

# PHARMACOLOGY FOR NURSES

## Part II

**Dr. Nasser Abu-El-Noor**

2013

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

**The Islamic University**  
Faculty of Nursing



## Pharmacology For Nurses (2)

Nurs 2307

### **Prerequisites:**

Anatomy and physiology.

### **Teacher :**

Nasser Abu-El-Noor, R.N., M.S.N, Ph.D.

### **Placement :**

**Semester 4**

### **Credits:**

The course is made up of 2 credit hours.

### **Course description:**

The course aims to provide the nursing students the essentials of pharmacology, with the emphasis on the application of the nursing process, drug actions, uses, routes of administration, dosages, adverse reactions, contraindications, nursing implications, and patient and family teaching about specific drugs information. Antidotes of some commonly known risky drugs and drug reactions are going to be tackled during the course period.

### **Course objectives:**

**On completion of this course the student will be able to:**

1. Accurately perform mathematical calculations when they are necessary to calculate drug dosages.
2. Demonstrate awareness of various nursing responsibilities before, during, and after drug administration.
3. Apply the nursing process to drug administration.
4. Express knowledge of various significant drugs in regard to classifications, routes, doses, and adverse effects.
5. Follow proper nursing implications when administering medications to patients.
6. Offer the necessary teaching about drug therapy for both patients and their families.
7. Recognize the dangers of medications and handling them with great caution.

### **Teaching Method:**

- Lectures.
- Discussion

### **Evaluation:**

- Midterm exam.....30%
- Quizzes .....15%
- Attendance .....05%
- Final exam..... 50%

### Expectations:

1. Students are expected to attend all lectures, unless if there is an excused absence. You should at least attend 75% of the lectures. If you will be absent for more than 25% of the lectures, you will not pass the course.
2. In case if an emergency happens during the midterm exams, you should provide a written excuse for the professor within one week of the exam time. If you provide the excuse within one week, **it will not be accepted** and you will receive a zero in the course. If your excuse will be accepted, the grade for that exam will be added to the grade of the final exam.

### Course Outlines:

1. Cardiac drugs
2. Antihypertensive drugs
3. Antiarrhythmic agents
4. Drugs affecting The Central Nervous system
5. Centrally acting skeletal muscle relaxants
6. Narcotic Analgesics & Antagonists
7. Non-narcotic Analgesics & Antipyretics
8. Antirheumatic & Nonsteroidal Anti-inflammatory Agents
9. Anti-gout Agents
10. Drugs Affecting the Autonomic Nervous system
11. Adrenergic blocking (sympatholytic) Agents
12. Cholinergic Blocking (Parasympatholytic) Drugs
13. Drugs affecting the respiratory system
14. Antihistamines
15. Drugs affecting the G.I.T.
16. Hormones & Hormone Antagonists
17. Oral Contraceptives
18. Diuretics

### References:

1. Loebel S., et. Al. (1991). The Nurse's Drug Handbook, sixth edition, Wiley Medical Publications, New York.
2. Scherer, C. (1988). Introductory Clinical Pharmacology, third edition, Philadelphia, Lippincott.
3. Skidmore, L (1993). Mosby's Nursing Drug Reference, St. Louis C.V., Mosby.

## Cardiac drugs

### Cardiac glycoside

- Cardiac glycosides are the most effective drugs for treatment of C.H.F.
- Digitoxins are plant alkaloids.
- They increase myocardial contractions, which will increase blood supply to all organs including the kidneys therefore causing diuresis, which will decrease the edema.
- They are used to treat cardiac arrhythmia because they decrease heart rate.

#### ▪ **Action:**

- They increase the force of myocardial contractions (positive inotropic).
- It increases the contractility of the heart muscle by minimizing the movement of  $\text{Na}^+$  and  $\text{K}^+$  ions and increasing the release of  $\text{Ca}^{++}$  ions in the myocardial cells.
- It decreases the heart rate due to increase in parasympathetic nervous system and decrease in the sympathetic tone.
- They are primarily excreted through the kidneys.
- The initial dose is the larger dose (the loading or digitalizing dose), the subsequent doses are referred to as (Maintenance doses).

#### ▪ **Results:**

- Decrease in venous pressure.
- Coronary dilatation.
- Reduce heart size.
- Marked diuresis and decreasing edema.

#### ▪ **Indications:**

1. Congestive heart failure (C.H.F).
2. Cardiac arrhythmia (atrial fibrillation, atrial flutter and sinus tachycardia).

#### ▪ **Contraindication:**

1. Hypersensitivity.
2. Angina pectoris in absence of CHF.
3. Given with caution for elderly and people who have kidney failure.

#### ▪ **Side effects:**

1. They are extremely toxic and may cause death.

2. There is a narrow margin of safety between the therapeutic dose and the toxic dose.
3. Could cause overdose by cumulative effects of the drug, so frequent assessment of the serum level is essential.
4. May cause cardiac arrhythmia such as bradycardia (below than 60 beat/minute), ventricular fibrillation (which may lead to cardiac arrest and death), and Bigeminal rhythm.
5. Nausea, vomiting, and diarrhea.
6. Headache, malaise and muscle weakness.
7. Skin rashes, blurring of vision, diplopia and white halos.

▪ **Note:**

- Patients suffering from digitalis intoxication should be admitted to the ICU for continuous monitoring of ECG. Administration of digitalis should be halted.
- If serum potassium is below normal, administer  $K^+$  salts and give antiarrhythmic drugs as Lidocain as ordered by Dr.

▪ **Drug interactions:**

1. Antacid (they decrease the effect of digitalis).
2. Furosemide (Lasix): it increase  $K^+$  loss and increase the chance for digitalis toxicity.

