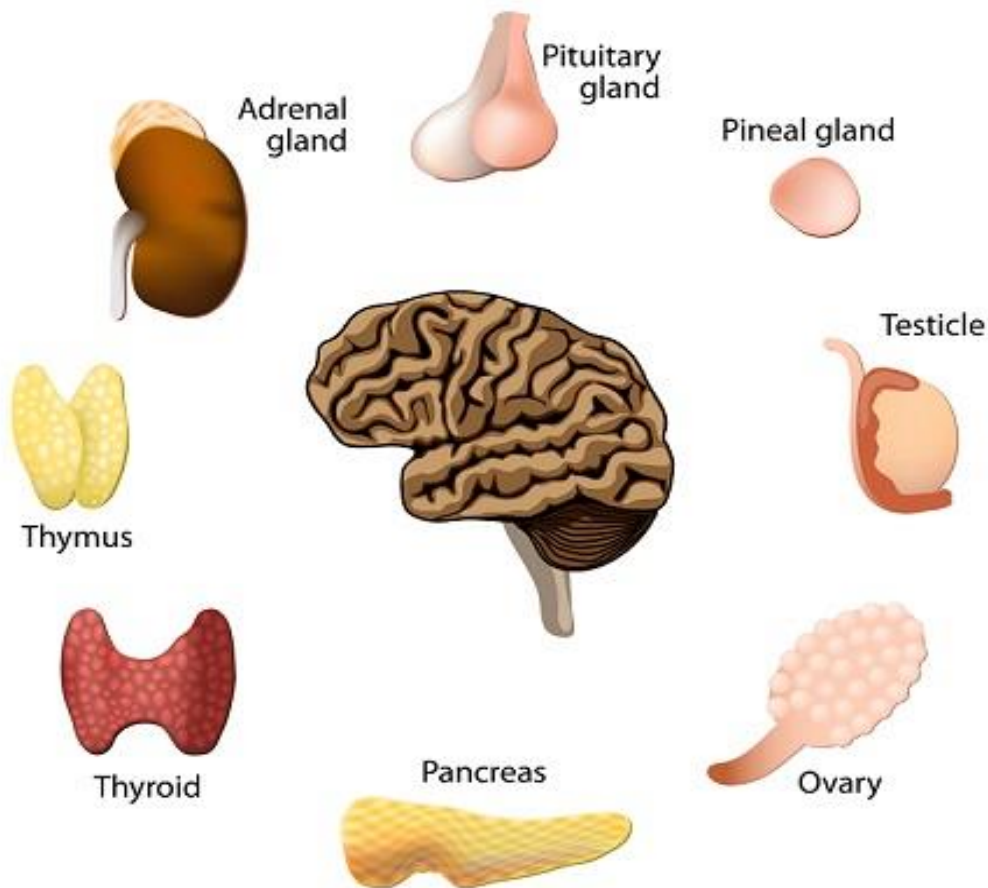


ENDOCRINE SYSTEM



Pituitary Gland Problems

Posterior Pituitary: DI, SIADH

Adrenal gland problems

Adrenal Cortex: Addison's disease, Cushing disease and Cushing syndrome.

Adrenal Medulla: Pheochromocytoma.

Problems of the pancreas

Diabetes mellitus.

Risk factors for Endocrine problems

Age, Heredity, Congenital factors, Trauma, Environmental factors, Consequences of other health problems or surgery.

Diabetes Mellitus:

Chronic disorder of impaired carbohydrate, protein and lipid metabolism caused by a deficiency of insulin. An absolute or relative deficiency of insulin results in hyperglycemia.

Multisystem disease related to abnormal insulin production, impaired insulin utilization or both.

- **Two types:**
- Type 1 diabetes:
 - Insulin Dependent
 - Results from progressive destruction to pancreatic beta cells, owing to an auto-immune process.
- Type 2 Diabetes:
 - Non-insulin Dependent
 - Obesity and lack of exercise are pre-disposing factors
 - Body is resistant to the use of insulin

Clinical Manifestations:

Classic Signs: -Polyuria -Polydipsia -Polyphagia

Type 1DM: Weakness and fatigue, weight loss, changes in visual acuity, yeast infections among women.

