V. ENDOCRINE

A. Thyroid Gland:

- Produces ____________ hormones (T3, T4, and Calcitonin)

- Calcitonin ______ serum Ca+ levels by taking calcium out of the blood and pushing it back into the bone.

- You need ______________ to make hormones. (This is dietary iodine)

- Thyroid hormone gives us ____________!

1. Hyperthyroid: TOO MUCH ENERGY!! (Graves Disease):

    a. S/S:

    - Nervous
    - Weight ______
    - Sweaty/hot
    - Exophthalmos
    - Attention span __________
    - Appetite ____
    - Irritable
    - GI ________
    - BP ________
    - Thyroid __________

    b. Dx:

    - If you drew a serum T4 (thyroxine) level on this client, would it be increased or decreased? ______________

    - Thyroid scan

    - Client must discontinue any iodine containing medication ____ week prior to the thyroid scan.

Amiodarone (Cordarone®), an antiarrhythmic drug, contains high levels of iodine and may affect thyroid function.
c. Tx:

1) **Anti-thyroids:** propylthiouracil (PTU®), methimazole (Tapazole®)
   - **Stops** the thyroid from making thyroid ______________________.
   - It’s used ______________________ to stun the thyroid.
   - We want this client to become euthyroid (eu=____________________).

2) **Iodine Compounds:** potassium iodine (SSKI®), strong iodine solution (Lugol’s solution®)
   - ______________________ the size and the vascularity of the gland
   - ALL endocrine glands are VERY VASCULAR!
   - Give in milk or juice, and use straw. Why? _________________________

3) **Beta Blockers:** ________________ (Inderal®)
   - Decreases myocardial contractility
   - Could decrease cardiac output
   - Decreases HR, BP
   - ______________ anxiety.

4) **Radioactive Iodine** (___________ dose):
   - Given __________ (liquid or tablet form)
     **Rule out pregnancy first**
   - **Destroys** thyroid cells→ __________________________
   - Follow radioactive precautions.
     Stay away from _________ for _____ hours.
     Don’t _________ anyone for ____ hours.
   - Watch for thyroid storm (thyrotoxicosis and thyrotoxic crisis).
     It is hyperthyroidism multiplied by 100.
     **Could be rebound effect post-radioactive iodine**
5) Surgery: thyroidectomy (partial/complete):

- **Post op:**
  
  Teach how to support neck.
  
  Put personal items _________ to them.

- **Positioning:**
  
  HOB? __________

- Check for bleeding where? ___________________________

- Nutrition (pre & post op): Client needs _______________ calories.

- Assess for recurrent laryngeal nerve damage by listening for ____________.

- Could lead to vocal cord paralysis? __________

- When there is paralysis of both cords ________ obstruction will occur requiring immediate ________________.

- Teach to report feelings of ____________.

- Trach set at bedside

  - Swelling

  - Recurrent laryngeal nerve damage (vocal cord paralysis)

  - Hypocalcemia

    Assess for ______________ removal.

    How? S/S of ________________________

---

Eye care is important for a client with hyperthyroidism. If the client can’t close their eyelids, hypoallergenic tape may be applied to close lids (to help prevent injury or irritation). Dark glasses may be worn if photosensitivity is present. Artificial tears are used to prevent drying of the eyes.

Treatment of hyperthyroidism DOES NOT correct any eye or vision problems.
2. Hypothyroid (Myxedema):

a. S/S:

- No ________
- When this is present at ___________, it’s called cretinism (very dangerous and can lead to slowed mental and physical development if undetected).
- Fatigue
- GI __________
- Weight ______
- Hot or cold? __________
- Amenorrhea
- Speech __________
- No expression

You may be taking care of a totally immobile client.

b. Tx:

- levothyroxine (Synthroid®), thyroglobulin (Proloid®), liothyronine (Cytomel®)
- Do they take these meds forever? ______
- What will happen to their energy level when they start taking these meds?
  ____________________________

People with hypothyroidism tend to have ______________________________.
B. Parathyroid Problems:

- The parathyroids secrete _________________________ which makes you pull calcium from the ________________ and place it in the blood. Therefore, the serum calcium level goes ____________.