▪ **Predisposing factors for digitalis toxicity:**

1.  $K^+$  loss (hypokalemia) which results from: diuretics, NPO, gastric suction, and poor  $K^+$  intake.
2. Pathological conditions;
  - a. Liver disease: they decrease metabolism and therefore increase digitalis level.
  - b. Kidney disease: they decrease the excretion of drug and therefore increase digitalis levels.

▪ **Nursing considerations:**

- Check doctor's order, medication record and bottle label accurately.
- Observe & monitor for evidence of bradycardia or arrhythmia.
- Measure intake and output accurately.
- Weigh the patient in daily basis.
- Pulse should be checked by 2 nurses.

- Provide the client with food high in potassium as banana, orange.
- Monitor serum digoxin level.
- Elderly people should be assessed for early signs of toxicity.
- Teach patients that bradycardia, nausea, vomiting, diarrhea, appetite loss, and visual disturbances could be early signs of toxicity.
- Teach client if heart rate is less than 60/minute to hold the medication and see the doctor.
- Have digoxin antidote available (digoxin immune FAB).

▪ **Drugs:**

1. **Digitoxin:**                                 crystodigin  
 Class:             cardiac glycoside  
 Uses:             drug of choice for maintenance in CHF.  
 Dose:             Digitalizing dose is 0.6 mg in 4-6 hours.  
 Maintenance: 0.05 – 0.3 mg/day.

2. **Digoxin:**   Lanoxin  
 Class:            cardiac glycoside.  
                     It is the drug of choice for CHF because of:

1. It has rapid onset.
2. It has short duration.
3. It can be administered P.O. or IV.

Dose:            digitalization dose = 0.4 – 0.6 mg followed by 0.05 – 0.35 mg once or twice daily.

3. **Digoxin Immune FAB: (Ovine)**  
 Class:            digoxin antidote.  
 Action:           antibodies bind to digoxin and excreted through the kidneys.  
 Uses:            life threatening digitalis toxicity or overdose.  
                     Note: cardiac arrest can be expected if an adult ingests 10 mg  
                     or if a child ingests 4 mg.

### Coronary vasodilators

#### Antianginal drugs

❖ **Angina pectoris:** is a clinical syndrome characterized by paroxysm of pain in the anterior chest caused by insufficient coronary blood flow and/or inadequate oxygen supply to the myocardial muscle.

Causes: (1) Atherosclerosis. (2) Vasospasim.

❖ There are three groups of drugs used for treatment of angina:

1. Nitrates/nitrites.
2. Beta-adrenergic blocking agents.
3. Calcium channel blocking agents.

❖ **Nitrates/nitrites:**

- Nitrates/nitrites - Action: direct relaxation of blood vessels and smooth muscles  
vasodilatation  $\longrightarrow$   $\downarrow$  O<sub>2</sub> requirements.
- Relaxation of smooth muscles of coronary arteries  $\longrightarrow$  coronary  
vasodilatation  $\longrightarrow$   $\uparrow$  blood supply to the myocardium.
- Relaxation of arteries and veins  $\longrightarrow$   $\downarrow$  BP  $\longrightarrow$   $\downarrow$  workload in the  
heart.

❖ **Objectives of treatment:**

1. Treatment of anginal attack and thus relief pain.
2. Prophylactic treatment to prevent or delay the occurrence of MI.
3. Prolongs intervals between attacks.

❖ **Indications:**

1. Prophylaxis and treatment of acute angina pectoris.
2. Treatment of chronic angina pectoris.
3. Treatment of hypertension associated with MI or CHF.
4. Nitroglycerin ointment for treatment of Raynaud's disease.

❖ **Contraindications:**

1. Sensitivity to nitrates  $\longrightarrow$  Hypotension.
2. Severe anemia.
2. Hypotension.
3. Head trauma.
4. Cerebral hemorrhage.

❖ **Side effects:**

1. Headache, syncope, dizziness.
2. Postural hypotension, transient flushing, and palpitation.
3. Topical application may lead to dermatitis.

- ❖ **Drug interaction:** Antihypertensive agents, Beta-adrenergic blocking agents, and calcium-channel blocking agent (they may lead to additive hypotension).
- ❖ **Dosage:** there are several forms available:
  1. Sublingual: Cordil 5 mg PRN.
  2. PO: Isotard 20 – 40 mg twice a day.
  3. Topical: available as patches or ointment.
  4. Parental (IV infusion).
- ❖ **Nursing considerations:**
  1. Medications should be taken on an empty stomach.
  2. Carry sublingual tablets in a glass bottle, tightly capped.
  3. If anginal pain is not relieved in 5 minutes by first sublingual tablet, to take up to 2 more tablets at 5 minutes interval. If pain has not subsided 5 minutes after the 3<sup>rd</sup> tablet, client should be taken to the emergency room as this case could be an infarction (MI) and not angina.
  4. Take sublingual tablets 5-15 minutes prior to any situation likely to cause anginal pain such as climbing stairs.
  5. Take sublingual tablets while sitting to avoid postural hypotension.
- ❖ **Isosorbide dinitrate:**
  - Present in the forms of capsules chewable, sublingual, tablets.
  - **Trade names:** Isoral, Cordil, Isotard.
  - **Class:** coronary vasodilator.
  - **Dosage forms:** caps 20-40 mg, tabs 20-40 mg.
  - **Uses:**
    - Tabs for only prophylaxis of anginal pain.
    - Chewable, sublingual to terminate acute attack and relieve acute pain.
    - Esophageal spasm.
  - **Side effects:** Headache, hypotension.
  - **Dosage:**
    - Sublingual: acute attack 2.5-5 mg Q 2-3 hrs.
    - Oral caps/tabs: 5-20 mg Q 6 hrs.
    - Extended release tabs: 20 –80 mg Q 8-12 hrs.
  - **Note:** Isosorbide mononitrate given for patients with liver impairments.



