**INITIAL CARE**

**ENSURE:**
- Secure airway and adequate ventilation/oxygenation

**MONITOR:**
- Orthostatic hypotension (If not hypotensive)
- Continuous EKG monitoring
- Urine output
- Frequent Vital signs

**PLACE:**
- Adequate IV access (may require 3 ports)
- Foley catheter

**CALCULATE:**
- Anion Gap
- Serum Osmolality
- Free Water Deficit
- Corrected Serum Sodium

**LABS:**
- Basic metabolic panel, Serum phosphate level, hepatic enzymes, A1C
- beta-HCG. Urine (for women of child bearing age)
- CBC w/differential
- Cardiac enzymes
- Serum ketones/acetone/Beta-hydroxybutyrate
- PT/PTT
- Venous/Arterial blood gas
- UA/Urinary micro/Urinary culture

**ORDER:**
- EKG
- CXR
- Venous thromboembolism prophylaxis: Heparin 5,000 units SQ BID or TID (unless contraindicated)

**CONSIDER, as indicated:**
- Further Infectious work up
- Amylase/Lipase to rule out pancreatitis
- Head CT/LP if encephalopathic
- Consider Central access

* Patients with ESRD/Anuria may not require volume and K+ repletion.

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**GOALS OF TREATMENT**
- Replace volume deficit*
- Correct ketosis and acidosis with continuous insulin
- Replace electrolyte deficits*
- Replace free water deficit*
- Prevent hypoglycemia
- Determine inciting condition for the DKA
- Correct hyperglycemia (secondary goal)
- When DKA resolved: begin appropriate SQ insulin before stopping Insulin drip

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**PATHOPHYSIOLOGY**

1) Ketonemia

2) Hyperglycemia

**CALCULATIONS**
- **Anion Gap (AG) [<12-16]:**
  \[
  \text{AG} = [\text{Na}^+] - ([\text{Cl}^- + \text{HCO}_3^-])
  \]

- **Serum Osmolality [275-295 mOsm/L]:**
  \[
  2 \times [\text{Serum Na}^+ (\text{mEq/L})] + \left[\frac{\text{Glucose (mg/dL)}}{18}\right] + \left[\frac{\text{BUN (mg/dL)}}{2.8}\right]
  \]

- **Free Water Deficit:**
  \[
  \text{Dosing Factor X wt (Kg)} \times \left\{\frac{\text{Serum Na}^+ (140)}{100} - 1\right\}
  \]
  *(Dosing Factor = 0.6 (Male) and 0.5 (Female))*

- **Corrected Serum Sodium:**
  \[
  \text{Corrected Na}^+ = \text{Serum Na}^+ \text{ mEq/L} + (1.6 \text{ mEq/L for each 100 mg/dL glucose} > 100 \text{ mg/dL})
  \]

---

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* Patients with ESRD/Anuria may not require volume and K+ repletion.
If tolerating oral feeds:
- Discontinue insulin drip 2 hours after administering long-acting SQ insulin

Subcutaneous insulin options (use 1 or 2)
- Calculate total daily dose (TDD): 0.3 Units/kg/day (type 1 & Renal pts) or 0.5 Units/kg/day (type 2):

PRIOR TO DISCHARGE:
- Screen and treat for tobacco abuse
- Screen and treat for hyperlipidemia, HTN, microalbuminuria
- Assess peripheral neuropathy w/tuning fork and 10 gram monofilament
- Arrange ophthalmologic/podiatric care as needed
- Referral for outpatient diabetes self-management training
- Screen patient to receive influenza and pneumococcal vaccine

OPTION #1* (Preferred)

Glargine: 50% of TDD (as above)
For Discontinuation of Drip in AM:
- Pre-breakfast administer both glargine and aspart dose according to pre-meal aspart order set

For Discontinuation of Drip in PM:
- Pre-dinner administer both glargine and aspart dose according to pre-meal aspart order set

NPH: 50% of TDD (as above)
For Discontinuation of Drip in AM:
- Pre-breakfast administer 2/3 NPH dose and aspart dose according to pre-meal aspart order set

For Discontinuation of Drip in PM:
- Pre-dinner administer 1/3 NPH dose and aspart dose according to pre-meal aspart order set

OPTION #2*

AG is closed and serum ketosis resolved
- Maintain insulin infusion to keep serum glucose 70 – 150 mg/dL (minimum 0.5 Units/hr)

GLIPAZ: 60%
For Discontinuation of Drip in AM:
- Pre-breakfast administer 1/3 NPH dose and aspart dose according to pre-meal aspart order set

For Discontinuation of Drip in PM:
- Pre-dinner administer 2/3 NPH dose and aspart dose according to pre-meal aspart order set

- Change fingerstick to qAC and QHS (NYP-WC) with rapid acting insulin meal bolus coverage
- Start consistent carbohydrate diet
- Obtain endocrine consult on all patients on continuous tube feeds or new Type 1 DM and others as needed.
- Nutrition and Diabetes education consult.

Types of Insulin

<table>
<thead>
<tr>
<th>Type of insulin</th>
<th>Onset</th>
<th>Peak effect</th>
<th>Duration of action</th>
<th>Dosing time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MEALTIME INSULIN (SHORT ACTING)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aspart (Novolog®) (rapid acting)</td>
<td>5 - 15 min</td>
<td>1 hr</td>
<td>3-5 hrs</td>
<td>Within 20 min, before or after a meal</td>
</tr>
<tr>
<td>Regular (Humulin R®) (short acting)</td>
<td>30 min</td>
<td>2-4 hr</td>
<td>5-8 hr</td>
<td>30 min before a meal</td>
</tr>
<tr>
<td><strong>BASAL INSULIN (LONG ACTING)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glargine (Lantus®) (long acting)</td>
<td>1.5-2 hr</td>
<td>No peak</td>
<td>24 hr</td>
<td>Usually q 12 or q 24</td>
</tr>
<tr>
<td>NPH (Humulin N®) (intermediate acting)</td>
<td>1-2 hr</td>
<td>4-12 hr</td>
<td>12-18 hr</td>
<td>Once or Twice daily</td>
</tr>
</tbody>
</table>

- These combinations deliver continuous insulin and prevent recurrent ketosis
- If patient’s outpatient regimen was able to achieve optimal glycemic control, consider re-instatement
- Oral agents generally not useful in immediate post-DKA stage

- OOB, d/c foley and unneeded intravenous lines
- If eating reliably can discontinue IV dextrose
- If not volume or free water depleted discontinue IV fluids

- Change fingerstick to qAC and QHS (NYP-WC) with rapid acting insulin meal bolus coverage
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Aspart
Regular
NPH
Lantus