Addisons crisis: life threatening disorder caused by adrenal insufficiency. Crisis is precipitated by infection, trauma, stress, or surgery. Death can occur from shock, hyperkalemia, or vascular collapse.

Addisons disease: decreased secretion of adrenal cortex hormones (glucocorticoid/mineralcorticoid). Condition is fatal if untreated.

Cushings disease: a metabolic disorder characterized by release of too much cortisol caused by the release of too much ACTH.

Diabetes insipidus: not enough ADH is released into the body from the posterior pituitary causing increased diuresis.

Diabetes mellitus: chronic disorder of glucose intolerance/impaired metabolism of carbohydrates, protein, and fats. Caused by a deficiency in insulin or insulin resistance.

Hyperthyroidism: excessive thyroid hormone secretion

Hypothyroidism: not enough thyroid hormone
**Function of the endocrine system**

1. Maintenance and regulation of vital functions
2. Respond to stress and injury (cortisol)
3. Growth and development (human growth hormone)
4. Energy and metabolism
5. Reproduction (estrogen, testosterone, progesterone)
6. Fluid and electrolyte balance/Acid base balance

**Endocrine gland**

1. Hypothalamus: activates and controls integrates the peripheral autonomic nervous system, endocrine fx and somatic fx (body temp)

2. Pituitary gland "master gland": base of the brain, influenced by the hypothalamus, directly effects the fx of other endocrine glands. Promotes growth of tissue, water absorption, and controls sexual development.

3. Adrenal gland: snow cap on top of kidney, regulates sodium (ADH/Aldosterone), electrolyte balance, metabolism of carbs, lipids, and protein. Sexual characteristics sustains fight/flight response

4. Adrenal cortex: outer shell of adrenal gland, synthesis of glucocorticoids/mineralcorticoids, secretes androgens and estrogens

5. Adrenal medulla: inner core of the adrenal gland, produces epinephrine and norepinephrine

6. Thyroid gland: located in the front of the neck, controls metabolic rate, produces thyroxine (T4), triiodothyronine (T3), thyrocalcitonin

7. Parathyroid glands: on the thyroid gland, controls calcium and phosphorus (increased CA = decreased phosphorus), produces parathyroid hormone

8. Pancrease: located behind the stomach, influences carb metabolism, indirectly influences fat and protein metabolism, produces insulin and glucagon (see Mike’s Pirates of the Pancrease video)

9. Ovaries and testes: produce sex hormones such as estrogen, and testosterone.
**Negative feedback loop**

Regulates hormone secretion by the hypothalamus and pituitary, increased amounts of hormones in the blood stream inhibit the hormone and others that cause its release.

**Diagnostic tests**

Stimulation and supression test: attempt to stimulate the release of the hormone when underactivity is suspected. Supression tests are when levels of a hormone are suspected to be high, agents that normally suppress the response are administered.

Radioactive iodine reuptake: thyroid fx test measures absorption of an iodine isotope. To determine if the normal negative feedback is intact. Normal values are at 3%-10% at 2-4 hours. 24 hours levels should be 5-30% . elevated levels indicate a hyperactive thyroid and decreased levels indicate a hypoactive thyroid

T3/T4 resin test: serum test to determine thyroid fx, normal values ( T3 80-230ng/dl, T4 5-12mcg/dl) .thyroxine free ft/ 0.8-2.2ng/dl . elevated T3 indicates hyperthyroid, decreased w/ hypothyroid. Same with T4

Thyroid stimulation hormone: normal range ( 0.2-5.4 microunits/ml) elevated levels indicate hypothyroidism, decreased values indicate hyperthyroidism.

Thyroid scan: identifies nodules and growths on the thyroid. Radioisotope is administered. Discontinue medication w/ HCP permission. Especially metformin . pt will remain NPO after midnight. Contraindicated in pregnancy .

Glucose tolerance test: diagnoses diabetes . ingest glucose and 2 hours later check blood sugar levels. Higher than 200mg/dl indicates diabetes. Fasting required. Client prep: eat atleast 150g carbs 72 hours prior, avoid alcohol, coffee, and smoking 36 hours pre test. Avoid exercise 8hours pre and post test. Withhold morning insulin/ or antidiabetic.

