Blood Glucose Monitoring
What is Glucose?

- A simple sugar that enters the diet as part of sucrose, lactose, or maltose
- Part of a polysaccharide called dietary starch
- Most of the body’s energy comes from glucose
- Insulin effects glucose metabolism
  - Insulin moves glucose into the cells
  - Stimulates storage of excess glucose as glycogen in the liver, or in muscle tissues
Why is it Important?

- Hypoglycemia and hyperglycemia may be medical emergencies
- Hyperglycemia may cause damage, dysfunction, and failure
  - Serious complications involve eyes, kidneys, nerves, heart, and blood vessels
Types of Diabetes

In **Type I Diabetes**, defect in insulin secretion
- Usually diagnosed when less than 30 y/o
- Onset rapid, and must be treated with insulin

**Type II Diabetes**, defect in insulin action, or not enough insulin produced
- Usually diagnosed when over 30 y/o
- Onset is gradual
- May be controlled by low carbohydrate diet, oral anti-diabetic medications, or insulin
Normal Ranges

- **Newborn**
  40-60 mg/dl
- **Infant (up to 2 yr.)**
  50-80 mg/dl
- **Child**
  60-100 mg/dl
- **Adult**
  75-110 mg/dl
- **Older than 90 yr.**
  75-120 mg/dl

Nursing Guidelines

For a person with diabetes, 80-140 is generally considered WNL’s.

Keeping BG fairly stable, not swinging high and low is best for preventing complications.

- Some clients with “brittle” diabetes are especially difficult to control.
- Generally, BG slightly higher than normal is safer than having frequent hypoglycemia.
Procedure for Hypoglycemia

- Use the protocol of your workplace
- Usually, give orange juice, or other sweet juice, and then a snack with complex carbohydrates
  - Usually no extra sugar is needed
- Recheck abnormal BG every 15 minutes
- May recheck prior to treating if results are questionable, and no symptoms seen
Hypoglycemia Treatment

- Some clients may keep candy or glucose tabs with them for low BG
- Facilities may have glucose gel, and Glucagon injections available
  - Use if clients unable to drink or eat
  - Need physician’s order to administer
Recommendations for Hyperglycemia

- Encourage client to drink water & maintain normal activities, rather than go to sleep.
- Observe closely for signs of dehydration or low blood pressure, ketoacidosis or extreme sleepiness.
- Call physician for BG over set parameters.
- Call 911 for mental or neurological changes, or if unable to retain oral fluids.
Ketoacidosis

Without adequate insulin, fat breakdown occurs-attempt to provide glucose to cells
- Ketone bodies are the acidic byproduct
- Ketones can be found by a urine test
- Causes fruity odor to the breath
Symptoms may be nausea and vomiting, abdominal pain, hyperventilation
Can result in coma and death
Common Errors in BG Monitoring

- Improper application of blood (drop too small) or site not clean and dry
- Neglecting cleaning and maintenance of BG meter
- Reagent strips damaged by heat or humidity
- Using outdated strips
- Improper calibration of meter
What Are the Symptoms of Hypoglycemia?

- Headache
- Confusion
- Hunger
- Irritability
- Nervousness
- Shakiness

- Sweating, clammy skin
- Anxiety
- Weakness
- Palpitations
- Restlessness

Caused by too much insulin, too little food, or more activity than usual
What Are the Symptoms of Hyperglycemia?

- Poldipsia (Thirst)
- Polyphagia (Hunger)
- Polyuria (Frequent urination)
- Blurred vision
- Drowsiness
- Nausea

Caused by too much food, too little insulin, or metabolic stress, including illness, or some drugs
What Drugs Can Cause Hyperglycemia?

- Glucocorticoids
- TPN (Total Parenteral Nutrition)
  - Usually, BG monitoring is needed with these treatments, even if the patient is not diabetic
- Beta Blockers
- Phenobarbital
- Birth Control Pills
Critical Values

- **Hypoglycemia** less than 40 mg/dl
  - Intervention is needed when less than 80 in adults

- **Hyperglycemia** greater than 400 mg/dl
  - BG over 600 reads HI on most meters

Contact physician immediately after starting treatment, unless you have prior directions for this.
Why Does the Type of Insulin Matter?

- The types of insulin have different onset, peak, and duration.
- Certain times of the day involve risk for hypoglycemia based on type of insulin, and timing of insulin and meals.
- Frequent BG monitoring is especially important with new diagnosis, or with insulin dose adjustments.
# Insulin Summary

<table>
<thead>
<tr>
<th>Insulin</th>
<th>Form</th>
<th>Onset</th>
<th>Peak</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rapid Acting</strong></td>
<td>Lispro</td>
<td>Less than 15 min</td>
<td>½ to 1 ½ hours</td>
<td>2-4 hours</td>
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<tr>
<td></td>
<td>Humalog</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Short Acting</strong></td>
<td>Humulin R</td>
<td>½-1 hr</td>
<td>2-3 hr</td>
<td>3-6 hours</td>
</tr>
<tr>
<td></td>
<td>Novolin R</td>
<td>½-2 hr</td>
<td>3-4 hr</td>
<td>4-6 hours</td>
</tr>
<tr>
<td></td>
<td>Iletin II Reg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Intermediate Acting</strong></td>
<td>Humulin or Novolin L</td>
<td>3-4 hr</td>
<td>4-12 hr</td>
<td>12-18 hr</td>
</tr>
<tr>
<td></td>
<td>(Lente) or Novolin L</td>
<td>2-4 hr</td>
<td>4-10 hr</td>
<td>10-16 hr</td>
</tr>
<tr>
<td></td>
<td>(Lente) or NPH, or</td>
<td>4-6 hr</td>
<td>8-14 hr</td>
<td>16-20 hr</td>
</tr>
<tr>
<td></td>
<td>Iletin II NPH</td>
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### Insulin Summary (Continued)

<table>
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<th>Insulin</th>
<th>Form</th>
<th>Onset</th>
<th>Peak</th>
<th>Duration</th>
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</thead>
<tbody>
<tr>
<td>Long Acting Insulin</td>
<td>Humulin U (Ultralente)</td>
<td>6-10 hr</td>
<td>No peak</td>
<td>18-20 hr</td>
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<tr>
<td></td>
<td>Lantus (Glargaine)</td>
<td>1.1 hr</td>
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<td>24 hours</td>
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<tr>
<td>Insulin Mixtures</td>
<td>Humulin or Novolin 50/50</td>
<td></td>
<td></td>
<td>Contains 50% NPH and 50% Reg</td>
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<tr>
<td></td>
<td>Humulin or Novolin 70/30</td>
<td></td>
<td></td>
<td>70% NPH and 30% Reg</td>
</tr>
</tbody>
</table>

*Taken from table developed by Barb Puryear, RN, MSN, NP. (2004). Western Wisconsin Technical College, LaCrosse, WI*
Conclusion

Knowledge and skills for Blood Glucose monitoring are essential for nurses.

Role includes teaching clients self-monitoring and diabetic management.

Prompt response to abnormal readings can prevent serious medical emergencies and diabetic complications.
This presentation was created by Mary Knutson, RN
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