Lecture 5 • Mark Klimek • 71:46

Diabetes Mellitus (DM), Diabetes Insipidus (DI), Insulin

Diabetes mellitus = An error in glucose metabolism … Glucose is the body's primary fuel source

- Can be a lack of insulin DM1
- Can be insulin resistance DM2

DIABETES INSIPIDUS = Not a type of DM! … It is insidious, diabetes w/out the glucose element

- It is Polyuria, Polydipsia leading to **dehydration**, due to low ADH.
- It is just the fluid part

So question is about **low** urine output or **high** urine output? …

- Similar to DM, DI has a high urine output

What is the opposite of Diabetes Insipidus?

- It is **SIADH** = Syndrome of inappropriate ADH (antidiuretic hormone)

So, DM has polyuria, polydipsia
Therefore, DI also has polyuria, polydipsia
However, SIADH is the opposite of the above 2 conditions …

- It presents w/ oliguria and no thirst
- Decrease urine output
- And then, decrease serum specific gravity (due to retention of water)
- Increase urine specific gravity (due to decrease urine volume)

Nursing Diagnosis?

Lots of urine retained, specific gravity is low = SIADH
Fluid Volume Deficit = DM, DI
Fluid Volume Excess = SIADH

Diabetes

- Type I—Insulin dependent, Juvenile onset, Ketosis prone
- Type II—Non-insulin dependent, Adult onset, Non-ketosis prone
- S/Sx of DM
  - Polyuria—pee a lot
  - Polydipsia—thirsty
  - Polyphagia—(eat/swallow a lot)

Treatment for DM Type I (if you don't treat)

- They will **"DIE"**
- **D**iet (calories from carbs, ***least important***)

- **I**nsulin (***most important***)
- **E**xercise

Treatment for Type II DM

- They are **"DOA"**
- **D**iet (most important)
- **O**ral hypoglycemic
- **A**ctivity

Diet for DM2

- Primary treatment modality is Calorie restriction
- 1200 Cal, 1400 Cal, 1600 Cal
- These pts need to eat 6 small feeding per day—smaller more frequent meals—keeps blood sugar more stable

Question

What is the best dietary action a DM2 should take?

a. Restrict calories
b. Divide meal into 6 feedings a day

Answer: (a) because pt can eat 6 meals but does not limit the Cal with each meal

Insulin acts to **lower** blood sugar

4 types of Insulin are covered here

1. **R-Regular insulin—clear solution, IV drip (HESI-intermediate, Rapid, Run IV)**
   - Onset: 1 hour
   - Peak: 2 hours
   - Duration: 4 hours … (Audio says 3 hours, but it is 4 hours)
   - Pattern: 1-2-4 (Pay attention to **peak**)

2. **N-NPH, Intermediate insulin—it is cloudy, N = Not So Clear, Fast (Cloudy = Suspension—it precipitates—can't give IV drip), N = not so fast, not in the bag**
   - Onset: 6 hours
   - Peak: 8 to 10 hours
   - Duration: 12 hours
   - Pattern: 6-8-10-12 (Hear the even #s and pay attention to **peak**)

Clear = Solution
Cloudy = Suspension → Will precipitate (Not given over IV drip or put in an IV bag)

Question

How would the board ask question about peak of insulin?
For instance, you give 30 units of insulin to a pt at 7 a.m. When do you check for hypoglycemia?

- Answer = Add the insulin peak time to the time of insulin administration
- For instance, if the pt was given NPH at 7 a.m., add 8 to 10 hours to the time
- Answer = Check for hypoglycemia between 3 and 5 p.m.

3. Lispro: (Humalog)
- Don't give it AC (before meal) … Give it with the meal
- Onset: 15 min
- Peak: 30 min
- Duration: 3 hrs
- Pattern: 15-30-3

4. Glargine (Lantus)
- Long-acting insulin
- No Peak
- Duration 12 to 24 hrs
- Little to no risk for hypoglycemia (only one you can safely give at bedtime)

Note: Always check insulin expiration date

What action invalidates the manufacturers date?
- Opening the package
- Once the package is open, the new expiration date is 30 days after that
- Open package without an opening or expiration date should be thrown out
- Label the package either with
  - "OPEN" and date package is open
    or
  - "EXP" and expiration date
- Once the package is open, refrigeration is optional
  - However, unopened bottle must be kept refrigerated
  - Although it is good practice to **teach** pt to refrigerate insulin at home

