

Endocrine System Drugs

Review the A&P of Endocrine System and Key Terms

Drugs Affecting the Endocrine System

Posterior Pituitary Hormones

- Animal posterior pituitary hormone extract
- Examples: Pitressin (vasopressin) IM, SC
DDAVP (desmopressin) synthetic. IV, SC, intranasal
- MOA: Natural antidiuretics. Produces concentrated urine by increasing tubular reabsorption of water.
- Uses: Diabetes insipidus, SIADH caused by trauma, surgery, etc. Bedwetting (DDAVP)
- Monitor BP, I&O, weight, and urine specific gravity.

Pitocin (oxytocin)

- Posterior pituitary hormone
- MOA: Enhances contractile activity of the uterine smooth muscle.
- Uses: Induce or stimulate labor, control post partum hemorrhage.
- Adverse Effects: Uterine rupture, fetal hypoxia or trauma.
- Nursing Measures: Accurate dose, Close monitoring of contractions and FHT in labor. Add drug to IV bag after IV is started.

Anterior Pituitary Hormones

- Example: Genotropin (somatropin)
- MOA: Promotes growth in children whose growth has been impaired by a deficiency of growth hormone.
- Uses: Children with deficiency of growth hormone, adults with deficiency of growth hormone from disease, surgery or radiation of pituitary.

Thyroid Hormones

- Examples: Synthroid, Levothroid (levothyroxine) synthetic thyroxine (T4)
- MOA: Increase metabolic activity of body
- Uses: Drug of choice for long-term hypothyroidism, simple goiter.
- Adverse Effects: S/S of hyperthyroidism – tachycardia, sweating, intolerance to heat, diarrhea, abd. cramping, weight loss, decreased bone density in the hip & spine.

Antithyroid Drugs

- Examples: PTU (propylthiouracil) prototype, Tapazole (methimazole), Lugol's solution (strong iodine solution).
- MOA: PTU and Tapazole interfere with synthesis of thyroid hormone and inhibits conversion of T4 to the more active T3.
- Lugol's Inhibits the release of thyroid hormone, causing them to accumulate in the thyroid gland.

Antithyroid Drugs

- Uses: Short-term treatment of hyperthyroid to bring patient to euthyroid pre-op, decrease the size and vascularity of thyroid pre-op.
- Adverse Effects: Hypothyroidism, hair loss, allergic reaction.

Corticosteroids

- Mineralocorticoids
- Example: Florinef (fludrocortisone)
- MOA: Promote Na and water retention. Help maintain fluid and electrolyte balance. Aldosterone is the main mineralocorticoid.
- Uses: Chronic adrenocortical insufficiency.
- Adverse Effects: Hypokalemia, fluid retention, hypertension, HA

Glucocorticoids

- Examples: Decadron (dexamethasone), Solu-Medrol (methylprednisolone), Prednisone, Celestone (betamethasone), Aristocort (triamcinolone), Nasonex, Azmacort
- MOA: Affect CHO, protein and lipid metabolism by: Increasing the catabolism of protein in bone, skin and connective tissue. Increasing output of glucose by the liver and decreasing cellular use of glucose. Mobilizing amino acids to increase energy in times of stress. Antiinflammatory response protects cells from damage related to immune response.

Glucocorticoids

- Uses: Replacement therapy in deficiency states. Antiinflammatory for hypersensitivity and inflammatory diseases like arthritis, lupus, psoriasis. Bronchospasm and edema related to emphysema, asthma and other respiratory diseases or injuries. Mature lungs in preterm fetus prior to delivery.
- Adverse Effects: Edema, hyperglycemia, hypokalemia, muscle wasting, peptic ulcer, hypertension, immunosuppression, increased WBC, masks signs of infection, thin skin.

Glucocorticoids

- Nursing Measures: Give PO with food. Give at 9am to mimic normal corticosteroid levels and minimize adrenal suppression. Weigh daily. Monitor BP, blood sugars, and electrolytes. Monitor for s/s of adverse effects.
- Teach to moderate salt intake, eat K rich foods, diet high in protein. Avoid licorice (may intensify hypokalemia), alcohol and caffeine. Medic Alert. Tapering drugs.

Adrenal Sex Hormones

- Androgens – male hormones secreted by the adrenal cortex in both sexes and are responsible for the physiological effects exerted by adrenal sex hormones.
- They increase protein synthesis (anabolism), which increases muscle and bone mass and strength, effect development of male secondary sex characteristics. They increase hair growth and libido in women. Excessive secretion: masculine effects in women.
- Female sex hormones exert few effects. Excessive secretion: feminine characteristics in men.

Drugs Affecting the Reproductive System

- Female Hormones:
- Estrogen and Progesterone
- Example: Oral contraceptives (OCPs)
- MOA: Estrogen prevents ovulation. Progesterone prevents implantation of ovum, decreases amount and increases viscosity of cervical mucous to impair sperm motility, and impedes motility of the ova by affecting peristalsis of the fallopian tubes.

