**CDU Inclusion Criteria**

- Age >17
- Clinical picture indicates hyperglycemia and DKA secondary to DM
- ED workup completed including BMP, Mg, PO4, Beta-hydroxybutyrate, urinalysis, urine HCG, CXR
- Initial ED BGL >250
- Ketosis
- pH > 7.25
- HCO3 >15
- K > 3.0
- Serum Os <320
- Anticipated stay >8 hours and <23 hours

**CDU Exclusion Criteria**

- Hemodynamic instability after 2L IVF
- Moderate or severe DKA
  - pH < 7.24
  - HCO3 < 15
- HHS
  - Serum Os >320
  - pH < 7.35
- Initial ED BGL < 250
- Altered Mental Status
- New onset DM if Diabetes Education unavailable during CDU time
- Severe renal insufficiency
  - ESRD/ Hemodialysis
  - Cr > 2.0 w/o CKD
  - Cr >2.5 w/ CKD
- Acute co-morbidity / precipitant (Pregnancy, MI, trauma, surgery, significant infection, alcoholism)

**Mild DKA Protocol**

**CDU Inclusion Criteria**

- Meets CDU Inclusion criteria?
  - NO 
    - Admit to hospital
  - YES
    - ED Patient identified in DKA

**CDU Admission Orders**

**INCLUDE:**
- SBS, BMP, VBG @ CDU Admission
- FSBS q2h (before each insulin admin)
- BMP, VBG or ED VBG q4h
- BHB (if not obtained in ED) & HGB A1C
- Measure I/O to monitor urine output
- NPO, manage emesis
- Hold long-acting (Lantus, NPH)
- Treatment for precipitating cause (Abx, I&D, etc.)

**IV fluids**

**Calculate TBW Deficit:**

\[
(0.6 \times \text{kg (Pt)} \times \text{serum Na}/140)
\]

**Subtract total ED fluids from above**

**Give ½ of TBW remainder over first 4 hours, then ½ over next 8 hours**

**Corrected Na**

\[
\text{Corrected Na} = \text{Serum Na} + (\text{Glu}-100 \times 0.016)
\]

**INSULIN!**

**Did ED give bolus?**

- NO
  - Humalog 0.3 u/kg SC
  - Wait 1 h
  - Continue

- YES
  - Add 30 mEq KCL to IVF
  - Add 20 mEq KCL to IVF
  - Humalog 0.2 u/kg q2h SC

**BGL <250?**

- **NO**
  - Still DKA?

- **YES**
  - **IF DKA resolves**
    - Change fluids to D5 0.45% 150-250 ml/hr
    - Decrease Humalog to 0.1 u/kg q2h SQ (keep BGL 150-250)
    - D/C NPO

**Admission Criteria**

- Failure to correct within 20 hours
- Unable to tolerate PO
- Worsening clinical picture
- Acute comorbid or precipitating factor identified
- Abnormal vital signs or mentation

**Discharge Criteria**

- DKA Resolved x 4 hours
- Normal Vitals and mentation
- Arrange close follow-up
- Transition to home insulin regimen
- Oral Challenge
- Stop IVF if patient tolerates orals

---

1- Because a discharge disposition requires resolution of DKA for at least 4 hours, if DKA can’t be resolved in 20 hours, then patient should be admitted.
**Important Points**

**DKA**

- This protocol is work-intensive and requires careful coordination between provider and nurse to assure that labs and BGLs are drawn on time so that insulin can be administered every two hours.
  - Note: An ED VBG results quickly and contains an Na and K level, but does not calculate the anion gap.
- The endpoint of this protocol is not normalization of the BGL, but resolution of the ketoacidosis.
  - Insulin therapy should continue even if BGL drops below 250 until pH, HCO3 and Gap normalizes
  - Add D5W to IV fluids (DS 0.45% or DS 0.9% saline) if glucose falls below 250 to prevent hypoglycemia
    - Goal: keep BGL between 150 and 200 until DKA resolves
  - The patient should show resolution of DKA (pH >7.35, HCO3 >18, Gap <14) for at least 4 hours (on at least two BMP/VBG) before discharge
    - If DKA doesn’t resolve after 20 hours in CDU, will need to be admitted.

- If the BGL does not drop by 50-70 mg/dL in the first hour, you may double the SC dose
- If the ED initiates insulin drip, then decides on CDU admission, d/c insulin infusion and wait 20 minutes for BGL (IV insulin peaks immediately, half life of 10 minutes). May follow algorithm thereafter.
  - CDU nurses can not manage insulin infusions.
- If potassium level is <3 mmol/l, DO NOT START INSULIN. Give 10 meq/hr Potassium IV until K > 3, then add 40 meq/L to IV fluids.
  - May need two peripheral lines- may only give at 10 meq/hr rate through each peripheral IV

**Follow-up**

- Obtain HBG A1C on all DKA/Hyperglycemia patients placed in CDU (see attached A1C disposition guide)
- Diabetes Education Nurses are available M-F, 8am – 5pm. (Pager 249-7408)
- No diabetes education available on nights or weekends
- May refer to Hoxworth Diabetes Clinic (Adele Corbin, 584-0942) for urgent follow-up
- CDU Care Coordinator or Michele Long consult if no primary care. Need follow-up within 7 days.
- Ensure Critical Care time is documented as appropriate

**References**


Mild DKA and Hyperglycemia 7/12/18
Use of HbA1c in the Emergency Department

What is a Hemoglobin A1c (HbA1c)?