Exercise potentiates insulin action
- Exercise is like **another shot** of insulin
- Therefore, if a student is schedule to play soccer (exercise) this afternoon … It is necessary to decrease the dosage of insulin
- In addition, the school nurse must give the student rapidly metabolized carbohydrates—snacks or juice

Sick Days … Pt has a fever or the flu, and so on
- Serum glucose levels go up
- Need their insulin even though pt is eating
- Take sips of water because they get dehydrated
- **Any sick diabetic pt** has 2 problems
  - Hyperglycemia and Dehydration

Acute complications of Diabetes

- Low blood glucose—a.k.a. Hypoglycemia or Hypoglycemic shock or Insulin shock/reaction
- Why are some of the causes
  - Not enough food
  - Too much insulin (#1 cause, can lead to permanent brain damage)
  - Too much exercise

What does hypoglycemia look like?

- **Think of Drunk pt in Shock**
- Drunk
  - Staggering gait
  - Slurred speech
  - Cerebral impairment (labile)
  - Slow reaction time
  - Decrease social inhibition
- Shock—Vasomotor collapse
  - Tachycardia, tachypnea, Low BP
  - Cold/clammy, mottled skin

Treatment

- Give pt sugars or Rapidly metabolizable carbohydrate such as
  - Juice (any), candy, regular soda, milk (lactose), honey, icing, jelly, jam
- Boards want sugar + starch or protein
  - For example, apple juice + turkey, Milk is sugar/protein—1/2 cup Skim milk
- Bad answer
  - Candy + Soda—1 sugar is good, 2 sugars are bad
  - 5 packs of sugar emptied into a glass of orange juice
- Unconscious pts—pay attention to location
- Glucagon IM if the mother is on the phone
- Dextrose IV (D10, D50) if in the ER

DKA—High Glucose in a Type I (keto is the clue!)

Causes

- Too much food
- Not enough insulin
- Not enough exercise
- **#1 cause acute viral Upper Respiratory Infection within last 2 weeks**

S/Sx of DKA is "DKA"

- **D**ehydration (dry, poor skin elasticity and turgor, warm) … Water is a coolant (you overheat)
- **K**etones in serum, **K**ussmauls, High **K**+
- **A**cidosis, **A**cetone breath, **A**norexia due to nausea

Note: Ketone in urine does not necessarily means DKA

Treatment
- Insulin IV (Regular!)
- IV fluid! 200 mL/hr (some of the fastest rate)

HHNK or HHS or HHNS
- High blood sugar in a Type 2
- These pts don't burn ketones, no acid
- Whenever you see HHNK, think **dehydration**
- Severe Dehydration!
  - Skin is dry, flushed, decreased turgor, increased HR
  - #1 Nursing diagnosis: **fluid volume deficit (same as dehydration)**
  - #1 Nursing intervention: Rehydration!
  - Outcomes in successful treatment: Increase urine output, Moist mucous membrane, etc.
  - Long-term complications: Poor perfusion, Peripheral neuropathy

Between DKA and HHNK
- Which one is more dependent on insulin?
  - DKA pt is more dependent on insulin
  - HHNK pt needs to be rehydrated
- Which one has a higher mortality rate?
  - More pts die HHNK
- Which is a higher priority?
  - DKA is a more acute condition and responds very quickly to insulin
  - HHN pts show up late in the emergency room and do not readily respond to treatment

Long-term complication of diabetes
- Related to
  - Poor tissue perfusion
    or
  - Peripheral neuropathy
- Examples of long-term complications: Renal failure, Gangrene, Heart failure, Urinary incontinence, Pt can't feel a burn on the foot
- For instance
  - Renal failure is a cause of poor perfusion
  - Urinary incontinence is a cause of peripheral neuropathy

Which lab test is the best indicator of long-term blood glucose level?
- Hb A1C, a.k.a. glycosated Hb or glycosylated Hb
  - Average blood sugar over last 90 days
- (Hb = Hemoglobin)
- Hb < 6 is normal
- Hb > 8 is out of control
- Hb 7 Borderline—have pt come in for evaluation