- If you have too much parathormone in your body, the serum calcium level will be ____________.

- If you do not have any parathormone in your body, the serum calcium level will be ________.

1. Hyperparathyroidism = Hypercalcemia = Hypophosphatemia:
   a. S/S:
      - Too much _________________________
      - Serum calcium is _______________. Serum phos is ____________.  
      - Other S/S _________________________________

   b. Tx:
      - Partial parathyroidectomy – when you take out 2 of your parathyroids…. PTH secretion ________________.
      - What are you going to monitor post op? ________________

2. Hypoparathyroidism = Hypocalcemia = Hyperphosphatemia:
   a. S/S:
      Not enough ________
      Serum calcium is ___________. Serum phos is _____________.
      Other S/S: ____________________________

   b. Tx:
      - IV __________________
      - Phosphorus binding drugs
C. Adrenal Glands:

- Need your adrenals to handle __________
- You have two parts to your adrenal gland: adrenal medulla and the adrenal cortex.

1. **Adrenal medulla:** (epinephrine, norepinephrine)

   **Adrenal Medulla Problems:**

   - Pheochromocytoma
     
     Benign tumors that secrete epi and norepi in boluses

   a. **S/S:**

     - BP? __________
     - HR and Pulse? ________
     - Flushing/diaphoretic

   b. **Dx:**

     - VMA (vanillylmandelic acid) test: A 24 hour urine specimen is done and you are looking for increased levels of _____ and _______________ (also called catecholamines).

     With a 24 hour urine, you should throw __________ the first voiding and __________ the last voiding.

   c. **Tx:**

     - Surgery to remove __________
2. **Adrenal cortex**: (Glucocorticoids, Mineralocorticoids, and Sex hormones)

*Even though the body secretes steroids normally, the adverse effects are going to be more pronounced when the client is receiving oral or IV steroids.*

a. **Adrenal Cortex Steroids:**

1) **Glucocorticoids:**
   - Change your mood.
     Example: insomnia, depressed, psychotic, euphoric
   - Alter defense mechanisms
     Immunosuppressed
     High risk for _________
   - Breakdown _______ and proteins
   - Inhibit insulin
     Hyperglycemic
     Do blood glucose monitoring

2) **Mineralocorticoids: Aldosterone:**
   - Make you retain ______ & _________
   - Make you lose __________
   - **Too Much Aldosterone:**
     Fluid volume excess
     Serum Potassium: _______________
   - **Not Enough Aldosterone:**
     Fluid volume deficit
     Serum Potassium: _______________

3) **Sex hormones:**
   **See Cushing’s notes**

---

Adrenocorticotropin hormones (ACTH) are made in the pituitary and they stimulate cortisol to be made.

Cortisol is a hormone of the adrenal cortex.

So no matter what “fancy” word the NCLEX® Lady uses…you will still get the same result…think “steroids”.

↑ACTH = ↑Cortisol level

Too many steroids = Hypercortisolism (just another word).
b. Adrenal Cortex Problems:

1) **Addison’s disease**: (Adrenocortical insufficiency—not enough steroids)

- **Pathophysiology**:
  - They do not have enough glucocorticoids, mineralocorticoids, or sex hormones.
  
  - **Aldosterone** (mineralocorticoids)
    - Normally, aldosterone makes us retain ______ and ______ and lose ______...Now we don’t have enough (insufficient), so we will lose ______ and _____ and retain ______.
    
  - The serum K+ will be __________________.

- **S/S**:
  - Initially, the majority of the S/S are a result of the **hyperkalemia**.
    
    Begins with muscle twitching and then proceeds to weakness, followed by flaccid paralysis.

**Other S/S**:

- Anorexia/nausea

- Hyperpigmentation-bronzing color of the skin and mucous membranes

- Decreased bowel __________

- GI upset

- White patchy area of depigmented _______ (vitiligo)

- Hypotension

- Decrease Na, increased K+ and ___________________
**Tx:**
- Combat shock (losing ___________ and ____________)
- ____________ sodium in their diet
- Processed fruit juice/broth (has lots of ________________)
- I & O and daily weight
- If this client is losing Na and water, their BP will probably be __________.
- Will they probably be gaining/losing weight? __________

**Nursing DX: Fluid Volume ______________**
- Will be placed on the mineralocorticoid drug fludrocortisone (Florinef®). It’s aldosterone.

