Capillary Blood Glucose Testing

Prior to completion of the case study, review the ATI basic skills video on blood glucose testing and subcutaneous insulin administration.

Case Study 7—Type 2 Diabetes Mellitus
Scenario
A.R. is a 50-year-old Native American college professor of medical anthropology with a history of type 2 DM for the past 10 years. He has been controlling his glucose by taking glyburide and using a 2000-calorie diet recommended by the American Diabetes Association (ADA). He is aware of the higher incidence of type 2 DM in people of his race and is open to anything he can learn about it. His blood glucose level had been fairly consistent with an average AM reading of 200 mg/dL. He is 6'2" and weighs 220 lb, having lost 10 lb over the past month. Six months after hospitalization for viral pneumonia, A.R. is readmitted for hyperglycemia. He has been running higher blood glucose levels (280 to 300 mg/dL) and has lost 10 lb. He is currently on a medical leave of absence from work. His medical history includes a myocardial infarction, hypertension, and renal insufficiency.

1. Who are the high risk populations for hyperglycemia? (consider diseases and pharmacologic interventions)

2. What are the signs and symptoms of hyperglycemia?

3. How does the client with hyperglycemia measure the effectiveness of their therapy?

4. What are the advantages and disadvantages of capillary blood glucose monitoring?

5. How does frequent measuring of blood glucose impact glucose control?

The following sliding scale coverage orders have been placed on the chart.
Pre-printed Orders for Insulin Sliding Scale Orders

<table>
<thead>
<tr>
<th>Date:</th>
<th>2/2/08</th>
<th>Time:</th>
<th>4 pm a.m./p.m.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD signature</td>
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</tbody>
</table>

**Insulin sliding scale orders expire 48 hours after initiated.**

Regimens:
- a. Low dose: recommended for thin, elderly clients
- b. Moderate dose: recommended for starting point for average weight clients
- c. High dose: recommended for starting point for clients who are overweight, experiencing infection or prescribed steroids.

1. Start sliding scale: (check below)
   - d. Low dose ______ Moderate dose________ High dose __X_____

2. Insulin type:
   - a. Regular______ Humolog____X____

3. Route:
   - a. Subcutaneous__X__ IV______

4. Lab:
   - a. Basic metabolic panel _________ (call physician for serum KCL <3.5 mEq/L)

5. Check capillary blood glucose at prescribed frequency
   - a. When client exhibits signs of hypoglycemia at any time
   - b. Every 6 hours _________ (recommended for NPO clients)
   - c. Before meals and bedtime ___X____ (recommended for clients who are able to eat)

   Call physician if client becomes NPO

6. Changes:
   - Advance to next higher dose regimen if client’s blood glucose > 250 for two measures in a 24 hour period or if all readings are greater than 100.
   - Decrease to next lower dosing regimen if client’s blood sugar is >60 & < 100 for two measures in a 24 hour period.

7. If signs and symptoms of hypoglycemia are present:
   - a. For conscious clients: administer 4 oz of orange juice or three glucose tabs
   - b. For Unconscious patients: administer prefilled syringe of 50% Dextrose
   - c. Repeat blood sugar in 15 minutes and call physician

<table>
<thead>
<tr>
<th>Blood Sugar</th>
<th>Low Dose</th>
<th>Moderate Dose</th>
<th>High Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-110</td>
<td>No insulin</td>
<td>No insulin</td>
<td>No insulin</td>
</tr>
<tr>
<td>111-150</td>
<td>2 units</td>
<td>4 units</td>
<td>6 units</td>
</tr>
<tr>
<td>151-200</td>
<td>4 units</td>
<td>8 units</td>
<td>10 units</td>
</tr>
<tr>
<td>201-250</td>
<td>6 units</td>
<td>10 units</td>
<td>12 units</td>
</tr>
<tr>
<td>251-300</td>
<td>8 units</td>
<td>12 units</td>
<td>15 units</td>
</tr>
<tr>
<td>301-350</td>
<td>10 units</td>
<td>14 units</td>
<td>18 units</td>
</tr>
<tr>
<td>&gt; 350</td>
<td>12 units &amp; call MD</td>
<td>16 units &amp; call MD</td>
<td>20 units &amp; call MD</td>
</tr>
</tbody>
</table>

RN signature  _John Smith_ Date 2/2/08 Time 4pm

Modified from source: [www.hhsc.org/easthi/hmc/forms/Physicianorders/322-0582%20INSULIN%20rev%2006-05.pdf](http://www.hhsc.org/easthi/hmc/forms/Physicianorders/322-0582%20INSULIN%20rev%2006-05.pdf) retrieved 8/24/07
6. Dr. J., A.R.'s physician, determines that A.R. requires insulin for glucose control and orders NPH insulin 20 units before breakfast and supper and regular insulin per sliding scale before each meal and at bedtime. The order reads as above:

- When would the nurse perform testing?
- Would the timing for administration of humulog insulin be different than regular insulin?
- What would you do if the client required coverage in the A.M. with their NPH?

6. What preparation does the nurse ensure before capillary blood glucose testing can be performed in the hospital setting? (consider nursing responsibilities for accuracy in medication delivery, equipment needed, and quality controls to prevent equipment error)

- quality controls to prevent equipment error
- nursing responsibilities for accuracy in medication delivery
- equipment needed

7. What complications should the nurse plan for in care of clients receiving exogenous insulin?

8. What are the procedural steps in performing capillary blood glucose testing?

9. What are potential errors in performance of capillary blood sugar testing and the best nursing action to prevent them?

<table>
<thead>
<tr>
<th>Potential errors</th>
<th>Preventive action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate sample</td>
<td></td>
</tr>
<tr>
<td>Inadequate perfusion of blood to testing site</td>
<td></td>
</tr>
<tr>
<td>System errors in monitor</td>
<td></td>
</tr>
<tr>
<td>Quality control solution error</td>
<td></td>
</tr>
<tr>
<td>Reading that are excessively low or high</td>
<td></td>
</tr>
</tbody>
</table>

6. While you are teaching A.R. how to administer the insulin, he asks why it is necessary to prepare the regular insulin first. Offer a meaningful reason for this procedural step.

7. What are the procedural steps for capillary blood glucose testing?
8. What are the signs and symptoms of hypoglycemia?

9. At 0300 A.R. calls you into his room c/o sweating, nausea, and “shakiness.”
What would you do first?

It is determined that A.R.’s blood glucose is 55 mg/dL. Of the following choices, indicate which item(s) would be appropriate to give A.R. to immediately treat hypoglycemia.

___ 1/2 cup pure orange juice
___ 1 slice of bread
___ 2 graham cracker squares
___ 1 glass of milk
___ Half a bagel
___ 3 Glucose tablets
___ 1/2 cup soft drink (not diet or sugar-free)

Record the following blood glucose readings on the diabetic chart and determine what insulin should have been given and the appropriate nursing actions/

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Initials</th>
<th>CBG</th>
<th>Coverage</th>
<th>Injection Site</th>
<th>Hypoglycemic protocol initiated</th>
<th>Physician notified</th>
<th>Change in dosing regimen/coverage schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/2/08</td>
<td>7:30</td>
<td>200</td>
<td>CBG</td>
<td>2/3/08</td>
<td>0300</td>
<td>55</td>
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</tr>
<tr>
<td>11:30</td>
<td>120</td>
<td>16:30</td>
<td>348</td>
<td>22:00</td>
<td>11:30</td>
<td>151</td>
<td></td>
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<tr>
<td>22:00</td>
<td>400</td>
<td>16:30</td>
<td>136</td>
<td>22:00</td>
<td>12:00</td>
<td>225</td>
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