❖ **Calcium channel blocking agents:**

-**Action:** for contraction of cardiac and smooth muscle to occur, extracellular calcium must move into the cell through openings called calcium channels.

These agents inhibit the influx of calcium through the cell membrane resulting in a depression of automatically and conduction velocity in both smooth and cardiac muscles leading to:

1. ↓ Myocardial contractility.
2. Inhibit spasm of coronary arteries → dilatation.
3. Peripheral vasodilatation → ↓ peripheral resistance.
4. ↓ S. A. node automatically and conduction → ↓ heart rate.

▪ **Diltazem Hcl: Cardiazem, dilatam.**

- Class: calcium channel blocking agent (anti-angina, antihypertensive).
- Uses: vasospastic angina, essential hypertension.
- Contraindications: hypotension, pulmonary congestion, and MI.
- Side effects: AV block, bradycardia, CHF. Hypotension.
- Dosage: 30 mg qid before meals and at bedtime.

▪ **Nifedipine: Adalat**

- Class: calcium channel blocking agent (anti-angina, antihypertensive).
- Uses: vasospastic angina, essential hypertension.
- Contraindications: hypersensitivity, lactation.
- Side effects: pulmonary and peripheral edema, MI, hypotension, dizziness, light-headedness, palpitation, headache, muscle cramps.
- Dosage: 10- 30 mg tid.
  - In hypertensive emergencies: 10-20 mg given orally or sublingually by puncturing the capsule and squeezing contents under the tongue.

**Amlodipine besylate**

**Trade name:** Amicore

**Class:** calcium channel blocking agent (anti-angina, antihypertensive).

**Use:** Angina and hypertension.

**Dose:** Initially, 2.5 to 5 mg P.O. daily. Dosage adjusted according to patient response and tolerance. Maximum daily dose is 10 mg.

### **Adverse reactions**

CNS: headache, fatigue, dizziness, light-headedness, paresthesia.

CV: edema, flushing, palpitations.

GI: nausea, abdominal pain.

Musculoskeletal: muscle pain.

Respiratory: dyspnea.

Skin: rash, pruritus.

### **Contraindications & cautions**

Contraindicated in patients hypersensitive to drug.

Use cautiously in patients receiving other peripheral vasodilators, especially those with severe aortic stenosis, and in those with heart failure.

Because drug is metabolized by the liver, use cautiously and in reduced dosage in patients with severe hepatic disease.

### **Nursing considerations**

Monitor blood pressure frequently during initiation of therapy. Because drug-induced vasodilation has a gradual onset, acute hypotension is rare.

Notify doctor if signs of heart failure occur, such as swelling of hands and feet or shortness of breath.

Teach patient to continue taking drug, even when feeling better.

Grapefruit juice may increase drug level and adverse reactions. Discourage use together.

### ▪ **Verapamil: *Ikacor***

**Class:** calcium channel blocking agent (anti-angina, antihypertensive, antiarrhythmia).

- **Uses:**

- **P.O:**

- angina pectoris.
- arrhythmia (atrial fibrillation, and flutter).
- Essential hypertension.

- **IV:** supraventricular tachycardia.

- **Contraindications:** hypotension, cardiac shock, and MI.

- **Side effects:** AV block, bradycardia, headache, dizziness, abdominal cramps, blurring of vision, and edema. .

- **Dosage:** Initial 80-120 mg tid then 240-480 mg /day.

- **Nursing considerations for calcium channel blocking agents:**
  1. Discuss with the patient/family the goals of therapy.
  2. Teach them how to take pulse and blood pressure. Hold the medication in case of hypotension or bradycardia and consult the treating Dr.
  3. Instruct the client to report any untoward signs as dizziness.
  4. In case of postural hypotension, advise the client to change position slowly.
  5. Advise client to sit down immediately if fainting occurs.
  6. Calcium antagonists should be taken with meals to ↓ GI irritation.
    - **Beta-adrenergic blocking agents:**
      - Will be discussed later.
  
- **Peripheral vasodilators:**
  - **Isoxsuprine:**
    - **Trade name:** Vasodin.
    - **Class:** peripheral vasodilator.
    - **Action:** Direct relaxation of vascular smooth muscles increasing peripheral blood flow, the drug also has a cardiac stimulation and uterine relaxation effect “Alpha receptor blocking and Beta receptor stimulation.
    - **Uses:**
      1. Symptomatic treatment of cardiovascular insufficiency.
      2. Buerger’s disease.
      3. Raynaud’s disease.
    - **Contraindications:** postpartum period, arterial bleeding.
    - **Side effects:** tachycardia, hypotension, chest pain, nausea, vomiting, rash, dizziness.
    - **Dosage:** 10-20 mg 3-4 time daily.
  
  - **Papverine:**
    - **Class:** peripheral vasodilator.
    - **Action:** direct spasmolytic effect on smooth muscle and vascular system, bronchial muscle, GI & urinary tract.
    - **Uses:**
      1. Cerebral and peripheral ischemia.

2. Smooth muscle relaxant/
  3. Paraenteral use for: Acute MI and angina pectoris, Pulmonary embolism, and ureteral, biliary, & GI colic.
- **Side effects:** Flushing of face, hypertension, tachycardia, constipation, dry mouth and throat, headache.