DAILY WEIGHTS are very important in adjusting their medication.

Rule: When on a medicine where weight has to be monitored daily, keep the weight within 2-3 lbs or 1-2 kgs (+ or -) of their normal weight.

---

**Critical Thinking Exercise:**

- If you have a client at home taking fludrocortisone (Florinef®) and the following occurs…what should the CLIENT do?
  1. Overnight gain of 7 lbs. (3 kg) → what do they do with their AM dose? __________ or __________
  2. Overnight loss of 7 lbs. (3 kg) → what do they do with their AM dose? __________

- If the nurse is taking care of the client in the hospital on fludrocortisone (Florinef®) and the following occurs…what should the NURSE do?
  1. Client has edema or their BP is up→ ______________ ______________
  2. Client’s BP is steadily going down→ ______________ ______________

---

**TESTING STRATEGY**

Addisonian Crisis = severe hypotension and vascular collapse
2) **Cushing’s:**

**a) S/S:**

These clients have too many glucocorticoids, mineralocorticoids, and sex hormones.

- Growth arrest
- Thin extremities/skin (lipolysis)
- Increased risk of infection
- Hyperglycemia
- Psychosis to depression
- Moon faced (fat redistribution or fluid retention)
- Truncal obesity (fat redistribution; lipogenesis)
- Buffalo hump (fat redistribution)
- Oily skin/acne
- Women with male traits
- Poor sex drive (libido)

<table>
<thead>
<tr>
<th>Too</th>
<th>Many</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth</td>
<td>Thin</td>
</tr>
<tr>
<td>extremities/skin (lipolysis)</td>
<td>Increased risk of infection</td>
</tr>
<tr>
<td>Hyperglycemia</td>
<td>Psychosis to depression</td>
</tr>
<tr>
<td>Moon faced</td>
<td>Truncal obesity</td>
</tr>
<tr>
<td>Truncal obesity</td>
<td>Buffalo hump</td>
</tr>
</tbody>
</table>

- Since the client has too much mineralocorticoid (aldosterone), the serum K+ will be ________.

- If you did a 24 hour urine on this client the cortisol levels would be __________.

**b) Tx:**

- Adrenalectomy (unilateral or bilateral)
  
  *If both are removed→ lifetime replacement*

- Quiet environment

- Diet pre-treatment?

  _____ K+ _____ Na+ _____ Protein _____ Ca++

**Hint:** Steroids decrease serum Calcium by excreting it through the GI tract.

- Avoid infection.

- What might appear in their urine? ________________

---

Endocrine
D. Diabetes:

1. Classification:
   a. Type 1:
      - They have little or no insulin.
      - Usually diagnosed in childhood.
      - Causes: Auto-immune response (Type 1A) or Idiopathic (Type 1B)
      - First sign may be ________________.
      - Appears ________________, despite years of beta cell destruction.

1) Pathophysiology:
   You have to have __________ to carry glucose out of the vascular space into the cell…since there is no insulin, the glucose just builds up in the __________ space, the blood becomes hypertonic and pulls fluid into the vascular space…the kidneys filter excess glucose and fluids (polyuria and polydipsia) the cells are starving so they start breaking down protein and fat for energy (polyphagia)…when you break down fat you get ____________ (acids)…Now this client is ____________ (respiratory or metabolic?)

2) S/S:
   - Polyuria
     Polyuria think shock first.
   - Polydipsia
     Hyperglycemia = 3 Ps
   - Polyphagia

3) Tx:
   - Will oral hypoglycemia agents work for this client? ________
   - They have to have insulin.
b. Type II:

1) **Pathophysiology:**
   - These clients don’t have enough ____________, or the insulin they have is no good.
   - These clients are usually ________________.
   - They can’t make enough insulin to keep up with the __________ load the client is taking in.
   - This type of diabetes is not as abrupt as Type I.
   - It’s usually found by accident; or the client keeps coming back to the physician for things like a wound that won’t heal, repeated vaginal ____________, etc.
   - Individuals with Type 2 diabetes should be evaluated for _______________syndrome (Syndrome X).