OCPs

- Uses: Contraception, menstrual irregularities.
- Adverse Effects: N,V, HA, weight gain, fluid retention, breast tenderness, breakthrough bleeding.
- Contraindications: ABSOLUTE: Thrombophlebitis, CVA, breast cancer, pregnancy, liver disease or impairment, CAD, over 35 and smokes.

OCPs

- Nursing Measures: Teach how to take pill and how to use BUM to use with missed pills and antibiotic use. Encourage not to d/c pills without consulting HCP (30-50% stop before one year). Teach to report ACHES immediately and d/c pills.
- A=Abdominal pain
- C=Chest pain, cough, dyspnea H=HA severe, dizziness, numbness
- E=eye problems, vision loss, blurred vision
- S=severe leg pain, calf or thigh

Infertility Drugs

- Example: Clomid
- MOA: Stimulates secretion of FSH and LH which stimulates maturation of follicles, ovulation & development of the corpus luteum.
- Uses: Inadequate ovulation, low sperm count in males
- Adverse Effects: Similar to OCPs. Increased incidence of early abortion & multiple births.
- Teach to report pelvic pain immediately.

Oxytoxics

- Examples: Pitocin (oxytocin)
 - MOA: Enhances contractile activity of the uterine smooth muscle.
 - Adverse Effects: Uterine rupture, fetal hypoxia or trauma
 - Nursing Measures: Careful adm. and monitoring. Methergine (methylergonovine)
- MOA: Direct spasmogenic action on uterine muscle.
Uses: Post-partum hemorrhage only.
Adverse Effects: Hypertension, CVA

Premature Labor Inhibitors

- Examples: Yutopar (ritodrine)
- MOA: Selective beta 2 receptor agonist that activates the beta 2 receptors of the uterine smooth muscle inhibiting contractions.
- Uses: Preterm labor if gestation is > 20 weeks.
- Adverse Effects: N,V, HA, palpitations, tachycardia, hypotension.

Male Hormones

- Example: Testosterone
- Secreted by the testes
- Uses: Treatment of low sperm count and impotence caused by deficiency. Undescended testicles. Anabolic action in conditions such as osteoporosis, anemia, and debilitated states. Inoperable breast cancer in post menopausal women.
- Adverse Effects: Edema, acne, hirsutism, voice deepening, N&V, polycythemia, increased cholesterol, depression.
- Contraindications: Pregnancy, prostate cancer, breast cancer in males.

Drugs used to treat Diabetes

- Insulin
- MOA: Promotes the transport of glucose into the cells so it can be used as energy source. Promotes conversion of glucose to glycogen for storage in the liver and decreases production of glucose in the liver. Temporarily restores proper utilization of glucose and fats to prevent hyperglycemia, glucosuria, ketoacidosis, coma and death. Prevents free fatty acids from being converted to ketones.

Insulin

- Uses: Treatment of Type 1 diabetes, Type 2 diabetes that is uncontrolled with diet, exercise and oral medications, hyperglycemia caused by TPN, and to treat hyperkalemia (causes K to move from blood into cells).
- Adverse Effects: hypoglycemia
- Contraindications: Hypoglycemia, hypersensitivity to pork for pork insulin.
- There are different types of insulin. Some are from pork. The most frequently used is human insulin which differs from pork by one amino acid. Human insulin is synthetic that is made with recombinant DNA techniques using E-coli or by replacing the single different amino acid to modify pork insulin. The term human means it is identical to human insulin, not obtained from human pancreas.

Short Acting Insulin

- Regular: Regular Inletin II, Humulin R, Novolin R
- Clear solution, SC or IV (the only IV insulin).
- Rapid acting.
- Onset ½-1 hour, peak 2-3 hr, duration 5-7hr.

Intermediate Acting Insulin

- Isophane insulin suspension – NPH, NPH Iletin II, Humulin N, Novolin N.
- Modified by adding protamine and zinc.
- Insulin zinc suspension – Lente, Iletin II, Lente L, , Humulin L, Novolin L.
- Modified by adding zinc. May be used interchangeably with NPH insulin.
- Onset 1-1½ hr, peak 8-12 hr, duration 18-24 hr.

Long Acting Insulin

- Extended Insulin zinc suspension: Humulin U, Ultralente
- Modified by adding zinc. Large crystals that are absorbed slowly.
- Route - SC
- Onset 4-8 hr, peak 10-30 hr, duration > 36 hr.
- Rarely used.

Mixed Insulin

- NPH 70%, Regular 30% - Humulin 70/30, Novolin 70/30.
- NPH 50%, Regular 50% - Humulin 50/50
- Stable mixtures with onset, peak and duration of action the same as the N and R components.
- Route - SC
- Frequently used when patients have trouble mixing N and R insulin accurately themselves.

