Diabetes Sick Day Management

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carbDM
Seize Diabetes

American Diabetes Association

DYF
Diabetes Youth Families
Goals of the Talk

• Review ketones and sick day management
• Distinguish treatment for small, moderate and large ketones
• Know when to call your healthcare provider
• Learn how to prevent DKA
• Learn how to utilize diabetes technology on sick days
Everyone gets sick
Tips for sick days

• Check BG more frequently
  – Check ketones for fasting for unexplained highs
• Check ketones at least 2x per day regardless of BG
  – Call diabetes line for moderate to large ketones
• Do NOT skip insulin doses (especially basal)
• Be prepared to adjust insulin doses
**SUGAR**

Check your blood glucose every 2 to 3 hours or as necessary!

**INSULIN**

Always take your Insulin! Not taking it could lead to DKA!

**CARBS**

Drink lots of fluids!

If sugars are high drink sugar-free liquids.

If sugars are low drink carb-containing drinks.

**KETONES**

Check your urine or blood ketones every 4 hours.

Take rapid-acting insulin if ketones are present.
Where do ketones come from?

- Glycerol
- Fatty acids
  - lack of glucose for energy
  - +/- increased energy demand

Fat metabolism

- Glycerol
- Fatty acids

Ketones lead to:
- Acidosis
- Tachypnea
When to check for ketones?

- Two unexplained highs over > 300 mg/dL
- BUT ALSO when:
  - You feel sick and/or vomiting
  - You missed your injection of Lantus or Levemir
  - Your pump stopped working for any reason
  - There is extra stress to the body for any reason
You may be able to tell if ketones are present....

- Upset stomach or stomach pain
- Fruity odor
- Vomiting
- Dry mouth
- Drowsiness
- Deep breathing
How do you check for ketones?

• Choice of urine or blood
• Urine – get individually wrapped strips
• Blood is recommended for
  – Young children
  – Adolescents
  – Pumpers
• Check with insurance
## Interpreting Ketone Levels

<table>
<thead>
<tr>
<th>Urine</th>
<th>Blood (mmol/L)</th>
<th>Dose of H/NL/AP every 2 hours or Dose of Regular every 3 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trace/Small</td>
<td>&lt; 0.6</td>
<td>per “correction” factor for blood sugar</td>
</tr>
<tr>
<td>Moderate - Large</td>
<td>0.6 – 1.5</td>
<td>10% of total daily insulin dose**</td>
</tr>
<tr>
<td>Large - Very Large</td>
<td>&gt; 1.5</td>
<td>20% of total daily insulin dose**</td>
</tr>
</tbody>
</table>
### How to Interpret Ketone Testing

<table>
<thead>
<tr>
<th>Urine Ketones</th>
<th>Blood Ketones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td>&lt;0.6 mmol/L</td>
</tr>
</tbody>
</table>

- Normal schedule and activities
# How to Interpret Ketone Testing

<table>
<thead>
<tr>
<th>Urine Ketones</th>
<th>Blood Ketones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trace or Small (15 mg/dL)</td>
<td>&lt;0.6 mmol/L</td>
</tr>
</tbody>
</table>

- Drink extra water and recheck in 2 hours
- No Exercise
How to Interpret Ketone Testing

<table>
<thead>
<tr>
<th>Urine Ketones</th>
<th>Blood Ketones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate (40 mg/dL)</td>
<td>0.6 - 1.5 mmol/L</td>
</tr>
</tbody>
</table>

- Give extra insulin (~10% more than usual)
- Push fluids
- No Exercise and Call your diabetes team
How to Interpret Ketone Testing

<table>
<thead>
<tr>
<th>Urine Ketones</th>
<th>Blood Ketones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large (&gt;80 mg/dL)</td>
<td>&gt;1.6 mmol/L</td>
</tr>
</tbody>
</table>

- Extra insulin and fluids may be needed by IV
- No Exercise
- Go to ED if unable to drink, or develop abd pain/vomiting. Call your diabetes team!
Why are ketones dangerous?

• As ketones increase over time, you will become more “acidotic”
• Goal is to avoid Diabetic Ketoacidosis (DKA)
  – 1% chance of stroke, brain swelling and death with each episode

• Good news: DKA is avoidable!
Pump/Infusion site failure
Managing ketones

- Insulin and fluids help clear ketones
- Drink as much water as possible
  - Once BG <150mg/dL, drink carb-containing fluids
- Check BG every 2-3 hours giving hyperglycemia correction
- Increase insulin dosing by 10% for moderate ketones, 20% for large ketones
- Continue until ketones are small, trace or negative (i.e. <0.6 on meter)
Avoid this mistake…

• “My child with diabetes is sick and not able to eat so I don’t need to give him/her insulin.”

• Always give the background or basal insulin
  – May need to adjust dose
  – In as little as 3-4 hours ketones can start forming in the body
Dr. Dan’s keys to preventing DKA

• Check ketones with any illness, or unexplained high BGs
• Call diabetes emergency line for moderate-large urine ketones or blood ketones >1.0
• Push oral fluids!
• Give frequent insulin boluses
• Know when to go to ED
Hypoglycemia on sick days

- Still check ketones!
- Don’t skip the background insulin!
- Drink carb-containing beverages
- Consider mini-dose glucagon
Be proactive about sick days

- Get the flu shot
- Prepare a sick day kit
  - Urine or blood ketone strips (and/or meter)
  - Carb-containing fluids
  - Glucagon + insulin syringes
  - Diabetes team contact info
Use technology to your benefit

- Pumps: temp basals, ease of dosing
- CGM: patterns and trends
Review of glucose monitoring

- Traditional “fingerstick” glucose testing
- Continuous glucose monitoring (CGM)

1) Sensor
2) Transmitter
3) Receiver
RAGE BOLUS?
Dexcom Share
“Tylenol Effect” on sensor glucose

- Greatest mean difference was 62mg/dL at 2 hours
- Important implications for closed-loop AP systems
Future of diabetes

Pancreum™

Gene
sis

Artificial
Pancreas

154
mg/dL

12/30/2011 13:27

Temp. Basal
Insulin Bolus
Glucagon Bolus

BG Meter
Activity
Stop/Cancel

GraphActivity

GraphViewDemo
References:

- Stanford Children’s Health Diabetes Handbook
- Understanding Diabetes 12th edition by H. Peter Chase and David Maahs