   The features of Metabolic Syndrome include:
   - insulin resistance,
   - _______________ obesity (waist circumference > 40 inches for males, > 35 inches for females)
   - increased triglycerides
   - decreased HDL
   - increased BP
   - and CAD

2) **Tx:**
   - Start with diet and exercise and then add oral agents. Some clients may have to take ____________.

c. **Gestational Diabetes:**
   - Resembles Type 2
   - Mom needs 2-3x more ____________ than normal.
   - Screen all moms at _______ gestation.
   - If mom has risk factors for gestational diabetes, screen at ________ prenatal visit.
   - Complications to baby:
     - Increased birth weight and ________________
2. General Treatment of Diabetes (Type 1 and Type 2):

a. Diet:

- Majority of calories should come from: complex carbohydrates, then fats, and lastly protein. Limit protein to 10-20%.

  Diabetics tend to have ___________ disease.

- Why are diabetics prone to CAD? Sugar destroys vessels just like ________.

- High _______ diet (keeps blood sugar steady; client may have to decrease insulin)

  High fiber slows down ____________ absorption in the intestines, therefore, eliminating the sharp rise/fall in blood sugar.

b. Exercise:

- Wait until blood sugar _________________ to begin exercise.

- What should the client do pre-exercise to prevent hypoglycemia? __________

- Exercise when blood sugar is at its highest or lowest? _______________

- Exercise ______________ time and amount daily.

c. Medications: Oral hypoglycemics:

- How do oral hypoglycemic agents work? ________________ the pancreas to make insulin.

  *Note: not all oral hypoglycemic agents stimulate the pancreas to make insulin.

Despite whether they stimulate the pancreas, all oral hypoglycemic work to decrease the amount of circulating glucose.
• Only give to Type II
  
  Common Oral Anti-Diabetic Agents: glipizide (Glucotrol®), metformin (Glucophage®), pioglitazone (Actos®), sitagliptin (Januvia®)

• How is the insulin dose determined?
  
  It is based on ____________. The average adult dose of insulin is _______ units/kg/day.
  
  The insulin dose is adjusted until the ____________ is normal and until there is no more ____________ or ____________ in the urine.

• Reg (__________)….NPH (__________)

• Lantus is also clear and is considered a ____________ insulin.

• What is the only type of insulin you can give IV? __________

• The most common method of daily dosing insulin is _______________ dosing.

• The ________ daily dose of insulin with the Basal/Bolus method is a combination of a ____________ insulin, and a ____________ insulin.
  
  The long-acting insulin is given once a day.
  
  The rapid-acting insulin is given throughout the day before meals in ____________ doses, and it covers the food eaten at meals.

• Snacks are __________ required with Basal/Bolus insulin dosing, but clients still must eat when dosing with a rapid-acting insulin. So, have food available.

• Clients should eat when insulin is at its? __________

• When insulin is at its peak, the blood sugar is at its? __________
• Always monitor a client on insulin for hypoglycemia.

• When drawing up Regular and NPH insulin together, which one do you draw up first? _______

d. Client Teaching Education:
• Glycosylated Hemoglobin *(HbA1c)*: blood test; gives an average of what your blood sugar has been over the past 3 _____________.

• What happens to your blood sugar when you are sick or stressed? _____

  The normal pancreas can handle these fluctuations. An increase in the blood sugar when sick or stressed is a normal reaction to help us fight the illness/stressor.

  *TESTING STRATEGY*
  Illness = DKA

• Rotation of sites (Rotate _____________ an area first)

• Aspirate? ______

e. Insulin Infusion Pumps:
• Alternative to daily insulin injections

• Only ___________________ insulin is used in infusion pumps.

• Obtain better control: receiving a basal level of insulin from the pump and boluses of additional insulin as needed with ________, or if they have an _________________________ blood sugar.