Type 2 DM: Fatigue, recurrent infections, prolonged wound healing, visual acuity changes, painful peripheral neuropathy in feet.

Diagnostics:

1. HbA1C >6.5%
2. Fasting Blood Glucose: > 7.0 mmol/L
3. Random Plasma Glucose: > 11.1 mmol/l

Management:

Type 1DM:

- a. Diet
- b. Insulin (Most Important)
- c. Exercise

Type 2 DM:

- a. Diet(most important)
- b. Oral hypoglycemics
- c. Activity

Type of insulin	Onset	Peak	Duration
Short acting: regular, Humulin R (IV).	1-1 1/2 hour	2-4 hours	5-8 hours
Intermediate- acting: NPH	1-3 hours	6-8 hours	12-16 hours
Extended long acting: Insulin glargine(Lantus), Levemir, Determir.	1-2 hours	No peak	24+ hours
Rapid acting: Lispro, Aspart	10-15 min.	60-90 min.	3-5 hours

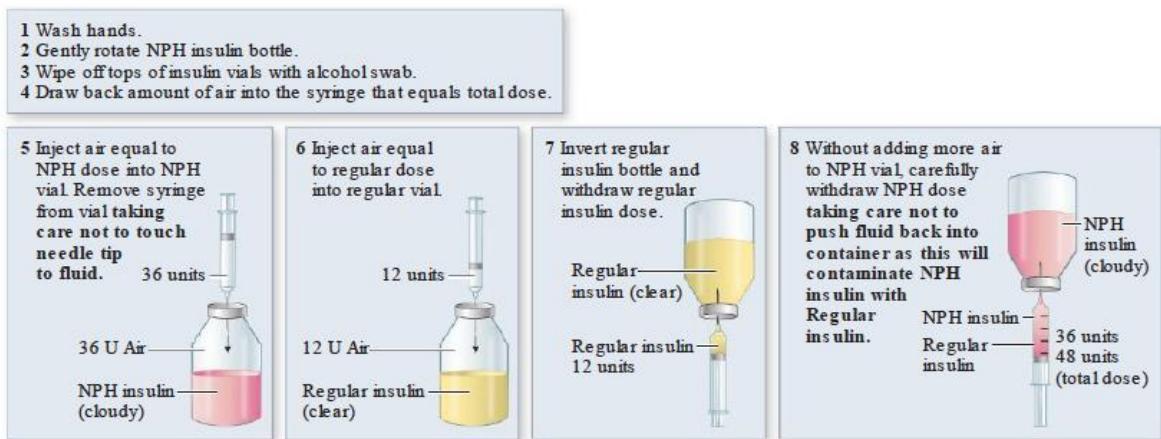
Complications of Insulin therapy:

- Local allergic reactions.
- Insulin lipodystrophy
- **Dawn phenomenon:** Dawn phenomenon is characterized by hyperglycemia upon morning awakening that results from excessive early morning release of GH and cortisol.

Treatment: requires an increase in the client's insulin dose or a change in the time of insulin administration.

Somogyi phenomenon: Normal or elevated blood glucose levels are present at bedtime; hypoglycemia occurs at about 2 to 3 a.m. which causes an increase in the production of counter regulatory hormones. Client experiencing the Somogyi phenomenon may complain of early morning headaches, night sweats or nightmares caused by the early morning hypoglycemia.

Combination Therapy:



• Storage of Insulin:

- Opened vials, disposable insulin pens: at room temperature for up to 4 weeks
- Unopened vials, disposable insulin pens: Refrigerate them.
- Non-disposable insulin pens: Do not refrigerate
- Expiry date changes after open: 28 days once the patient starts using.

• Problems with Insulin Therapy:

- Hypoglycemia
- Allergic reactions
- Lipodystrophy.
- Somogyi Effect and Dawn phenomenon

The body's response to illness and stress is to produce glucose. Therefore, any illness results in hyperglycemia.

If in a doubt whether a client is hyperglycemic or hypoglycemic, treat for hypoglycemia.