## Antihypertensive drugs

- ❖ **Hypertension:** is a condition in which the mean arterial blood pressure is elevated.
- ❖ **Essential hypertension:** could be mild, moderate, or severe and may lead to dangerous changes in kidneys, eyes and blood vessels.
- ❖ **Secondary hypertension:** a certain disease or condition leads to elevation of blood pressure such as toxemia or pregnancy, acute kidney failure, etc.
- ❖ **Antihypertensive agents:** are initiated when diastolic blood pressure is higher than 90mm/Hg.
- ❖ **Treatment of hypertension includes:**
  1. Weight reduction.
  2. Sodium restriction.
  3. Alcohol restriction.
  4. Stop smoking.
  5. Exercise.
  6. Behavior modification.
- ❖ Single drug should be considered from the following classes:
  1. Diuretics.
  2. Beta-blocking agents.
  3. Calcium channel blocking agents.
  4. Angiotensin converting enzyme inhibitors.
- ❖ Initial therapy is continued for one month. If there is no response, combination therapy is needed.
- ❖ **Nursing considerations:**
  1. Determine base line blood pressure before starting antihypertensive treatment.
  2. Evaluate the extent of the client's understanding of the disease and the therapy.
  3. Ascertain lifestyle changes.
  4. Determine client's ability to take his BP measurement.
  5. Record significant changes in BP readings.
  6. Advise client to adhere to low sodium diet.

7. Explain the importance of adhering to treatments plan.
8. Teach the patient/family how to measure intake and output.

## 1. Angiotensin-converting enzyme inhibitors (ACE-Inhibitor):

### ❖ Captopril:

- **Trade name:** Capotin, inhabace.
- **Calss:** antihypertensive, inhibitor of angiotensin synthesis.
- **Action:**
  - Captopril is a highly specific competitive inhibitor of angiotensin I converting enzyme. The enzyme is responsible for the conversion of angiotensin I to angiotensin II which decrease BP.
  - Reduce peripheral arterial resistance.
  - Decrease aldosterone secretion which works to increase level of serum potassium.
- **Indications:**
  1. Hypertension.
  2. In combination with diuretics and digitalis in the treatment of CHF.
- **Contraindication:** Hypersensitivity, renovascular disease and pregnancy.
- **Side effects:**
  - Skin rash, loss of taste, neutropnea, nausea, vomiting, hypotension, proteinuria, renal failure and hyperkalemia.
- **Dosage:**
  - **Tablets:** - 12.5 mg 2-3 time per day.
    - If there is no response, after 1-2 weeks, increase dose to 25 mg 2-3 time per day.
- **Nursing considerations:**
  1. In case of overdose, give normal saline to restore BP.
  2. Should not be discontinued without Dr. order.
  3. Obtain baseline hematological studies, liver & renal functions tests prior to beginning the treatment.
  4. Determine client's understanding of the therapy and if he/she takes other medications.
  5. Observe client closely for hypotension 3 hours after the initial dose.

6. In case of hypotension, place client in supine position and give IV saline infusion.
7. Withhold potassium sparing diuretics and consult with physician (hyperkalemia may occur).
8. Take captopril 1 hour before meal or on an empty stomach.
9. Report skin rash, heartburn, and chest pain to physician.
10. Explain to client that he may develop loss of taste for 2-3 months, if it persists, notify the physician.

### **Enalapril maleate**

**Class:** ACE-inhibitor

**Uses:** Hypertension

**Dose:** Initially, 5 mg P.O. once daily; then adjusted based on response. Usual dosage range is 10 to 40 mg daily as a single dose or two divided doses. Or, 1.25 mg I.V. infusion over 5 minutes q 6 hours.

Adjust-a-dose: If patient is taking diuretics or creatinine clearance is 30 ml/minute or less, initially, 2.5 mg P.O. once daily.

#### **Side effects:**

CNS: headache, dizziness, fatigue, vertigo, syncope.

CV: hypotension, chest pain, angina pectoris.

GI: diarrhea, nausea, abdominal pain, vomiting.

GU: decreased renal function (in patients with bilateral renal artery stenosis or heart failure).

Hematologic: bone marrow depression.

Respiratory: dyspnea, dry, persistent, nonproductive cough.

Skin: rash.

Other: angioedema.

#### **Interactions**

Diuretics: May excessively reduce blood pressure. Use together cautiously.

Insulin, oral antidiabetics: May cause hypoglycemia, especially at start of enalapril therapy. Monitor patient closely.

Lithium: May cause lithium toxicity. Monitor lithium level.

NSAIDs: May reduce antihypertensive effect. Monitor blood pressure.

Potassium-sparing diuretics, potassium supplements: May cause hyperkalemia. Avoid using together unless hypokalemia is confirmed.

### **Contraindications & cautions**

Contraindicated in patients hypersensitive to drug and in those with a history of angioedema related to previous treatment with an ACE inhibitor.

Use cautiously in patients with renal impairment or those with aortic stenosis or hypertrophic cardiomyopathy.

### **Nursing considerations**

Closely monitor blood pressure response to drug.

Monitor CBC with differential counts before and during therapy.

Diabetic patients, those with impaired renal function or heart failure, and those receiving drugs that can increase potassium level may develop hyperkalemia. Monitor potassium intake and potassium level.

Instruct patient to report breathing difficulty or swelling of face, eyes, lips, or tongue.

Swelling of the face and throat (including swelling of the larynx) may occur, especially after first dose.

Advise patient to report signs of infection, such as fever and sore throat.

Inform patient that light-headedness can occur, especially during first few days of therapy. Tell him to rise slowly to minimize this effect and to notify doctor if symptoms develop. If he faints, he should stop taking drug and call prescriber immediately.

Tell patient to use caution in hot weather and during exercise. Inadequate fluid intake, vomiting, diarrhea, and excessive perspiration can lead to light-headedness and fainting.

Tell woman of childbearing age to notify doctor if pregnancy occurs. Drug will need to be stopped.

## **2. Beta-adrenergic blocking agents:**

- **Action:** it combines with beta-adrenergic receptors to block the response to sympathetic nerve impulses, circulating catecholamines or adrenergic drugs.
- $\beta$ -adrenergic receptors have been classified as beta 1 (in the cardiac muscle) and beta 2 (in the bronchi and blood vessels).
- Blocking of  $\beta_1$  receptors  $\longrightarrow \downarrow$  HR, myocardial contractility and cardiac output  $\longrightarrow \downarrow$  BP.

