Orders for Adults with DKA and Hyperglycemic Hyperosmolar State (HHS)

These orders may be initiated in the Emergency Department

DKA: Moderate ketonemia, arterial pH <7.3, serum glucose >250 mg/dl, serum bicarbonate <18 mEq/L
HHS: Serum glucose >600 mg/dl, minimal ketonemia or ketonuria, serum bicarbonate >15 mEq/L, pH >7.3

<table>
<thead>
<tr>
<th>Admit</th>
<th>Date:</th>
<th>Time:</th>
<th>Location:</th>
<th>Attending</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis</td>
<td>No known drug allergies</td>
<td>List:</td>
<td></td>
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</tbody>
</table>

Monitor and Record

1. Vital signs & I&O every hour until stable, then every 2 hours x 24 hours
   - Insert Foley if no urine output within first hour or within ________________ hours
2. STAT fingerstick (capillary) blood glucose
   (Use venous or arterial draw if glucose >450 or <45 mg/dl or SBP <60 mmHg)
   - Neuro checks every 2 hours (maintain seizure precautions) x 24 hours

Diet

- NPO
- Ice Chips
- Other:

Activity

- Bed rest
- Bathroom privileges with assistance
- Other:

Admission lab

- STAT Metabolic Profile (Glucose, BUN, Creatinine, Na, K, Cl, HCO3, Ca)
- Serum ketones
- Serum PO4, Mg
- Arterial blood gas
- CBC with diff.
- Blood cultures x 2
- Urine C&S
- A1C
- TSH
- B-hydroxybutyrate
- Serum osmolarity (measured)
- Record acidosis-ketosis gap (AKG = arterial pH – plasma B-hydroxybutyrate. AKG >3 may indicate drug abuse5)
- Other:

Additional labs & studies

- K and HCO3, every ______ hour(s). Call results to physician (hourly monitoring is recommended)
- Metabolic profile every 4 hours x 24 hours. Call results to physician
- Ca, PO4, Mg every ______ hours x 24 hours. Call results to physician
- Record anion gap  AG = (Na) – (Cl + HCO3)
- EKG
- Chest X-ray
- Portable chest X-ray
- Culture and sensitivity of:
- Other:

Initial IV fluids

- Run IV at __________ ml per hour for ________ hours (Adjust for fluid volume already given in ER)
  - Use 0.9% NaCl if corrected sodium is low (less than ____________ mEq/L)
  - 0.45% NaCl if corrected serum sodium is normal or elevated
    (Corrected sodium: Add 1.6 mEq to Na lab value for each 100 mg/dl glucose greater than 100 mg/dl)
  - Other:

Mix standard insulin drip

- Discontinue all previous insulin orders
  - Mix 100 units Regular insulin in 100 mL NS
  - Other: Mix ________ units of ________ insulin in ________ mL NS

Give initial IV insulin bolus

- Bolus ________ units Regular insulin IV (recommend 10-15 units Regular insulin IV)
  - Other: Bolus ________ units of ________ insulin in ________ mL NS

Start insulin infusion

- Start insulin infusion at __________ units per hour
  - Recommend infusion rate is calculated as: Glucose mg/dl ÷ 100 (Ex: Glucose=350 → Start 3.5 units/h)
### Target range for glucose

- **DKA:** 100 to 130 mg/dL
- **HHS:** Low target: 200 mg/dL, High target: 300 mg/dL

### Adjust insulin infusion rate

- **Note:** No patient begins on Algorithm 3 or 4 without endocrine service authorization
- **Start on Algorithm 1**
- **Start on Algorithm 2** (consider if s/p CABG, transplant, glucocorticoid therapy, >80 U/d insulin)
  - Move up or down on the same algorithm each hour if glucose remains outside target range
  - Advance one algorithm column (i.e. 1→2, etc.) if glucose is outside the target range at highest infusion rate
  - Treat for hypoglycemia if glucose is <60 mg/dL
  - Decrease one algorithm column (i.e. 2→1, etc.) if glucose is 60-69 mg/dL x 2 or decreases >60 mg/dL in 1 hour

