



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

From Schnell, Z., Leeuwen, A.M., & Kranpitz, T.R. (2003). *Davis's Comprehensive Handbook of Laboratory and Diagnostic Tests*. In L.B. Deitch, G. Services, & L. Collins (Eds.), Philadelphia: F.A. Davis

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?

- Polydipsia (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

Insulin	Form	Onset	Peak	Duration
Rapid Acting	Lispro Humalog	Less than 15 min	½ to 1 ½ hours	2-4 hours
Short Acting	Humulin R Novolin R	½-1 hr	2-3 hr	3-6 hours
	Iletin II Reg	½-2 hr	3-4 hr	4-6 hours
Intermediate Acting	Humulin or Novolin L (Lente) or NPH, or Iletin II NPH	3-4 hr	4-12 hr	12-18 hr
		2-4 hr	4-10 hr	10-16 hr
		4-6 hr	8-14 hr	16-20 hr

Insulin Summary (Continued)

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

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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