- Blocking of  $\beta_2$  receptors  $\longrightarrow \uparrow$  airway resistance (bronchospasm) , and vasoconstriction.
- These drugs could be selective (working on one receptor such as  $\beta_1$  selective drugs (Atenolol) or it could be nonselective (such as Propranolol)

**Uses:** 1. hypertension, 2. Anginal pectoris.  
3. Cardiac arrhythmias. 4. Myocardial infarction.  
5. Prophylaxis of migrin.

**Contraindications:**

Bradycardia, C.H.F., cardiogenic shock, diabetes, thyrotoxicosis, chronic bronchitis, asthma, bronchospasm, emphysema.

**Side effects:**

Bradycardia, C.H.F., hypotension, cold extremities (due to peripheral vasoconstriction), edema, dyspnea, shortness of breath, nausea, vomiting, hepatomegaly and bronchospasm.

**Treating overdose:**

1. Inducing vomiting, gastric lavage.
2. Artificial respiration.
3. Give atropine sulfate 0.6 mg (up to 3 mg) and glycogen for the treatment of bradycardia.
4. Treat hypoglycemia and hypokalemia.
5. I.V fluids.
6. Adrenaline or dopamine to increase Blood pressure.

**Nursing considerations:**

1. Instruct patient/family to take blood pressure and pulse.
2. Provide written instructions as when to call physician (e.g. HR below 50 beat/min).
3. Consult the physician before interrupting the therapy.
4. Some drugs lead to blurring of vision, so that tell patients not to engage in activities need mental alertness.
5. Instruct patient to dress warmly during cold weather.
6. Diabetic patient should be very careful about symptoms of hypoglycemia.
7. Report any asthma-like symptoms.



**Atenolol:**

**Trade name:** Normatin.

**Classification:** Beta-adrenergic blocking agent

**Classification:** beta 1 –adrenoreceptr blocking drug which is a cardioselective.

**Uses:** Hypertension     angina pectoris.

**Dosage:**

**Tablets:** 50 mg or 100 mg daily

Initial dose is 50 mg, if there is no response, increase dose to 100 mg daily.

IV in case of acute MI: give 5 mg over 5 minutes, and if there is no response, give another 5 mg after 10 minutes.

**Specific nursing considerations:**

3. For IV use, the drug may be diluted in sodium chloride, dextrose, on dextrose saline.

**Valolol:**

- **Trade name:** Corgard
- **Class:** Beta-adrenergic blocking agent.
- **Action:** manifests both beta 1 and beta 2 adrenergic blocking.
- **Uses:** hypertension, angina pectoris.
- **Dose:** 40-80 mg daily.

**Propranolol hydrochloride**

**Trade name:** Inderal, Deralin

**Classification:** beta-adrenergic blacking agent, antiarryhthmic.

**Action:** manifests both beta1 and beta 2 adrenergic blocking activity.

**Indication:**

1. Angina pectoris.
2. Hypertension.
3. Cardiac arrhythmias.
4. Prophylaxis of migrin.
5. Prophylaxis of MI.
6. Pheochromocytoma

**Additional side effects:** psoriasis-like eruptions.

**Dosage:**

Tablets: initial dose of 40 mg bid, then 120-240 mg in 2-3 divided doses.

**Temolol maleate:**

**Trade name:** Blocadren, Timptic.

**Classification:** Ophthalmic agent, beta-adrenergic agent.

**Action:** both beta1 and beta 2 receptors blocking activity.

**Uses:**

Tablets: for hypertension.

Ophthalmic solution: chronic open angle glaucoma.

**3. Centrally acting agents:-**

Used for treatment of chronic hypertension, since it affects CNS.

**Clondine Hydrochloride:-**

**-Trade name:- (Catapres)**

**- Classification:-** Antihypertensive, centrally antiadrenergic agent.

**- Action:-** stimulates alpha-adrenergic receptors of CNS → inhibition of sympathetic vasomotor centers & ↓ nerve impulses → ↓ HR & BP.

**-Uses:-** treatment of mild to moderate hypertension.

**-Side effects:-** Drowsiness, headache, malaise, dry mouth, bradycardia, and constipation.

**- N.B:-** If clonidine is D.C abruptly, rebound hypertension may occur.

**- Dosage:- Initially** 0.1 mg bid ,then increased to 0.1 - 0.2 mg daily until desired response is obtained.

**Methyldopa :-**

**-Trade name:-(Aldomin)**

**-Classification:-** Antihypertensive, centrally acting antiadrenergic agent.

**-Action:-** The active metabolite alphas-methylenepinephrin lowers BP by stimulating central inhibitory alpha-adrenergic receptors.

**-Uses:-** Hypertension & hypertension crises (parenteral).

**-Contraindications:-**

1. Hypersensitivity,
2. Active hepatic diseases.
3. Pregnancy.
4. Pheochromocytoma.

**-Side effects:-**

- Headache, dizziness, general weakness, depression and sedation.
- Bradycardia, orthostatic hypotension.
- Dry mouth, nausea, vomiting, sore (black) tongue.
- Jaundice, liver disorders.
- Hemolytic anemia, & leukopenia.
- Male impotence.

**-Dosage:- Tabs. :-** initially 250 mg bid or tid.

**-Nursing considerations:-**

1. Avoid activities that need mental awareness such as driving.
2. Note any evidence of jaundice and do liver function test on intervals..
3. Advise pt. to rise from the bed slowly.
4. Instruct pt. about reportable Signs & Symptoms
5. Explain to pt. that urine rarely may be turn into dark / blue color.
6. Advise client to carry a card detailing current medication regimens always.