### Algorithm 1 Algorithm 2 Algorithm 3 Algorithm 4

<table>
<thead>
<tr>
<th>BG units/h</th>
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<th>BG units/h</th>
<th>BG units/h</th>
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<tbody>
<tr>
<td>&lt;60 = Hypoglycemia</td>
<td></td>
<td></td>
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<tr>
<td>&lt;70 Off</td>
<td>&lt;70 Off</td>
<td>&lt;70 Off</td>
<td>&lt;70 Off</td>
</tr>
<tr>
<td>70–109 0.2</td>
<td>70–109 0.5</td>
<td>70–109 1</td>
<td>70–109 1.5</td>
</tr>
<tr>
<td>110–119 0.5</td>
<td>110–119 1</td>
<td>110–119 2</td>
<td>110–119 3</td>
</tr>
<tr>
<td>120–149 1</td>
<td>120–149 1.5</td>
<td>120–149 3</td>
<td>120–149 5</td>
</tr>
<tr>
<td>150–179 1.5</td>
<td>150–179 2</td>
<td>150–179 4</td>
<td>150–179 7</td>
</tr>
<tr>
<td>240–269 3</td>
<td>240–269 5</td>
<td>240–269 8</td>
<td>240–269 16</td>
</tr>
<tr>
<td>300–329 4</td>
<td>300–329 7</td>
<td>300–329 12</td>
<td>300–329 24</td>
</tr>
<tr>
<td>&gt;360 6</td>
<td>&gt;360 12</td>
<td>&gt;360 16</td>
<td>&gt;360 32</td>
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### Treat hypoglycemia

1. **Glucose <40 mg/dL:** Give 1 ampule D50W (25 grams) by slow IV push over 30 seconds
   - Decrease insulin infusion by moving down 1 algorithm (i.e. 2→1, etc.)
   - Recheck glucose in 15 minutes; repeat D50W, as above, if necessary

2. **Glucose 40-59 mg/dL:** Give ½ ampule D50W by slow IV push over 30 seconds
   - Recheck glucose in 15 minutes; repeat D50W, as above, if necessary

### Maintenance IV fluids

- **DKA:** 200 mg/dL, change IV to D5 ½ NS and run at ____________ mL/hour
- **HHS:** 250 mg/dL, change IV to D5 ½ NS and run at ____________ mL/hour
- **Other:**
  - For patients at risk of volume overload, consider D5W or D10W (infuse D5W via central line using infusion pump)

  **Note:** HHS: Maintain blood glucose at 250-300 mg/dL until plasma osmolarity is ≤315 mOsm/Kg

### Potassium replacement

**Call physician if K is <3 or >6 mEq/L** (Note: Urine output should be >30 mL/hour before starting K* replacement)

- Add KCl to IV fluids:
  - If K is <3.3 mEq/L, add 30 mEq KCl/L of IV fluid
  - If K is 3.3–5.2 mEq/L add 20 mEq KCl/L IV fluid to maintain K between 4-5 mEq/L
  - If K* is >5.2 mEq/L, hold KCl
  - Consider KPO₄ instead of KCl if serum PO₄ is low
- **Other:**
<table>
<thead>
<tr>
<th>Phosphorus replacement</th>
<th>Consider if evidence of alcohol abuse, malnutrition, etc.</th>
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<tbody>
<tr>
<td></td>
<td>❑ Give 10 mEq/L KPO₄ in one liter of IV fluid x 1</td>
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<tr>
<td></td>
<td>❑ Other:</td>
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<tr>
<td>NaHCO₃ (DKA)</td>
<td>❑ Give sodium bicarbonate</td>
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<tr>
<td></td>
<td>If pH &lt; 6.9 dilute 100 mmol NaHCO₃ in 400 mL H₂O containing 20 mEq KCl</td>
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<td></td>
<td>❑ Infuse over 2 hours</td>
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<tr>
<td></td>
<td>❑ Other:</td>
</tr>
<tr>
<td></td>
<td>❑ IV Push _________ ampule of NaHCO₃</td>
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<td>❑ Recheck arterial pH (ABG) within ________ minutes and call results to the attending</td>
</tr>
</tbody>
</table>

**Alert parameters for notifying physician**

- Two consecutively treatments for hypoglycemia
- K less than _________ mEq/L
- Withholding IV insulin infusion for >1 hour with no other source of insulin
- TPN stopped, interrupted or any change in formulation
- Deterioration in mental status
- Patient does not respond to above orders for glycemic control

- Other: 

- Other: 

**Transition to SQ insulin**

- Proceed to Texas Diabetes Council Transition Algorithm From I.V. to S.Q. Insulin

- Other: 

**Other orders**

1. 
2. 
3. 
4. 

**References:**