Sickness and Diabetes

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Objectives

• Investigate the cause of DKA in children with diabetes
• Determine the risks of illnesses in children with diabetes
• Evaluate the management of illness in children with diabetes
Disclosures

• No Financial Conflicts of Interest
• We will only discuss therapies that are currently FDA approved
Outline

1. Background
2. Diabetic ketoacidosis
3. DKA treatment
4. Sick day treatment
Background: Diabetes and Sickness

• Kids with diabetes and other chronic diseases have a higher absentee rate than their peers.

• Illness leads to increased risk of KETONE build-up
• Illness leads to increased risk of DKA

• Management of diabetes changes with illness in order to prevent life-threatening DKA.
Diabetic Ketoacidosis (DKA)

DKA is the most common cause of death in children T1D.

- Type 1 diabetes ~1 in 250-300 kids in WI
- Patients with T1D always need insulin
- **DKA**: due to relative or absolute insulin deficit
- Prevention: **KISS** education, ↓ social barriers
  When sugars >250 or illness: **KISS**!

**KISS**: Ketones / Insulin / Sugars / Sips
Diabetic Ketoacidosis (DKA)

- Insulin
- Counter Regulatory Hormones (glucagon, cortisol, catecholamines, GH)
  - Hypoglycemia
  - Hyperketonemia
  - Osmotic diuresis
  - Fluid and electrolyte loss (Na, K, PO$_4$, Cl, Ca, Mg)
  - Volume depletion
  - Dehydration
  - Secondary Hyperaldosteronism
  - Tissue ischemia
  - Metabolic acidosis
    - Lactic acidosis
    - Hyperkalemia
      - Potassium loss from cells

- Ketones (from broken down fat) (β-hydroxybutyrate & acetoacetate) ->
  - $\uparrow$ H$^+$ ions in the blood

Adapted from Schatz and Rosenbloom
Diabetic Ketoacidosis (DKA)

- Nausea & emesis
- Abdominal pain (ketones)
- Tachycardia
- Dehydration
- Wheezing/"asthma"/Kussmauling
- Sore / red throat / acetone smell
- Lethargy, weight loss

DKA diagnosis: bicarb <15 • pH <7.25 • anion gap >15.

- Degree of hyperglycemia \(\rightarrow\) severity of dehydration
- Degree of acidosis \(\rightarrow\) severity of insulinopenia
Rx for DKA: Hydration + Insulin

INSULIN drives K into cells so initial K may be inflated due to insulinopenia!

1. Dehydration (FLUID)
2. Metabolic Acidosis (INSULIN stops ketosis)
3. Hypokalemia (FLUIDS w/ K + replete K)
4. Cerebral edema (watch for it + if needed Tx)

Increased thirst/urination +/- vomiting?
Think NEW diagnosis of diabetes – emergency!
Transfer to a children’s hospital
Rx for Sick days: Prevent DKA with a KISS

• Illness leads to increased energy needs
• Illness leads to increased insulin needs
• Illness leads to increased risk of KETONE build-up
• Illness leads to increased risk of DKA
Rx for Sick days: Prevent DKA with a KISS

**Ketones:** Check every time you urinate (pee)

**Insulin:** Use syringe/pen to give correction insulin every 3 hours (no carb ratio)

**Sugar (blood):** Check every 3 hours

**Sip:** Sugar-free drinks if blood sugar >250 or sugary drinks if ≤250

**KISS:** Ketones / Insulin / Sugars / Sips
**Rx for Sick days:** Prevent DKA with a **KISS**

I am sick and/or I have ketones. What should I do?

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>What to Do</th>
</tr>
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<tbody>
<tr>
<td><strong>Mild</strong></td>
<td></td>
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<tr>
<td>• Able to eat and drink</td>
<td>Take your long-acting basal insulin as usual, AND....</td>
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<tr>
<td>• No vomiting</td>
<td>Ketones: Check once a day</td>
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<tr>
<td>• No fever</td>
<td>Insulin: Give all doses – carb ratio and correction</td>
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<tr>
<td>• Urine: No ketones</td>
<td>Sugar (blood): Check before meals/bedtime</td>
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<tr>
<td>• Blood: Ketones &lt;0.6 mmol/L</td>
<td>Sip: Sugar-free drinks. (Fluids are very important.)</td>
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<tr>
<td><strong>Moderate</strong></td>
<td></td>
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<tr>
<td>• Fever, nausea, or diarrhea</td>
<td>Take your long-acting basal insulin as usual, AND....</td>
</tr>
<tr>
<td>• Urine: Small/moderate ketones</td>
<td>Ketones: Check every time you urinate (pee)</td>
</tr>
<tr>
<td>• Blood: Ketones 0.6-1.5 mmol/L</td>
<td>Insulin: Use syringe/pen to give correction insulin every 3 hours (no carb ratio)</td>
</tr>
<tr>
<td><strong>Severe</strong></td>
<td></td>
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<tr>
<td>• Vomiting</td>
<td>Sugar (blood): Check every 3 hours</td>
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<tr>
<td>• Urine: Large ketones</td>
<td>Sip: Sugar-free drinks if blood sugar &gt;250 or sugary drinks if ≤250</td>
</tr>
<tr>
<td>• Blood: Ketones &gt;1.5 mmol/L</td>
<td></td>
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</tbody>
</table>
Thank you.