**4. Agents that act directly on vascular smooth muscles:-**

**-Hydralazine hydrochloride:-**

**-Trade name:-** ( Apresoline )

**-Classification:-** Antihypertensive, direct action on vascular smooth muscles.

**-Action:-** directly affect smooth muscles  $\longrightarrow$  vasodilation,  
 $\uparrow$  cardiac output and finally  $\uparrow$  blood flow to the brain and kidneys.

**- Uses:-** used with combination therapy to treat hypertension.  
Given **parenterally** in hypertension emergencies.

**- Contraindications:-**

- Angina pectoris.
- Rheumatic heart disease.
- Chronic glomerulonephritis.
- Systemic lupus erythematosus (S.L.E.)

**- Side effects:-**

-Orthostatic hypotension, tachycardia, nausea, vomiting.

-Headache, dizziness, constipation and male impotence.

**-Dosage:-**

**-Tabs. : initially** 10 mg qid for 2-4 days, then 25 mg bid

**-I.V, I.M :-**50 mg (IV slowly) repeated as necessary. ( may decrease Bp in 5 minutes.)

**\*\*\* Antiarrhythmic agents \*\***

**Cardiac arrhythmias:-** altered patterns of contraction or marked

increased or decreased HR reducing the ability of the heart to pump blood.

**Examples:-**

Premature ventricular beats, atrial flutter, atrial fibrillation, ventricular fibrillation-----

**N.B:-** The effective treatment of arrhythmias depends on:

- 1) Accurate diagnosis.
- 2) Changing the causative factor.
- 3) Appropriate selection of an antiarrhythmic drugs.

**Amiodarone hydrochloride:-**

**Trade name:- ( Procor)**

**Classification:-** Antiarrhythmic

**Action:-** increases the duration of the myocardial cell action potential as well as alpha & beta antiadrenergic effect.

**Indications:**

- Should be reserved for life threatening ventricular arrhythmias which don't respond to other therapy.

**Contraindications:**

- Sensitivity.
- Sinus bradycardia
- AV block
- Thyroid dysfunction

**Side effects:**

- Bradycardia, CHF, Fatigue, tremors.
- Visual disturbances, photophobia, dry eyes.
- Hemolytic or aplastic anemia.
- Hepatotoxicity.

**Dose:**

- Tabs 200 mg.
- Maintenance dose: 200-400 mg daily.
- IV infusion: 5 mg/kg over 20-120 minutes.

**2- Lidocaine Hydrochloride:**

**Trade name:** xylocaine – Esracain

**Class:** antiarrhythmic.

**Action:** shortens the refractory period & suppresses the automaticity of ectopic foci without affecting conduction of impulses through cardiac tissue.

**Indications:** acute ventricular arrhythmias as which follow MI or cardiac surgeries.

**Contraindications:**

- Hypersensitivity
- Heart block.

**Side effects:** hypotension, bradycardia, dyspnea, dizziness .

**Dosage:** available in ampules of a concentration of 1% (100mg), 2% (200mg)

Loading dose : IV. Bolus 50-100 mg at rate of 25-50 mg/min

Infusion : 20-50 mg/kg at a rate of 1-4 mg/min.

**Nursing considerations:**

1. Don't add lidocaine to blood transfusion assembly.
2. Make certain that vials state "for cardiac arrhythmias".
3. Use 5% dextrose solution to prepare drug (stable for 24 hours).
4. Assess for history of hypersensitivity.
5. Use electronic infusion device to regulate the infusion of the drug.
6. Obtain B.P., Pulse, Resp. rate to use as baseline data to evaluate response to treatment.
7. Drug should be given in a monitored environment.
8. Assess B.P. frequently during administration.

9. Assess for respiratory depression.
10. If adverse reactions occur, discontinue infusion & prepare for emergency management.

### 3. Phenytoin

**Trade name:** Dilantin

**Class:** anticonvulsant , antiarrhythmic.

**Action:** acts in the motor cortex of the brain to reduce the spread of electrical discharges from the rapidly firing epileptic foci in this area. Also activity of centers in the brain stem responsible for the tonic phase of grand mal seizures.

**Uses:**

Chronic epilepsy.

Premature ventricular contractions.

Tachycardia.

**Contraindications:**

Hypersensitivity.

**Side effects:**

Drowsiness, ataxia, dizziness, measles-like rash, gingival hyperplasia, Hirsutism (excessive hair growth) , hypoglycemia.

**N.B :** - rapid I.V. administration → Hypotension & arrhythmia.

**Dose for arrhythmias:**

Tab 200-400 mg daily.

I.V. 100 mg q 5 minutes up to a maximum of 1g.

**Nursing Considerations:**

- 1- I.V. phenytoin may form precipitate, so flush tubing by saline (not dextrose) before & after administration.
- 2- Assess for hypersensitivity.
- 3- If a pregnant woman takes this drug, tell her not to breast-feed her baby.
- 4- Obtain liver & kidney function studies.
- 5- Monitor serum drug levels on a routine basis.
- 6- During I.V. therapy, monitor B.P. for signs of hypotension .
- 7- Take e food to minimize GI upset.
- 8- If the patient is diabetic, monitor for signs of hypoglycemia.
- 9- Oral hygiene to minimize bleeding from the gum.

10- Report any excessive growth of hair.

#### 4. Procainamide:

**Trade name:** procan

**Classification :** antiarrhythmic

**Action:** produce a direct cardiac effect to prolong the refractory period of the heart & depress the conduction of the cardiac impulse.

**Uses:**

- ventricular tachycardia.
- Atrial fibrillation.
- Digitalis intoxication.

**Contraindication:** Hypersensitivity, complete AV heart block.

**Side effects:** Hypotension, abdominal pain, bitter taste.

#### 5. Propranolol

#### 6. Verapamil

### Drugs affecting The Central Nervous system

#### Barbiturates:

##### Phenobarbital :

**Trade name:** Luminal.

**Class:** sedative- anticonvulsant- barbiturate.

**Action:**

- Long-acting barbiturate- act as a sedative- hypnotic and anticonvulsant by producing CNS depression.
- It increase the inhibitory activity of the on nerve synapses.