- **Oral Hypoglycemic Agents:**

- **Metformin: Most used drug**

- Reduces glucose production by the liver and enhances insulin sensitivity at tissue level and improves glucose transport into the cells.
 - Do not use in patient with kidney disease, liver disease, or heart failure.
 - Lactic acidosis is a rare complication of metformin accumulation .
 - Discontinue before surgery or any procedures involving contrast media and should not resume until 48 hours afterward once their serum creatinine has been checked and is found to be normal

- **Nutritional Therapy:**

- Eating three meals per day at regular times and eating at intervals no more than 6 hours apart.
 - Limiting sugars and sweets such as sugar, regular pop, desserts, candies, jam, honey. Limiting the amount of high-fat food such as fried foods, chips, and pastries.
 - Eating more high-fiber foods.
 - Drinking water if thirsty.
 - Adding physical activity to the lifestyle.
 - Protein: 15-20%, fat: less than 35%, Fiber: 25-50g/day, Carbohydrate: 45-60%
 - Limit alcohol consumption 1-2 standard drinks/day.

Exercise:

- Regular, consistent exercise.
 - Exercise potentiates the effect of insulin.

- **Sick days and Insulin:**

Never miss a dose especially if you are sick.

- **Acute complications:**

Hypoglycemia: (Both Type 1 and Type 2): Blood Glucose <4.0

Causes:

- Too little food.
 - Too much medication.
 - Too much exercise.
 - Alcohol taken without food

Clinical Manifestations:

Diaphoresis, tremors, hunger, nervousness, anxiety, pallor, palpitations, altered cognitive functioning (Neuroglycopenic signs): Confusion, difficulty speaking, stupor, visual disturbances, irritability and coma.

Untreated hypoglycemia: Loss of consciousness, seizures, coma, and death

- **Treatment:**

- 15-20g of simple carbohydrates orally.
- Injection Glucagon 1mg IM or Subcut.
- 20-50mL of 50% dextrose IV push
- Monitor Blood sugar every 15 min.

- **Hyperglycemia: DKA and HHS**

Diabetic ketoacidosis: Blood glucose >14.

- Fats are metabolized in the absence of insulin.
- Profound deficiency of insulin; Hyperglycemia(ketosis) metabolic acidosis, dehydration.

- **Most likely seen in Type 1 DM.**

Causes: Illness, infection, inadequate insulin dosage, insulin omission, undiagnosed DM, poor self-management.

Clinical manifestations:

D: Dehydration

K: Ketonuria, ketones in blood, Kussmaul's respiration, Increased K⁺

A: Acidosis, Acetone breath, Abdominal pain with Nausea and vomiting

Treatment:

D-Dehydration First: 0.9% normal saline

K- Kill the sugar (**Slowly**) prevent rapid hypoglycemia.

Hourly BS checks "**Land the plane slow and smooth**"

Over 250: IV regular insulin **only**.

Below 200: SQ insulin + 1/2 NS with D5W.

A: Add **K⁺** even if it's normal

During IV insulin

**2. Hyperosmolar Hyperglycemic State: Blood Glucose >34.
Most likely in Type 2 DM**

Clinical Manifestations: Dehydration, confusion, coma, seizures, hemiparesis, aphasia.

Treatment:

H: Hydration 0.9% NS.

S: Stabilize sugar (IV regular insulin).

- **Chronic Complications:**

- Neuropathy
- Retinopathy
- Nephropathy

Why do client with Diabetes have trouble with wound healing?

High blood glucose contributes to damage of the smallest vessels, the capillaries. This damage causes permanent capillary scarring, which inhibits the normal activity of the capillary. This phenomenon causes disruption of capillary elasticity and promotes problems such as diabetic retinopathy, poor healing of breaks in the skin, and cardiovascular abnormalities.

Comparison of Hyperglycemia and Hypoglycemia

Hyperglycemia		Hypoglycemia	
Signs and symptoms	Nursing Action	Signs and symptoms	Nursing Action
Polydipsia	Encourage water intake.	Headache, nausea, sweating	Usually occurs rapidly and is potentially life threatening, treat immediately with complex carbohydrates.
Polyuria, Polyphagia and blurred vision	Check blood glucose frequently.		
Weakness, Weight loss	Urine for ketones and glucose.	Tremors, lethargy, Hunger, confusion, slurred speech, tingling around mouth, anxiety, nightmares.	Check blood glucose (may seize if less than 40).
Syncope	Administer insulin as directed.		

