

## Immediate Response: Ups and Downs of Glucose Emergencies

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## Hypoglycemia

- Prevalence:
  - Type 1
    - Average 2 a week, 1 severe episode a year
  - Type 2
    - Relatively low
- Deaths: 2-4% in patients with Type 1

## Hypoglycemia

- Definition-occurrence of typical autonomic and/or neuroglycopenic symptoms with low blood sugar levels.
- Usually occurs when glucose is <50-60 mg/dl

## Pathophysiology

An imbalance between the rate of glucose removal from the circulation (uptake into the muscle) and the rate of glucose entry into the system from the liver or food source.

## The Body's Answer to Hypoglycemia

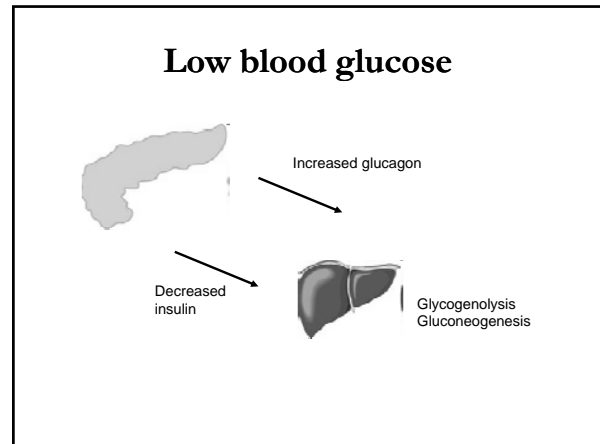
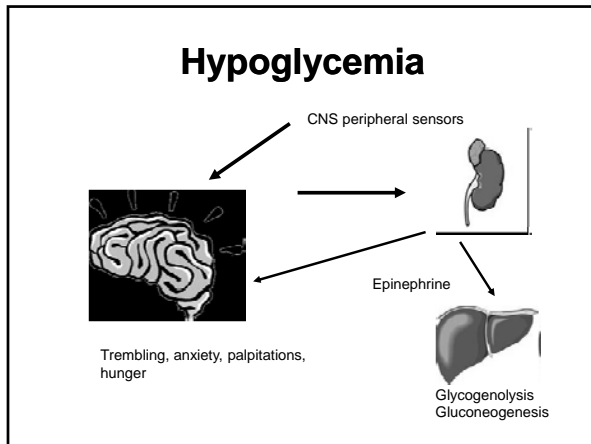


### Physiologic Response

- Inhibit insulin production
- Secrete glucagon, the primary counterregulatory hormone
- Secrete epinephrine
- Release cortisol and growth hormone

## The Body's Behavioral Response to Hypoglycemia

**Eat Something!**



- ### Physiology of glucose counterregulation
- <81mg/dL: decrease in insulin secretion
  - ~65-70mg/dL: Glucagon and epinephrine secretions occurs
  - ~50-55mg/dL: neurogenic, neuroglycopenic symptoms
  - Glycemic thresholds may vary
  - Cortisol and growth hormone

- ### Houston We Have A Problem!
- Impairments in Type 1 Diabetics**  
Glucagon deficiency 2-5 yrs after diagnosis
- Epinephrine secretion may be impaired as a result of autonomic neuropathy
- Injected insulin may be unrelated to glucose level
- Impairments in Type 2 Diabetics**  
Glucagon deficiency may happen many years after diagnosis

- ### How to identify hypoglycemia?
- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>■ Neurogenic:                             <ul style="list-style-type: none"> <li>■ Palpitations</li> <li>■ Tremor</li> <li>■ Anxiety</li> <li>■ Sweating</li> <li>■ Hunger</li> <li>■ parathesias</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>■ Neuroglycopenic                             <ul style="list-style-type: none"> <li>■ Cognitive impairment</li> <li>■ Behavior change</li> <li>■ Psychomotor</li> <li>■ Seizure</li> <li>■ coma</li> </ul> </li> </ul> |
|---|--|

- ### Common Causes of Hypoglycemia
- Too much insulin
  - Not enough food
  - Increase in level of exercise or activity
  - Diabetes agents

### Risk Factors for Hypoglycemia

- Nutritional status
  - Missed meals, delayed meals
- Heart failure, renal or liver disease
- Malignancy
- Sudden reduction of steroid dose
- Altered ability of patient to report symptoms
- Vomiting

### Risk Factors for Hypoglycemia

- Risk factors for hypoglycemia
  - New NPO status
  - Reduction in IV dextrose
  - Unexpected interruption of feeds/TPN
  - Altered consciousness from anesthesia
  - Advanced age
  - Previous history of severe hypoglycemia