**Uses:**

- 1- Preanesthetic medication.
- 2- Sedation
- 3- Hypnotic
- 4- Epilepsy
5. in tetanus & eclampsia ( as anticonvulsant) .

**N.B.:** should be given parenterally for anticonvulsant effect.

**Contraindication:** Hypersensitivity.

**Side effects:**

Headache, fever, megaloblastic anemia, dizziness, hypotension, nausea, vomiting epigastric pain.

**Forms and Dose:**

Tablets 100mg, ampules 130mg in 1 cc

Sedation: 30-120 mg daily in 2-3 divided doses.

For adults: Hypnotic 100-320 mg at bed-time.

Anticonvulsant: I.V. 100-320 mg, repeated as necessary.

Preoperative sedation: I.M. only 130-200 mg – 60-90 minutes before surgery.

**N.B:** Luminal can be used in neonates as antihyper- bilirubinemia.

**Over dose:**

Manifested by tachycardia , hypothermia, coma, respiratory depression , absent reflexes & circulatory collapse respiratory relaxation unseals and vascular collapse.

**Treatment of overdose toxicity:**

- 1- Maintain & assist respiration as indicated.
- 2- Support circulation by vasopressor & I.V. fluids as required.
- 3- Aspirate stomach content, take care to avoid pulmonary aspiration.
- 4- Diuretics may be given as ordered.
- 5- Intake & output measurement.
- 6- Dialysis if indicated.

**Nursing considerations:**

- 1- If given I.V, closely monitor the rate of flow. Rapid administration may lead to respiratory depression.
- Monitor the site of I.V. for soft of extravasation which cause sever pain, nerve damage & necrosis.
- 2- Avoid the use of alcoholic beverages.
- 3- Instruct the client not to drive a car or operate other hazardous machinery after taking the medication .
- 4- Take the medication only as prescribed.
- 5- If used for hypnotic effect, give ½ hr before bedtime.
- 6- Teach patient about signs and symptoms of toxicity, and instruct patient to report them to treating physician.



- 7- If taken for 8 weeks or more, instruct patient not to stop it suddenly to avoid withdrawal symptoms as convulsion.
- 8- Keep the drug out of reach of the children.

□ **Secobarbital:**

**Trade name:** seconal

**Class:** sedative – hypnotic , barbiturate type.

**Action:** short acting barbiturate, (as luminal) .

**Uses:** short- term of insomnia.

- Sedative to relief anxiety.
- Preoperative sedation.
- Some times parenterally as anticonvulsant.

**Dose:** tab. 100 mg at bedtime.

❖ **Nonbarbiturate sedative- hypnotics:**

**Paraldehyde:**

**Trade name:** paral

**Class. :** nonbarbiturate sedative- hypnotic.

**Action:** as barbiturates(luminal) , is a bitter fasting liquid & has a strong unpleasant odor, in usual doses it has no or little effect on respiration & blood pressure.

**Uses:**

- Sedative & hypnotic.
- Emergency treatment of seizures.
- Delirium tremors.

**Contraindication:** - Gastroenteritis - bronchopulmonary disease.

- Hepatic insfficiency.

**Side effects:** skin rash, pain at injection site, bradycardia.

□ **Anti-anxiety Agents\***

**Temazepam**

**Lorazepam**

**Alprazolam**

**Diazepam:**

**Trade name:** Valium, assival

**Class:** antianxiety agent, benzodiazepine.

**Action:** the anxiolytic effect is believed to be mediated through the action of benzodiazepine to increase the inhibitory action of GABA “Gamma aminobutyric acid” inhibit CNS neurotransmitter.

- The drug is metabolized in the liver & excreted through urine.

**Indications:**

- 1- Symptomatic relief of anxiety & tension.
- 2- Alcohol withdrawal.
- 3- Muscle relaxant.
- 4- Anticonvulsive.
- 5- Preoperatively.
- 6- Before gastrescopy or esophagoscopy.
- 7- Treatment of status epilepticus .
- 8- Relief of facial muscle spasm.

**Contraindications:**

- Hypersensitivity.
- Acute narrow angle glauccma.
- Pregnancy.
- Shock, coma.
- Alcoholic intoxication (to avoid respiratory of depression).

**Side effects:**

Drowsiness, fatigue, ataxia, hypotension, visual disturbances, headache, phlebites at injection site.

**Dosage:**

Ampules of 2 ml containing 10 mg.

Tablets 2 mg, 5 mg or 10 mg.

I.V. or I. M. 2-20mg depenoling on the indication.

Tablets 2-10 mg 2-4 times daily.

**Nursing Considerations:**

- Stress that drug may reduce pt’s ability to handle dangerous equipment.
- Avoid alcohol ingestion.

- Don't stop taking the medication suddenly, withdraw drug gradually.
- Monitor B.P. before & after administration.

□ **Antipsychotic Drugs\***

**Chlorpromazine:**

**Trade name:** largactil

**Class:** Antipsychotic, phenothiazine.

**Action:** Act by blocking dopamin receptors. It has significant antiemetic effect, hypotensive, sedative & anticholinergic effect.

**Uses:**

- Acute & chronic psychosis (such as schizophrenia, mania & manic depression).
- Preanesthetic .
- Intractable hiccoughs.
- Nausea & vomiting.

**Contraindication:**

- Severe depression, coma.
- Bone marrow depression.
- Patients with history of seizures & on anticonvulsant therapy.
- Hepatic & renal diseases.
- Prostatic hypertrophy.
- Dehydration - glaucoma , measles.