Thyroid disorders:

1. Hyperthyroidism (Hyper-Metabolism) High T3 and T4/ Low TSH.

Hyperactivity of the thyroid gland with sustained increase in synthesis and release of thyroid hormones.

Emergency Condition: Thyroid storm “Thyrotoxicosis”

Causes: Grave's Disease and Goiter

Too much iodine.

Too much thyroid medication (Levothyroxine)

Clinical Manifestations: Decreased weight, tachycardia, **increased BP, agitation, restlessness**, nervousness, diarrhea, increased energy, bulging eyes(**exophthalmos**), warm skin,

Management:

Exophthalmos: Use eye patch/ tape eyelids down.

Radioactive Iodine Therapy: (To destroy thyroid cells).

non-pregnant adults,

Watch out for urine: Use private bathroom and Flush 2-3 times

Antithyroid Drug Therapy:

PTU: Propyl-thiouracil, Methimazole

Education: Isolation, wear masks, no kids,

Diet: High metabolism
 High calories: 4000-5000/ day.
 High protein and carbs.
 Not high fiber: Low fiber diet.
 No caffeine: Coffee, soda and tea.
 No spicy food.

Surgical Removal:

Thyroidectomy (Remove thyroid)

Total Thyroidectomy	Sub-total thyroidectomy
1. Need lifelong T3, T4 hormone replacement 2. At risk for hypocalcemia 3. S/S of hypocalcemia: _____ 4. Post-op risks: First 12 hours Airways and Hemorrhage 5. Post-op risks: 12-48 hours Thyroid Storm	1. At risk for Thyroid storm 2. S/S of thyroid storm a. very high fever >104 b. Psychotic Delirium (Life threatening priority) 3. Treatment: a. Wait out: either die or come out, give O2 lower body temperature b. Tx: focuses on saving the brain until they come out of it. c. Lowering body temperature i. Ice packs: On axilla, groin, back and neck ii. Cooling blanket iii. Post-op risks: first 12 hours:

Postoperative thyroidectomy

Be prepared for the possibility of **laryngeal edema**. Put a tracheostomy set at the bedside along with O2 and a suction machine; Calcium gluconate should be easily accessible.

Hypothyroidism (Hypo-metabolism) Hashimoto's Low/Slow.

Results from insufficient circulating thyroid hormone.

Clinical Manifestations: Low and slow/ Hypo.

Obesity, boring, dull, cold intolerant, dry skin, extreme fatigue, low body temperature, constipation, hair loss, Low mental forgetful, low mood, apathy, confusion.

Labs: Low T3 and T4/ TSH high.
 TSH is always opposite of T3 and T4.

Management:

Thyroid Hormone Replacement Therapy
 Levothyroxine (Synthroid, Eltroxin),
 S/E: Increases the cardiac workload, Increase myocardial O2 demand.

Nursing Care:

Do not sedate the patient.

NPO before surgeries but don't withhold the thyroid meds ,
Low calorie diet to promote weight loss.
Diabetics need to check the blood sugar more frequently.

Complication: Myxedema Coma
Respiratory failure.

Priority: Place Tracheostomy kit by bedside.

Medical emergency

Precipitated by: infection, drugs, exposure to cold, trauma
S/S: Subnormal temperature, hypotension and hypoventilation.
Treatment: IV Thyroid hormone replacement (Levothyroxin)

Diet: High fiber diet, including fresh fruits and vegetables (Low metabolism).
Low Calories.
Low energy "Frequent rest period"

Adrenal Gland Disorders

Addison's disease: Adrenocortical Insufficiency

A disorder in which the adrenal glands don't produce enough hormones.
Specifically, the adrenal glands produce insufficient amounts of the hormone cortisol and sometimes aldosterone, too. When the body is under stress (e.g. fighting an infection), this deficiency of cortisol can result in a life threatening **Addison crisis** characterized by low blood pressure.

