

DIAGNOSE IT *the 2024 consensus requires all four*

Criterion	Threshold
1 • Hyperglycemia	Plasma glucose ≥ 600 mg/dL (33.3 mmol/L).
2 • Hyperosmolality	Calculated effective osmolality > 300 mOsm/kg , or total serum osmolality > 320 mOsm/kg. <i>Effective osmolality = 2 × Na⁺ + glucose (mg/dL)/18 — urea is excluded because it crosses cell membranes freely and does not drive water shift.</i>
3 • No significant ketonemia	Beta-hydroxybutyrate < 3.0 mmol/L , or urine ketone strip 2+ or lower .
4 • No acidosis	pH ≥ 7.3 and bicarbonate ≥ 15 mmol/L .

WHAT CHANGED IN 2024

The consensus report **revised the criteria for diagnosis and resolution of both DKA and HHS**, and notably **removed the anion gap criterion** for DKA, to better account for the many factors influencing acid–base status. For fluids it recommends **0.9% sodium chloride or other balanced crystalloids and omits 0.45% sodium chloride**. **Mixed DKA–HHS pictures are common** — roughly a third of hyperglycemic emergencies have features of both, and they are managed as DKA.

THE THREE DIFFERENCES FROM DKA *why this is not just “DKA with a higher sugar”*

MUCH BIGGER FLUID DEFICIT

Typically **8–12 L**, versus around 6 L in DKA. Develops over **days to weeks**, not hours, so there is far more time to become profoundly dry.

NO SIGNIFICANT KETOSIS

Residual insulin is enough to **suppress lipolysis** but not enough to control glucose. So the patient is hyperosmolar without being acidotic, which removes the acidosis that usually brings DKA patients in early.

OLDER, SICKER, HIGHER MORTALITY

Typically **older type 2 patients**, often with impaired thirst or restricted water access. **Mortality is several times higher than DKA**, driven mostly by the precipitating illness and comorbidity.

MANAGE IT *fluid is the treatment; insulin is an adjunct*

- Fluid first, and generously.** Start **0.9% sodium chloride** or a balanced crystalloid. Restoring circulating volume alone drops the glucose substantially through dilution and improved renal clearance. Reassess volume status repeatedly rather than following a fixed rate.
- Check potassium before insulin**, exactly as in DKA. Insulin drives potassium intracellularly, and total-body potassium is depleted even when the serum level looks normal. **If K⁺ is low, replace it before starting insulin.**
- Insulin infusion at a lower rate than DKA**, started **after** fluid resuscitation is under way. Giving insulin first pulls water intracellularly from an already depleted intravascular space and can precipitate collapse.
- Correct osmolality slowly.** Aim for a fall in **sodium-corrected osmolality of no more than about 3–8 mOsm/kg per hour**, and add dextrose once glucose approaches 250–300 mg/dL so you can continue insulin without dropping the glucose too fast. **Rapid correction risks cerebral edema.**
- Find and treat the precipitant.** **Infection** is the commonest, then myocardial infarction, stroke, pancreatitis, non-adherence, and drugs including **steroids, thiazides, and atypical antipsychotics**. HHS is nearly always a symptom of something else.

RESOLUTION & WHAT ELSE TO WATCH *the endpoint is osmolality and cognition, not glucose alone*

HHS IS RESOLVED WHEN

Osmolality falls below 300 mOsm/kg · urine output exceeds 0.5 mL/kg/hr · cognition has improved · and glucose is under 250 mg/dL. Note that **mental status recovery can lag** the biochemistry by many hours, so do not assume failure if the patient is slow to clear.

COMPLICATIONS

Venous thromboembolism — these patients are hyperviscous and immobile, so give prophylaxis unless contraindicated. Also **arterial thrombosis**, aspiration in the obtunded patient, **rhabdomyolysis**, and acute kidney injury. **Cerebral edema** is rare in adults but is the feared consequence of correcting too fast.

THE FIRST 24 HOURS *what to order and how often to check it*

Element	Detail
Monitoring	Hourly glucose while on an insulin infusion · electrolytes, urea and creatinine every 2–4 hours initially · recalculate effective osmolality with each set · strict fluid balance and hourly urine output · continuous cardiac monitoring while potassium is shifting.
Potassium	Total-body potassium is depleted even when the serum value is normal or high. Start replacement once K⁺ is below the upper limit and urine output is established , and recheck frequently — the fall with insulin and fluid can be steep.
Investigations for the trigger	Cultures, chest imaging, ECG and troponin in everyone. Add lipase, CT head for focal signs, and a careful drug history. Assume infection until proven otherwise , and have a low threshold for empirical antibiotics in the unwell patient.
Other early tasks	VTE prophylaxis · nurse safely if obtunded, with attention to the airway · catheterize if needed to measure output accurately · avoid unnecessary sedation , which obscures the neurological trend that guides your correction rate.

BEFORE DISCHARGE *HHS is a sentinel event, not just an admission*

ADDRESS WHY IT HAPPENED

Many episodes reflect **undiagnosed diabetes**, medication access problems, cognitive impairment, or **inability to obtain water**. Review the **social situation and carer support** as seriously as the insulin regimen — the biochemistry was a symptom of the circumstances.

SET UP THE REGIMEN

Transition to **subcutaneous insulin with a 2–4 hour overlap** before stopping the infusion. Arrange **diabetes specialist review**, glucose monitoring the patient can actually perform, and **written sick-day rules** covering when to seek help and to keep drinking. Review any drug that contributed.

PEARLS & PITFALLS

- Fluid, then potassium, then insulin.** Starting insulin before volume resuscitation shifts water out of the intravascular space and can cause cardiovascular collapse.
- Correct the sodium for the glucose** before judging whether the patient is hypernatremic, and follow **effective** osmolality, which excludes urea.
- Altered mental status correlates with osmolality**, not with glucose. A drowsy patient with a modest osmolality needs a different explanation.
- Always hunt the precipitant.** Treating the sugar while missing the sepsis or infarct is the commonest fatal error.
- Give VTE prophylaxis** — the thrombotic risk in hyperviscous, immobile, elderly patients is substantial.
- The 2024 consensus dropped the anion gap from DKA criteria** and moved away from 0.45% saline. Check that local protocols have caught up.