Glycosylated hemoglobin: blood glucose bound to hemoglobin, HBA1c. Indicates how well the pt has been controlling their diabetes for the prior 3-4 months. Goal is under 7% for clients with diabetes. Goal is 4%-6% for undiagnosed pts , fasting is not required.
Pituitary gland disorders

**Hypopituitarism:**

Decrease in secretion of 1 or more pituitary hormones r/t tumors, trauma, encephalitis, autoimmune, or stroke. Usually affects : GH, LH, FSH. Other hormones that may be involved are: TSH, ACTH, ADH

**Assessment:** obeisty (GH, TSH), reduced cardiac output (GH, ADH), infertility / sexual dysfunction (gonadotropins, ACTH) fatigue/low bp (TSH, ADH, ACTH, GH) tumors may also cause headaches and visual defects.

**Interventions:** provide emotional support, client may need hormone replacement, education regarding the signs and sx of hypofunction.

**Hyperpituitarism**

Hypersecretion of growth hormone caused by tumors. Leads to acromegaly and cushings

**Assessment:** large hands and feet, thick or protruded jaw, arthritic joint changes, visual disturbances, diaphoresis, oily, rough skin, organomegaly, HTN, dysphagia, deepening of the voice.

**Interventions:** emotional support, skin care (frequent), pharmacological/ non pharmacological interventions for joint pain, prepare client for radiation to decrease the tumor, hypophysectomy if needed.

**Diabetes insipidus**

Hyposecretion of ADH, caused by stroke or trauma, may also be idiopathic, kidney tubules fail and reabsorb H2O

**Assessment:** excretion of large amounts of dilute urine, polydipsia, dehydration, low urinary specific gravity, postural hypotension

**Interventions:** monitor vitals/neuro/ cardio/ status, maintain adequate intake, strict I&O, may be prescribed vasopressin, instruct the client on proper management of medications, have them wear a medic alert bracelet.

**SIADH**

Excess release of ADH, caused by trauma, stroke, malignancies, and stress. Induces FVE, water intoxication, hyponateremia.

Assessment: sx of fluid volume overload, ALOC, weight gain, HTN, tachycardia, anorexia, nausea, vomiting, hyponateremia.

Interventions: monitor daily weights, monitor vitals, provide a safe environment, I&O, monitor fluid and electrolyte status, monitor serum osmality.
**Adrenal gland disorders**

*Addisons disease*: chronic adrenocortical insufficiency due to inadequate adrenal cortex function. Fatal if left untreated.

**Assessment**: lethargy, fatigue, muscle weakness, GI disturbances, weight loss, menstrual changes, impotence in men, hypoglycemia, hyponatremia, hyperkalemia, hypercalcemia, hypotension, have bronzed skin.

**Interventions**: monitor vitals, monitor WBC, glucose, potassium, sodium, and calcium. Administer glucocorticoids and mineralocorticoids, adisionian crisis (infection, trauma, surgery).

**Pt education**: avoid individuals with infections, diet high in protein, high carbs, normal sodium. Avoid strenuous exercise, avoid OTC medications, educate on s/sx of complications of under/over replacement of hormones.

**Addisonian crisis**: severe headache, severe, abdominal, leg, and lower back pain, genral weakness, irritability/confusion, severe hypotension and shock. Can cause hyponaterima, hyperkalemia, hypoglycemia.

Acute renal insufficancy
Emergency treatment for acute adrenal insufficiency (addisonian crisis) is I.V. infusion of hydrocortisone and saline solution. The client is usually given a dose containing hydrocortisone 100 mg I.V. in normal saline every 6 hours until blood pressure returns to normal.
**Cushings syndrome**

Hypersecretions of glucocorticoids from the adrenal cortex, a metabolic disorder caused by abnormally increased secretions of cortisol, caused by release of copious amounts of ACTH.

Assessment: general weakness, moon face, buffalo hump, obese in the middle, thin arms and legs (apple shape). Hyperglycemia, hypernatremia, hypokalemia, hypocalcemia, HTN, fragile skin.