Symptoms tend to be non-specific and include fatigue, nausea, darkening of the skin and dizziness upon standing.

S/S: Skin hyperpigmentation, hypotension, hyponatremia, hyperkalemia, N/V, diarrhea, loss of libido, Irritability and depression
Don't adapt to stress
Rx: Give steroids (Glucocorticoids and mineralocorticoids): ending in -sone

Cushing's syndrome: Adrenocortical Excess

A condition that occurs from exposure to high cortisol levels for a long time.

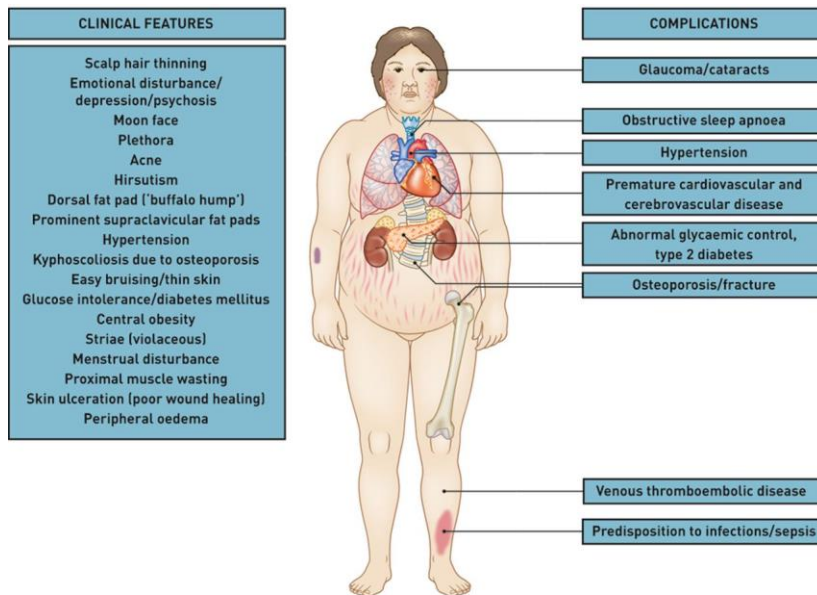
The most common cause is the use of steroid drugs, but it can also occur from overproduction of cortisol by the adrenal glands.

S/S: Refer to Figure

Rx: Adrenalectomy: 1st choice

Drug therapy if surgery is contraindicated: Mitotane, Ketoconazole Inhibits Cortisol production and metabolism.

Gradual tapering of steroid meds if the disease developed during prolonged administration of corticosteroids (Prednisone).



Pheochromocytoma

Rare condition characterized by a tumor of the adrenal medulla.

Common in young middle-aged adults

S/S: Severe, episodic hypertension with severe pounding headache, tachycardia with palpitations, profuse sweating, unexplained abdominal) and chest pain

Rx: Surgical removal of tumor, adrenalectomy, anti-hypertensive drugs.

Pituitary Gland disorders

SIADH: Syndrome of inappropriate Antidiuretic Hormone

Pituitary Gland: ADH (Antidiuretic hormone).

Nursing care: Daily weights not weekly.

Causes: Small cell lung cancer.

Severe brain trauma.

Sepsis infections of brain (Meningitis).

Labs: Low urine output cause High specific gravity 1.030+
Hyponatremia

Patho, s/s, Treatment

Low urine output, high urine specific gravity, hyponatremia, seizures, severe high blood pressure.

Management: Stop all fluids, give salt and diuretics.

DI (Diabetes Insipidus) Dry inside.

“Die”: ADH

Causes: D: Damage to brain (Tumors, trauma and surgery).

Labs: Dry inside “high and dry labs”

Hypernatremia over 145+

High urine output cause low urine specific gravity.

Patho/ S/S/Treatment

D: Drinking a lot “thirsty”

Dry mucosa and skin.

Decrease blood pressure.

Increase urine output

Death by headache (High Na+).

Urinating too much (polyuria) can cause severe dehydration and very high sodium levels.

Treatment:

D: Desmopressin, “Vasopressin” ADH.

Headache: Priority

Teach exercise regimen because exercise decreases blood sugar levels.