HbA1c represents a patient’s average glucose level over the last 1-4 months. HbA1c measures the percentage of glycosylated hemoglobin in the blood and thus reflects the average glucose level over the life of a red blood cell (120 days) and the hemoglobin it contains. Because of the constant turning over of red blood cells, more recent glucose levels (ie. the last few weeks) have a greater effect on the HbA1c value than do those from 8 or 12 weeks ago. It is estimated that half of an HbA1c value is attributable to the previous month’s glucose level, a further quarter to the month before that, and the other quarter to the two months before that. Since the HbA1c value is not influenced by daily fluctuations in blood glucose concentration, it should not be used to monitor day-to-day blood glucose concentrations and to adjust insulin treatment. Moreover, the HbA1c value may not reflect the day-to-day presence or absence of hyperglycemia and/or hypoglycemia.

- HbA1c level may be **false**ly **increased** in patients with: kidney failure, chronic excessive alcohol intake (Vit B12 and foliate deficiency), untreated iron deficient anemia, and hypertriglyceridemia

- HbA1c level may be **false**ly **decreased** in patients with: acute or chronic blood loss, sickle cell disease, hemolytic anemia/thalassemia.

Why obtain an HbA1c in the Emergency Department?

Without primary care and proper diabetes management it is extremely difficult for many diabetics to control their glucose levels. It is this lack of glycemic control that is ultimately responsible for the host of debilitating and potentially life threatening health complications associated with poorly controlled diabetes. Diabetic patients who present to the emergency department (and who lack adequate primary care or who are in need of improved diabetes management, education and/or follow up) should have their HbA1c level obtained. The result can then be used to assess the patient’s current glycemic control and determine their urgency of needed follow up.

The implementation of this tool could significantly reduce the number of unnecessary emergency department visits by decreasing the number of diabetic patients who use the emergency department as a means of obtaining primary care and by decreasing the incidence and severity of diabetic related complications that require emergency department treatment. This also has the potential to reduce costs by decreasing the number of emergency department visits and their related work ups.

<table>
<thead>
<tr>
<th>HbA1c %</th>
<th>&lt; 5.0</th>
<th>5.4-6.4</th>
<th>6.5-7.0</th>
<th>7.1-8.0</th>
<th>8.1-9.0</th>
<th>9.1-11.9</th>
<th>&gt; 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Serum Glucose mg/dL</td>
<td>&lt; 81</td>
<td>94-127</td>
<td>130-147</td>
<td>150-180</td>
<td>184-214</td>
<td>217-310</td>
<td>&gt; 314</td>
</tr>
</tbody>
</table>

**Known Diabetic**

- **Increased risk for severe hypoglycemia adverse events including coma, seizures and death**
- **Increased risk for diabetes and diabetes related complications**
- **Well controlled diabetes**
- **Marginally managed diabetes**
- **Poorly managed diabetes**
- **Very poorly managed diabetes**
- **Severely elevated Extremely poor diabetes management**

**New Onset Hyperglycemia**

- **Diabetes Unlikely**
- **(Pre Diabetic)**
- **Borderline Diabetics**
- **Diabetes Likely**
- **Diabetes Likely**
- **Diabetes Likely**

Mild DKA and Hyperglycemia 7/12/18
1. Hyperglycemia identified and treated
2. All applicable lab work obtained: CBCD, EP1, Mag, Phos, VBG, HbA1c, Serum Ketones, UA/Preg
3. Underlying cause of blood sugar variation/infection identified and treated

HbA1c %

- <5.9
  - Increased Hypoglycemic Risk (consider DM clinic referral)

- 6-7
  - no
  - yes

- 7.1-8
  - no
  - yes

- 8.1-9
  - Consider Diabetic Clinic Referral

- 9.1-11
  - Consider Admission (for intensive glucose management)

- >12
  - no
  - yes

Ensure that patient has all needed diabetic supplies including glucometers, and Rx refill for supplies if needed (free glucometers and generic Rx forms for common medications and DM supplies can be found in the radio room, see DM Committee member if none are available).

Brief diabetes education and discharge instructions specific for diabetes (found on CPQE).

Follow up with PCP

If no PCP, consider urgent medicine clinic referral

Referral to Adele Corbin (@ Hoxworth diabetes clinic) for urgent DM follow up. Call 584-0942 and leave up to date patient contact information, brief patient history and current HbA1c result (if available at time of discharge)

Follow up with PCP < 7 days

If no PCP, consider urgent medicine clinic referral

Disposition for Hyperglycemic/Diabetic Patients Discharged from the ED

Mild DKA and Hyperglycemia 7/12/18