

OUTLINE GUIDE TO MANAGEMENT OF DIABETIC KETOACIDOSIS IN ADULTS

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Reference: *Diabetes Care* 2002; 25(Suppl. 1):S100-S108

INITIAL DIAGNOSTIC MEASURES

First priority measures

- Rapid examination for airway, cardiovascular function, neurologic status, signs of infection
- Capillary blood glucose and urinary ketones
- Stat blood work: arterial gases, serum Na, K, Cl, HCO₃⁻, glucose, creatinine, BUN; CBC. Calculate serum osmolality and anion gap
- Stat ECG
- Start a flow sheet

Initial general medical data

- Chest film if indicated
- Cultures: blood, urine, sputum

INITIAL THERAPY

General

- NG tube if patient is unconscious or vomiting.
- Hemodynamic monitoring if there is suspicion of LV failure or cardiogenic shock.
- DVT prophylaxis, especially if patient is unconscious or severely volume-depleted.

Fluids

- 0.9% saline: 1 L in 30 min; then 1 L in next 1 hour; then 1 L in next 2 hours; then 2 L in next 8 hours
- Switch to 0.45% saline if osmolality increases during administration of saline, or if $[\text{serum Na} + 0.016 \cdot (\text{serum glucose} - 100)] > 145$.

Insulin

- **Check serum K. Hold insulin if K < 3.3 mEq/L.** Give KCl at 40 mEq/h, until K ≥ 3.3 mEq/L.
- Load with 0.15 units/kg Regular, IV; then start infusion at 0.1 units/kg/h.
- Double rate of infusion if glucose does not fall by at least 50 mg/dl in 1 h. Double rate hourly, until glucose falls by at least 50 mg/dl/h.

Potassium

- Be sure patient is making urine.
- If K < 3.3 mEq/L, **hold insulin.** Give 40 mEq K/h, until K ≥ 3.3 mEq/L.
- If K between 3.3 and 4 mEq/L, give 25 mEq K/h.
- If K between 4 and 5 mEq/L, give 20 mEq K/h.
- If K rises above 5 mEq/L, stop giving K; check K level q2h.
- K infusion should be 2/3 as KCl, 1/3 as K phosphate.
- Adjust rate of K infusion to keep serum K between 4 and 5 mEq/L.
- Monitor ECG as guide to extracellular [K⁺]

Alkali

- If arterial pH > 7.0, no need for bicarbonate
- For pH 6.9 - 7.0, may give 44 mEq NaHCO₃, with 10 - 15 mEq K⁺, over 30 min
- For pH < 6.9, give 88 mEq NaHCO₃, with 25 mEq K⁺, over 45 min
- 30 min after each infusion of NaHCO₃, re-check pH, and re-evaluate need for more alkali

Phosphate

- Patients in DKA are usually phosphate depleted, but not hypophosphatemic on admission; serum phosphate usually falls during therapy
- ***Controlled studies have failed to show a beneficial effect of intravenous phosphate replacement on clinical outcome, in diabetic ketoacidosis.***
- Do not give IV phosphate if patient is hyperphosphatemic, hypercalcemic, hypocalcemic, azotemic or oliguric
- Check P level initially and 8 hr. after starting insulin
- If [P] < 1 mg/dL, may give neutral K phosphate, 10 - 20 millimoles per liter of IV fluids
- Do not add phosphate to solutions containing calcium
- Monitor serum Ca, P and creatinine q12 h, while giving IV phosphate
- Safest way to replete phosphate is orally, after patient can take oral feedings

CONTINUED MANAGEMENT

Check capillary glucose hourly

- When glucose down to 250 mg/dL:
 - Switch to fluids containing 5% or 10% dextrose, until patient can eat
 - Patient will develop a non-anion-gap acidosis, during the treatment. Continue insulin infusion at therapeutic rate of at least 5 units/hr, until the acidosis has cleared (i.e. [HCO₃⁻] > 18 mEq/L). Give dextrose-containing fluids as needed to avoid hypoglycemia
 - After acidosis has cleared, continue insulin infusion at maintenance rate of 0.5 - 2 units/hr, until patient can eat
 - Keep giving IV K⁺ at about 3 - 5 mEq/hr, until patient begins eating

When acidosis has cleared and patient can eat, start NPH insulin

- Wait at least 1 hr after giving NPH insulin, before stopping the insulin infusion.
- Remember that a Type 1 diabetic patient will require NPH insulin twice daily
- Continue oral K⁺ and phosphate repletion for 5 to 7 days