1. Exercise after mealtime; either exercise with someone or let someone know where the exercise will take place to ensure safety.

2. A snack may be needed before or during exercise.

3. **Monitor blood glucose before, during, and after exercise when beginning a new regimen.**

If in doubt **whether a client is hypoglycemic or hyperglycemic, treat for hypoglycemia.**

- Self-monitoring of blood glucose (SMBG):

- Frequency of monitoring based on treatment regimen, changing meals, illness, and exercise regimen

- Requires recording results and reporting results to the healthcare provider at the time of visit

- Results of monitoring used to assess the efficacy of therapy and to guide adjustment in medical nutrition therapy, exercise, and medication to achieve the best possible blood glucose control.

- **The body's response to illness and stress is to produce glucose.**

Therefore, any illness results in hyperglycemia.

Important points:-

EXERCISE - It is important to self-monitor blood glucose levels before, during, and after exercise to determine the effects exercise has on blood glucose levels at particular times of the day.

- Before exercise, if **blood glucose is less than or equal to 100 mg/dl**, eat a **15-g carbohydrate snack.**

After 15 to 30 min, retest blood glucose levels. **Do not exercise if < 100mg/dl.**

-Before exercise, if **blood glucose is greater than or equal to 250 mg/dL** in a person with type 1 diabetes and ketones are present, avoid vigorous

activity.

Metformin

- *Do not use in patients with kidney disease, liver disease, or heart failure.

Lactic acidosis is a rare complication of metformin accumulation.

- *IV contrast media that contain iodine pose a risk of acute kidney injury, which could exacerbate metformin-induced lactic acidosis.

- * To reduce risk of kidney injury, discontinue metformin a day or two before the procedure.

- *May be resumed 48 hours after the procedure assuming kidney function is normal.

- *Do not use in people who drink excessive amounts of alcohol.

Can lead to Vitamin B12 deficiency.

Role of Registered Nurse (RN)

- *Assess for risk factors for pre diabetes and type 1 and type 2 DM.

- *Teach the patient and caregiver about self-management of DM, including self-monitoring of blood glucose (SMBG), insulin, noninsulin injectables, nutrition, physical activity, and recognition and management of hypoglycemia.

- *Develop a plan to avoid hypoglycemia or hyperglycemia in the patient with DM who is acutely ill or having surgery.

- *Assess for acute complications and implement appropriate actions: hypoglycemia, diabetic ketoacidosis (DKA), and hyperosmolar hyperglycemic syndrome (HHS).

- * Assess for chronic complications of diabetes, including cardiovascular disease, retinopathy, nephropathy, neuropathy, and diabetic foot complications

- *Teach patient and caregiver about prevention and management of chronic complications of diabetes.

---Role of Licensed Practical/Vocational Nurse (LPN/LVN)

- *Administer OAs and routinely scheduled insulin regimens.

- *Monitor the diabetic patient for symptoms of hypoglycemia, DKA, and HHS

- *In the ambulatory or home setting, monitor patient self-management of insulin, OAs, nutrition, and physical activity.

- *Report concerns with patient self-management in the home setting to the RN

----Role of Unlicensed Assistive Personnel (UAP).

- *Check capillary blood glucose (CBG) levels (after being trained and evaluated in this procedure) and report values to the RN.

- *Report changes in patient vital signs, urine output, behavior, or level of

consciousness to the RN.

Preventive foot care instructions

- Provide meticulous skin care and proper foot care.
- Inspect feet daily and monitor feet for redness, swelling, or break in skin integrity.
- Notify the health care provider if skin integrity is impaired.
- Avoid thermal injuries from hot water and heating pads.
- Wash feet with warm not hot water and dry thoroughly.
- Avoid treating corns, blisters or ingrown toenails.
- Do not cross legs or wear tight garments that may constrict blood flow.
- Apply moisturizing lotion to the feet but not between the toes.
- Prevent moisture from accumulating between the toes.
- Wear loose socks and well-fitting shoes; do not go barefoot.
- Wear clean cotton socks to keep the feet warm and change the socks daily.
- Avoid wearing open toed shoes or shoes with a strap that goes between the toes.
- Follow up with podiatry referral and recommendations as needed.

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