Insulin Analogs

- Insulin Lispro – Humalog
- A synthetic insulin made using recombinant DNA techniques. Two amino acids are reversed to make it have a faster peak and shorter duration of action than regular insulin.
- It is intended for use with an intermediate acting insulin.
- Route - SC
- Onset 15 min, peak ½-1 1/2 hr, duration 6-8
- More effective than R at decreasing postprandial glucose and decreasing incidence of hypoglycemia before next meal.

Insulin Analogs

- Insulin aspart – Novalog
- Similar to Humalog
- Has even more rapid onset and shorter duration than Humalog.
- Route - SC
- Onset 15 min, peak 1-3 hr, duration 3-5 hr.

Insulin Analogs

- Insulin gargline – Lantus
- MOA: Long acting provides action similar to endogenous insulin secretion. Recombinant DNA technique alters amino acid structure. No addition of zinc or protamine.
- Route – SC once daily, usually at bedtime.
- Onset 1 hr, peak NONE, duration 24 hr.
- Clear solution, must not be diluted or mixed with any other insulin or solution.

Nursing Measures

- Careful administration of correct dose.
- Close observation for hypoglycemia (before lunch for R and before dinner for N).
- Monitor blood glucose.
- Ensure compliance with diet.
- When giving IV use glass bottles because insulin adheres to plastic bags and tubing (up to 30% of dose).
- Observe circulation – foot care.

Patient Education

- Instruct patient and a family member:
- Type of insulin, differences in types.
- Dosage and how to draw up and administer SC in abdomen rotating sites.
- S/S of hypoglycemia (HA, hunger, nervousness, weakness, tachycardia, blurred vision, disorientation, sweating, unconsciousness, seizures).
- Teach how to check blood glucose.

Patient Education

- Teach how to treat hypoglycemia: Take 4 oz of OJ for < 70 and recheck glucose in 15 min., if < 70 repeat the OJ. If longer than 30 min. to next meal, eat a snack.
- Be sure they understand diabetic diet, sick day diet and the importance of compliance.
- Be sure they understand the importance of regular exercise, foot care, and need for regular check-ups and eye exams.
- Instruct family how to manage unconscious patient and how to use Glucagon.

Oral Hypoglycemic Agents

- Sulfonylureas – the oldest and largest group or oral agents. Second generation agents are safer and more potent than first generation agents such as Diabinese.
- Examples: Amaryl (glimepiride), Glucotrol (glipizide), DiaBeta, Micronase (glyburide).
- MOA: Stimulate the production of insulin in patients who still some ability to produce insulin. Increase the number of insulin receptors on the cells and may influence activity within the cells after glucose is inside.

- Uses: Type 2 Diabetes
- Adverse Effects: Hypoglycemia, N,D, rash.
- Contraindications: Sulfa allergy, pregnancy and lactation, severe liver or renal disease.
- May be used alone or in combination with other oral agents or with insulin.

Alpha Glucosidase Inhibitors

- Examples: Precose (acarbose), Glyset (migitol).
- MOA: Block alpha-glucosidase in the small intestines to reduce CHO absorption. This helps prevent postprandial hyperglycemia.
- Uses: Type 2 Diabetes
- Adverse Effects: Hypoglycemia, flatulence, abdominal pain, D.
- Take with first bite of meal. Use glucose tablets or gel for hypoglycemia because it can inhibit the breakdown of sucrose to glucose.

Biguanides

- Example: Glucophage (metformin)
- MOA: NO stimulation of insulin release. Potentiates insulin suppression of gluconeogenesis. Enhances glucose utilization by muscles by recruitment of glucose transporters. Increases intestinal utilization of glucose and reduces intestinal absorption of glucose.
- Uses: Type 2 Diabetes
- Adverse Effects: Rare lactic acidosis (use of alcohol or steroids increase risk), bloating.
- Contraindications: Real impairment.

Glitazones/TZDs/Insulin Sensitizers

- Examples: Actos (pioglitazone), Avandia (rosiglitazone)
- MOA: Decrease insulin resistance. Stimulate muscle, fat, and liver cell receptors to increase or restore the effectiveness of circulating insulin. This leads to increased uptake of glucose by the tissues and suppresses production of glucose by the liver.
- Uses: Type 2 Diabetes
- Adverse Effects: Liver toxicity – must check labs.
- There is an increased response in females and in obese clients.

Meglitinides

- Examples: Prandin (repaglinide), Starlix (nateglinide)
- MOA: Nonsulfonylureas that stimulate secretion of insulin.
- Uses: Monotherapy or with metformin.
- Onset 20 min., peak 1 hr, duration 3-4 hr.
- Take with or 30 min. before meals. If a meal is skipped the dose should be skipped. If meal is added, add a dose.

Hyperglycemic Agents

- Glucagon
- MOA: Appears to increase synthesis of cAMP and phosphorylase activity which increases hepatic gluconeogenesis.
- Uses: Emergency treatment of severe hypoglycemia reactions when patient is unconscious or unable to swallow.