### How to treat hypoglycemia

- Check finger stick, if Blood glucose is <70mg/dL
- Rule of 15
  - 15 grams of carbohydrate
  - Wait 15 minutes and recheck blood glucose
  - If BG is <70mg/dL :repeat prn
- If not close to meal: eat small snack

### Treating hypoglycemia

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>■ What to treat with?           <ul style="list-style-type: none"> <li>■ Glucose tablets=3 glucose tablets</li> <li>■ Tube of glucose gel</li> <li>■ 4 oz of juice, or sweetened soda=15grams of carbohydrate</li> <li>■ 5 life savers=15 grams of carbohydrates</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>■ What not to treat with:           <ul style="list-style-type: none"> <li>■ Chocolate</li> <li>■ Cookies</li> <li>■ ice-cream</li> <li>■ Milk</li> <li>■ Fat and protein retard may retards response</li> </ul> </li> </ul> |
|--|---|

### What if a patient is NPO or unconscious?

- Give ½ amp of D50, awake
- Give 1 amp of D50 if unconscious

### Follow-up

- Why did hypoglycemia occur? Need adjustment of medication?

## Case study

Ms. T is a 45 year old type 1 diabetic. She is brought to the emergency room S/P motor vehicle accident. The medics tell you that her blood sugar was 32mg/dl at the scene. When you question her, she does not recall anything that happened between when she started the car and when she arrived in the ED.

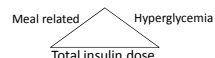
### Questions

1. What is the proper term for this complication of diabetes?
2. Given her history, how will you individualize her glucose goals?
3. Name 3 safety measures that should be in place for this patient.

## The Long and Winding Road to Glycemic Control



1. Always check a blood sugar before administering insulin.
2. Always wait at least 5 hours between doses of rapid acting insulin.
3. Use your critical thinking skills when administering Insulin/reviewing MD orders, Don't be afraid to question!
4. Give your patient enough insulin to cover both the pre-existing hyperglycemia, plus the anticipated calories.



## The Long and Winding Road to Glycemic Control



5. know the onset, peak and duration of the insulin you are administering.
6. Be cautious in giving short acting insulin at bedtime.

## Patient Education

- Signs and symptoms
- Time course of drugs they.
- How to treat hypoglycemia
- Blood glucose monitoring

## Hyperglycemia

### When does it occur?`

- Diabetic Ketoacidosis
- Hyperosmolar hyperglycemic state (HHS)``

## Diabetic Ketoacidosis DKA

**Definition:**A manifestation of severe insulin deficiency, often in association with stress and activation of counter-regulatory hormones.

### Precipitating factors:

- \*Interruption of insulin therapy
- \*Sepsis
- \*Trauma
- \*MI
- \*Pregnancy

## DKA

### Clinical features:

- \*Most common in Type 1 diabetics
- \*Can be first indication of diabetes
- \*Hallmarks of diagnosis: Hyperglycemia, Ketosis, Acidosis

### Signs and Symptoms:

- \*Nausea
- \*Vomiting
- \*Abdominal pain
- \*Profound dehydration
- \*Kussmaul breathing

### Lab findings:

- \*Increased glucose
- \*Increased ion gap
- \*Metabolic acidosis
- \*Hyponatremia
- \*Hyperkalemia

## What is up with the Potassium

Acidosis and dehydration causes potassium to shift out of the cell into the serum.

↓  
Patients will present with hyperkalemia.

↓  
Once fluid and insulin are administered, the acidosis will resolve.

↓  
The K will shift back into the cell causing hypokalemia.

## DKA Treatment

### Treatment:

- \***Replace fluids**-isotonic fluid is used initially
- \***D5 1/2NS** is used when glucose is <250
- \***Administer insulin**-continuous infusion per gtt protocol.  
Goal is to lower the glucose no faster than 100 mg/dl/hour.
- \***Address impending potassium deficit**-add K to IV fluids once the initial saline bolus is done.
- \***Follow hourly glucose and serial lytes Q4**
- \***Search for underlying precipitating factor** i.e. infection

## Hyperosmolar, Hyperglycemic State

**Clinical features:** Hyperglycemia, severe dehydration, absence of ketosis. Most common in Type 2 diabetics. Higher Mortality than DKA~10-20%

**Precipitating factors:** stress, infection, stroke, non-adherence with medication regimes.

**Signs and symptoms:** Patients appear quite ill and obtunded.

**Lab findings:**Hyperglycemia >600, increased osmolality >320

## HHS Treatment

### Treatment:

- \***Fluid replacement**-isotonic initially, glucose is added when serum glucose is <250.
- \***Insulin therapy**- continuous infusion per gtt protocol.
- \***Replace K**
- \***Monitor**-hourly glucose, serial lytes.

## Questions?

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**Questions?**

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