"> ▪ 50 mg (25 g) dextrose 50% I.V. slowly into large vein, or glucagon injection I.M. • Position patient on right side to prevent aspiration from vomiting • Recheck blood glucose 15 minutes after treatment. • If levels remain low, re-treat patient until levels have stabilized • No meals until blood glucose has risen to an acceptable level
Severe hypoglycemia < 40 mg/dL (2.2 mmol/L)	<ul style="list-style-type: none"> • Administer 30 gm rapidly digested carbohydrate • Follow algorithm above

Hyperglycemia

Hyperglycemia is high blood glucose which may cause symptoms when levels rise above 200 mg/dL (11 mmol/L). Early signs include frequent urination, increased thirst, blurred vision, fatigue and headache.

If hyperglycemia goes untreated, toxic acids (ketones) build up in the blood and urine (ketoacidosis). Two hyperglycemic emergencies are diabetic ketoacidosis (DKA) and hyperosmolar hyperglycemic state (HHS).

Diabetic Ketoacidosis (DKA) versus Hyperosmolar Hyperglycemic State (HHS)		
	DKA	HHS
Definition	Severe, uncontrolled diabetes characterized by hyperglycemia, ketoacidosis and ketonuria	Severe, uncontrolled diabetes characterized by hyperglycemia, hyperosmolarity and dehydration
Plasma glucose	>250 mg/dL	>600 mg/dL
Arterial pH	<7.30	>7.30
Serum bicarbonate	<18	> 18
Urine ketones	Positive	Small/None
Serum ketones	Positive	Small/None
Serum osmolality	Variable	>320 mOsm/kg
Anion gap	>12	Variable
Mental status	Drowsy, stupor/coma	Stupor/Coma
BUN/Creatinine	Elevated	Elevated
Onset	Rapid (< 24 hours)	Slow over days
Affects	Both Type 1 and 2 DM, but occurs most often in Type 1	Both Type 1 and 2 DM, but occurs most often in Type 2 and elderly
Precipitating factors	<ul style="list-style-type: none"> • Decreased or missed dose of insulin • Physiologic stress (infection, surgery) • Undiagnosed or untreated diabetes • Excess alcohol intake 	<ul style="list-style-type: none"> • Illness • Medications that cause hyperglycemia • Dialysis
Signs & symptoms	<ul style="list-style-type: none"> • Kussmaul respirations (rapid, shallow breathing) • “Fruity”, acetone breath • Malaise, weakness, fatigue • Nausea, vomiting, abdominal pain • Cardiac arrhythmias, tachycardia • Hypotension • Mild disorientation, confusion 	<ul style="list-style-type: none"> • Similar signs and symptoms as DKA • Dehydration, extreme thirst • Tachycardia • Hypotension • Mental status changes, lethargy • Fever • Loss of vision • Hallucinations
Treatment	<ul style="list-style-type: none"> • Correct fluid deficit 	<ul style="list-style-type: none"> • Correct fluid deficit

(per orders)	<ul style="list-style-type: none"> • Replace electrolytes • Reverse acidosis and ketosis • Administer insulin to reduce glucose level to 150-200 mg/dL • Identify underlying cause 	<ul style="list-style-type: none"> • Replace electrolytes • Administer insulin to reduce glucose level to 250-300 mg/dL • Identify underlying cause
Signs of resolution	<ul style="list-style-type: none"> • Blood glucose level < 200 mg/dL • Two of the following are present: <ol style="list-style-type: none"> a. Serum bicarbonate level ≥ 15 mEq/L b. pH > 7.3 c. Anion gap ≤ 12 mEq/L 	<ul style="list-style-type: none"> • Osmolality is normal • When mental status is back to baseline, patient may start clear liquid diet and transition to subcutaneous insulin.
Potential complications of treatment	<ul style="list-style-type: none"> • Fluid overload due to aggressive fluid replacement • Hypokalemia due to inadequate potassium replacement, or administration of bicarbonate • Hypoglycemia due to aggressive insulin treatment • Cerebral edema due to excessive hydration and rapid intracellular fluid shifts 	
Nursing considerations	<ul style="list-style-type: none"> • Monitor hemodynamics, intake/output, serum osmolality, BUN and creatinine • Assess cardiac, renal and mental status • Monitor blood glucose every hour if on IV insulin infusion • Monitor electrolytes (Na^+, K^+, Mg^{2+}, PO_4^-) every 2-4 hours, per policy • If hypokalemic, delay insulin treatment until serum $\text{K}^+ > 3.3$ mEq/L • Monitor arterial blood gas (ABG) to determine if acidosis is resolving. • IV insulin should continue for 1 to 2 hours after the first dose of subcutaneous insulin administration to avoid hyperglycemia. 	

References:

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- Pollock, F. & Funk, D.C. (2013) Acute Diabetes Management: Adult Patient With Hyperglycemic Crises and Hypoglycemia. *AACN Advanced Critical Care*, 24(3): 314-324. doi: 10.1097/NCI.0b013e31829b7d38
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