DKA and HHS

Ketones or dehydration, potassium before insulin, fluids first

ON THIS SHEET 1 At a glance 2 Priority and safety calls 3 Exam anchors 4 Self-quiz 5 Sources ★ high yield

1 AT A GLANCE

When glucose climbs out of control, the danger is acid from burning fat (DKA), or dehydration so deep it clouds the brain (the hyperosmolar state, HHS).

DKA or HHS?

	DKA	HHS
Usual type	Usually type 1; sometimes the first sign of it	Usually type 2
★ What happens	So little insulin that the body burns fat too fast; **ketones make the blood acidic**	Some insulin is still made, so **ketones are absent or mild**, without significant acidosis
Glucose	200 mg/dL or more, or known diabetes, plus ketones and acidosis. Can be near-normal, notably on SGLT2 inhibitors or in pregnancy	Extremely high. Blood becomes concentrated (hyperosmolar), with high sodium
Onset	Comes on quickly	Builds over days to weeks
★ Main danger	The acid	Extreme dehydration: the concentrated blood draws water out of the organs, including the brain

Not always clear-cut: Mixed DKA and HHS cases occur in either type of diabetes.

DKA: signs and triggers

- Thirst and frequent urination lead to dehydration: dry skin, dry mouth.
- Nausea, vomiting and abdominal pain are common.
- ★ **Kussmaul breathing**: deep and rapid, as the body blows off acid. **Fruity breath.**
- Headache, muscle aches, and alertness drops.
- Potassium is often high at first, which can cause dangerous rhythms.
- Triggers: infection, injury, serious illness, missed insulin, surgery.

DKA: tests

Test	What it shows
★ Blood beta-hydroxybutyrate	The ketone test to use, **rather than relying on urine ketones**
Blood gas	Metabolic acidosis: a pH under 7.35 with low bicarbonate
Metabolic panel	With the anion gap
Glucose	200 mg/dL or more, or known diabetes

Treating DKA: fluids, insulin, electrolytes

	What the nurse knows
Where and what	In the hospital: IV fluids, insulin and electrolyte replacement. Replace the fluid and electrolytes lost through urine and vomiting
★ Potassium first	Potassium may start high, but insulin moves it into the cells. **Check it before insulin. Below 3.5 mmol/L: replace it and delay insulin until corrected**
Insulin	Severe DKA: an IV infusion. Selected mild or moderate uncomplicated DKA: protocolized subcutaneous rapid-acting insulin
★ Once insulin runs	Potassium falls: check it often and replace it as ordered
The cause	Find and treat it, such as an infection

Recovery: Most clients respond within 24 hours: alertness and breathing improve, and glucose and acid move toward normal. Untreated, DKA can be fatal.

HHS: who, signs, tests

- ★ High risk: **older adults with impaired thirst or limited access to water**, as with dementia or being bedbound.
- Triggers: infection, heart attack or stroke, some drugs, running out of diabetes medicines. Heart failure and poor kidney function add risk.
- Signs build over days to weeks: thirst and frequent urination, then weakness, nausea, a dry mouth and tongue, fever, a fast heart rate.
- Blood pressure falls. Confusion can progress to seizures, speech and movement problems, and coma.
- Tests: blood concentration, sodium adjusted for glucose, kidney function, ketones, potassium and bicarbonate.

Treating HHS

- ★ **Fluids first**: correct the water loss with IV fluids, with careful monitoring as the hyperosmolality is corrected.
- Fluids improve blood pressure, urine output and circulation, and lower the glucose.
- Fluids and potassium go in carefully; IV insulin treats the high glucose.
- Then look for the cause: cultures, a chest X-ray and an ECG.

Educational use only. Not a substitute for clinical judgment, your facility's policy or the provider's orders. Where practice varies, follow facility policy and state law. No patient information.

DKA and HHS

2 PRIORITY AND SAFETY CALLS

★ Deep, rapid breathing with fruity breath and vomiting in an ill client with diabetes **suggests DKA**, not anxiety, a low or a simple stomach virus.

★ **Check potassium before insulin.** Below 3.5 mmol/L, potassium is replaced and insulin waits until it's corrected.

★ On an insulin drip, a potassium that was high and is now dropping fast is the insulin pushing it into the cells: check it often and replace it as ordered. Stopping the insulin isn't the nurse's call.

Don't restrict fluids. In HHS, IV fluids to correct the water loss come first.

NPH insulin for DKA is a trap: severe DKA needs an IV insulin infusion.

An older client with type 2 diabetes who is confused and very dry, with an extreme glucose and ketones absent or mild: **HHS fits**.

Teach clients to test for ketones when they're warned, and to call the provider right away if ketones are present, and not to stop insulin on their own.

4 SELF-QUIZ

1. Deep, rapid breathing in DKA is called _____ breathing.
2. In DKA, the breath smells _____.
3. Potassium below _____ mmol/L is replaced, and insulin is delayed until it's corrected.
4. DKA: a glucose of _____ mg/dL or more, or known diabetes, plus ketones and acidosis.
5. The preferred ketone test in DKA is blood _____.
6. HHS signs build over days to _____.
7. Treatment of HHS starts with IV _____.

ANSWER KEY 1. Kussmaul · 2. fruity · 3. 3.5 · 4. 200 · 5. beta-hydroxybutyrate · 6. weeks · 7. fluids

3 EXAM ANCHORS

1. DKA: no insulin, ketones and acid, Kussmaul breathing, fruity breath.
2. Kussmaul breathing is deep and rapid, to blow off acid.
3. Treat DKA with fluids, insulin and electrolytes, checking potassium before insulin and as it falls.
4. HHS: usually type 2, extreme glucose and dehydration, few ketones, slow onset.
5. DKA has ketones and acidosis; HHS has few or none.
6. HHS: fluids first, then insulin and potassium, and find the cause.

5 SOURCES

1. Open RN, Nursing: Health Alterations, 7.5 Diabetes Mellitus (DKA and HHS). wtcs.pressbooks.pub/healthalts/chapter/7-5-diabetes-mel…
2. MedlinePlus, Diabetic ketoacidosis. medlineplus.gov/ency/article/000320.htm
3. MedlinePlus, Diabetic hyperglycemic hyperosmolar syndrome. medlineplus.gov/ency/article/000304.htm
4. Open RN, Nursing Fundamentals 2e, 15.5 Acid-Base Balance. wtcs.pressbooks.pub/nursingfundamentals/chapter/15-5-ac…
5. International consensus on hyperglycemic crises (DKA and HHS) in adults (PubMed Central) (2024). pmc.ncbi.nlm.nih.gov/articles/PMC11272983

Built from RN PocketPal course lessons: Diabetic ketoacidosis and hyperosmolar state (c11-l02). Every line on this sheet comes from those lesson scripts.

Educational use only. Not a substitute for clinical judgment, your facility's policy or the provider's orders. Where practice varies, follow facility policy and state law. No patient information.