  **Remember:**
  1. Regular Insulin is the only insulin that can be given in IV fluids as an intravenous infusion.

  2. Rapid-Acting Insulin is the only insulin that can be given via a subcutaneous insulin infusion pump. Insulin infusion pumps are small computerized devices worn by the client that provide both a continuous (basal) dosing of rapid-acting insulin and on-demand (bolus) dosing.
f. Hypoglycemic/Hyperglycemic Episodes:

- What are the S/S of hypoglycemia?

- If hypoglycemic, what should the client do? _____________________

- Glucose absorption is delayed in foods with lots of ____________

- Once the blood sugar is up, what should they do? ___________________

- You enter a diabetic client’s room and they are unconscious …do you treat this client like he is hypo or hyperglycemic? __________________

  D50W (hard to push; and if you have a choice you need a large bore IV)

  Injectable glucagon (GlucaGen®) (used when there is no IV access; given IM)

- For prevention, teach the client to: 1) ________________________

  2) ________________________

  3) ________________________

  4) ________________________

| Hypoglycemia is a glucose level of 70mg/dL (3.8 mmol/L) or less |
| 2) ________________________ |
| 3) ________________________ |
| 4) ________________________ |

Critical Thinking Exercise:

What foods would be the best choice for Pawpaw?

Select all that apply.

1. Milk
2. Apple Juice
3. Hershey chocolate bar
4. Three oatmeal cookies
5. A handful of raisins

NCLEX Update: Multiple Response items are described as having 5 or 6 options with more than one correct option. These items contain the statement “Select all that apply.”
3. Complications of Diabetes:

a. Diabetic Ketoacidosis (DKA):

1) Pathophysiology:
- Anything that increases blood sugar can throw a client into DKA (illness, infection, skipping insulin).
- DKA may be the first sign of __________.
- Have all the usual S/S of Type 1 diabetes
- Patho: Absent or inadequate insulin→ blood sugar goes sky high→ Polyuria, Polydipsia, Polyphagia→ Fat breakdown (acidosis) → Kussmaul’s respirations (trying to blow off CO₂ to compensate for the metabolic acidosis). Also, as the client becomes more acidotic, the LOC goes down.

2) Tx:
- Find the cause.
- Hourly blood sugar and K+ levels
- IV insulin
  Insulin decreases ______________ & ______________ by driving them out of the vascular space into the cell.
- ECG
- Hourly __________
- ABGs
- IVFs→ Start with NS…then when the blood sugar gets down to about 300, switch to D5W to prevent throwing the client into ______________.
- Anticipate that the physician will want to add ______________ to the IV solution at some point.
b. Hyperosmolar Hyperglycemic Nonketosis (HHNK) or Hyperglycemic Hyperosmolar State (HHS):

- Looks like DKA, but no __________
- Making just enough insulin so they are not breaking down body________
  - No fat breakdown….no __________
  - No ketones…no ______________
- Will this client have Kussmauls’ respirations? ________________

<table>
<thead>
<tr>
<th><em>TESTING STRATEGY</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>In the NCLEX® world: <strong>Type 1→ DKA</strong> <strong>Type 2→ HHNK (HHS)</strong></td>
</tr>
</tbody>
</table>

DKA and HHNK (HHS) are both hyperosmolar states caused by ___________ and _______________, but there is no ______________ with HHNK (HHS).

c. Vascular Problems: Macro-vascular and Micro-vascular

- Will develop poor circulation everywhere due to __________ damage (sugar irritates the vessel lining; accumulation of sugar will decrease the size of the vessel lumen therefore decreasing blood flow)
  1) Diabetic retinopathy
  2) Nephropathy

d. Neuropathy:

  1) Sexual problems: impotence/decreased sensation
  2) Foot/leg problems: pain/paresthesia/numbness
     Review Diabetic Foot Care
  3) Neurogenic bladder: the bladder does not empty properly…the bladder may empty spontaneously, called ____________, or it may not empty at all, and this is called ________________.
  4) Gastroparesis: stomach emptying is delayed so there is an increased risk for ________________.

e. Increased Risk for ________________