Interventions: monitor vitals, strict I&O, monitor labs for electrolyte imbalances especially WBC and sodium/potassium/glucose. Provide skin care, may need an adrenalectomy.

Primary hyperaldosteronism: hypersecretion of mineral corticoids (aldosterone) most commonly caused by adenoma.

s/sx: polydypsia, polyuria, parathesia, visual changes, low urine specific gravity, increased urinary aldosterone levels.

Interventions: monitor vitals, monitor electrolytes, administer aldactone as needed.

Phenochromocytoma: catecholamine producing tumor, found in the adrenal medulla, can be found in the urinary bladder, the chest, and the brain. Typically benign but can be malignant. Excess EPI/NE are secreted. Dx by 24 hour urine collection. Will require surgical removal.

Assessment: sustained hypertension, severe headaches, palpitations, diaphoresis (excessive), pain in the chest with vomiting, heat intolerance, weight loss, tremors, and hyperglycemia.

Interventions: monitor for hypertensive crisis, stroke, cardiac dysrhythmia, MI. Administer Beta blockers to control HTN, promote rest, diet high in calories and vitamins.
**Thyroid gland disorders**

**Hypothyroidism:**
Hypossecretion of T3/T4 thyroid hormone, characterized by decreased rate of metabolism

**Symptoms (s/sx):** lethargy, fatigue, weakness, thigling, weight gain, dry skin, loss of body hair, bradycardia, constipation, generalized puffiness, edema around the eyes, loss of memory, menstrual disturbance, cardiac enlargement, heart failure may occur, goiter may or may not be present.

**Interventions:** administer levothyroxine, educate pt on a low calorie, low cholesterol, low fat diet, assess for constipation, provide a warm environment, avoid sedatives and opioids due to increased sensitivity.

**Hyperthyroidism:**

**Symptoms (sxs):** irritability, aggitation, moodswings, nervousness/tremors, heat intolerance, weight loss, smooth soft skin and hair, palpitations and cardiac dysrythmia, tachycardia, and A-FIB, diarrhea, protruding eyeballs “exophthalmos”, diaphoresis, HTN, goiter

**Interventions:** provide adequate rest, administer sedatives as prescribed, provide a cool quiet environment, obtain daily weight, avoid stimulants, administer anti-thyroid meds, provide a high calorie diet.
**Thyroid storm**

Acute life threatening condition occurs in a client with uncontrolled hyperthyroidism, can be caused by manipulation of the thyroid gland during surgery and release the thyroid into the blood. Can also occur due to infection and stress. You can administer beta-blockers and glucocorticoids prior to surgery to avoid an occurrence.

- elevated temp
- tachycardia, systolic HTN
- Nausea, vomiting, diarrhea
- agitation, tremors, anxiety
- restlessness, tremor, seizures

Maintain a patent airway, administer anti-thyroid medications, monitor vitals, continuous cardiac monitoring.

**Parathyroid disorders**

**Hypoparathyroidism**

Decreased secretion of parathyroid hormone from the parathyroid gland, can occur following thyroidectomy.

**Assessment:** hypocalcemia, hyperphosphatemia, numbness and tingling in the face, cramping in the abdomen and extremities, positive trussus and chvosteks sign, tetany (bronchospasm, laryngospasm, carpopedal spasm, dysphagia, photophobia, cardiac dysrhythmias, seizures) hypotension, anxiety and irritability.

**Interventions:** initiate seizure precautions, place o2, suction and trach kit at bedside, prepare to administer calcium gluconate IV for hypocalcemia, high calcium/low phosphorus diet.

**Hyperparathyroidism**

Increased secretion of parathyroid hormone

**Assessment:** hypercalcemia, hypophosphatemia, fatigue, muscle weakness, skeletal pain and tenderness, bone deformities, anorexia, nausea, vomiting, epigastric pain, weightloss, constipation, hypotension, cardiac dysrhythmia, renal stone

**Interventions:** monitor vitals, especially bp, monitor cardiac fx, move client slowly carefully (can break bones), encourage fluid intake, administer lasix as prescribed to lower calcium, IV NS to maintain hydration, administer biphosphates as prescribed, monitor clacium and phosphate carefully.