**Side effects:**

Depression, dizziness, seizures, gynecomastia. Orthostatic hypotension, bronchospasm , laryngospasm tardive dyskinesia, photosensitivity, leukopenia, aplastic anemia, and dry mouth.

**Dose:**

Tablets 10-25 mg 2-4 times a day.

I.M. 25-50 mg repeated after 1 hour if needed.

**Nursing considerations:**

- Shouldn't be used to treat nausea & vomiting in children less than 6 months of age.

- Should avoid getting solution on hands or clothing (it will cause dermatitis).
- Solutions with marked discoloration should be discarded.
- Note any history of seizures.
- Take liver & kidney function test periodically.
- Document & rotate injection sites.
- Report side effects immediately.
- Determine age of male patients & assess for prostatic hypertrophy.

**Fluphenazine Decanoate:**

**Trade name:** modecate.

**Class:** antipsychotic, phenothiazine.

**Action:** is accompanied by a high incidence of extrapyramidal symptoms & low incidence of sedation, anticholinergic, antiemetic & orthostatic hypotension.

**Uses:**

- Psychotic disorders.
- For chronic pain in conditions such as diabetic neuropathy & patients trying to withdraw from narcotics.

**Doses:**

P.O. or I.M.

Tablets : 2.5 – 10 mg / day in divided doses (3-4 times).

I.M.: 12.5 –25 mg can be repeated /1-3 weeks.

**Thioridazine:**

**Trade name:** mellaril

**Classification:** Antipsychotic – phenothiazine.

**Uses:**

Schizophrenia, depression, anxiety, alcohol withdrawal, intractable pain sleep disturbances.

**Action:** probably related to drug's antidopaminergic effects.

**Dose:** P.O.: 25 mg tid.

**Side effects:**

Headache, tardive dyskinesia, blurring of vision, dry mouth , skin

rashes, and photosensitivity.

**Contraindications:**

- Comatose patients.
- Parkinson's disease.
- Severe hypertension or hypotension.

**Nursing considerations:**

- Monitor vital signs before beginning therapy & at regular intervals.
- Administer medication with meals to minimize GI upset.

**Antianxiety drugs**

**Chlordiazepacide :**

**Trade names:** librium, lipoxide.

**Class:** antianxiety agent.

**Action:**

Depress subcortical levels of CNS, particularly the limbic system. (cortex). It inhibits sensory input in CNS.

**Uses:**

- Anxiety
- Acute withdrawal symptoms of chronic alcoholic .
- Preoperatively.
- Sedative, hypnotic.

**Side effects:**

Drowsiness, fatigue, ataxia, dizziness jaundice, hepatic dysfunction.

**Dose:** P.O. 5-25 mg tid or qid.

**Contraindications:** coma, shock, lactation, pregnancy.

**Nursing considerations:**

- Monitor vital signs.
- Don't mix it with any medication.
- Administer oral medications with food.
- When given I.V., should be administered slowly.
- When given I.M or I.V., dilute with water, don't shake the vial to mix it.
- Inject deep into large muscle.

**Haloperidol:**

**Trade name:** Haldol

**Class.:** antipsychotic.

**Action:**

- Block dopamine receptors → sedation .
- Alpha-adrenergic blockade → ↓ the release of growth hormone & the release of prolactine.
- Anticholinergic effect → sedation & orthostatic hypotension.

**Uses:**

- Psychotic disorders such as
- Mania
- Drug induced psychoses.
- Schizophrenia.
- Aggressive & agitated patients. (mental retardal)
- Short-term W of hyperactive children.
- Treating symptoms of dementia in elderly peoples .

**Dose:**

- P.O. 3-5 mg bid –tid.
- I.M. 2-5 mg q 4-8 hrs.
- In sever situations: I.V. 2-25 mg every 30 minutes.

**Side effects:**

Headache, tardive dyskinesia, hypotension, dry mouth photosensitivity, skin rashes, Nausea, vomiting, and constipation.

**Contraindications:**

- Pregnancy
- Lactation
- Shock
- Bone marrow depression
- Hepatic & renal insufficiency.

**Nursing considerations:**

- Monitor vital signs before & during therapy.
- Administer oral medication with food.
- Administer IM deep into large muscle.
- Don't mix it with any other drugs.
- If concentrated drug is spilled on skin, wash it immediately to prevent dermatitis.

**Lithium carbonate:**

**Trade name:** lithium.

**Class:** antipsychotic , antimanic.

**Action:**

Action is not known. Theories trying to explain the action of this drug include effectiveness to an alteration in Na ion metabolism within nerve & muscle cells “ +K ion & ATP ase” → ↓ in catecholamine neurotransmitter levels → hyperactivity.

**Uses:**

- Control of manic and hypomanic episodes in manic depression patients.
- Prophylactic of bipolar depression.

**Dose:** P.O. 600 mg tid or qid .

**Side effects:**

Drowsiness, dizziness, hand tremors, lethargy. Hypothyroidism, ECG changes, anorexia, dry mouth, nausea, vomiting, polyuria, leukocytosis slurred speech .

In case of toxication (blood level over 2.0 mmol/L): hyper-reflexia and hyperextension of limbs, convulsions, toxic psychosis, syncope, oliguria, circulatory failure, and coma.

**Contraindications:**

- Cardiovascular , renal diseases.
- Grain damage.
- Pregnancy & lactation.
- Dehydration.
- Patients receiving diuretics.
- Sodium depletion.

**Nursing considerations:**

- Monitor serum level of lithium every 1-2 weeks to prevent toxicity (normal level is 0.4 - 1.0 mmol/L and toxic level is above 1.5 mmol/L).
- Monitor for pulse irregularities & changes in B.P.
- Provide diet adequate in sodium.

- Monitor for signs & symptoms of toxicity.
- Avoid factors that enhance toxicity: dehydration, renal failure, infection, co-administration of diuretics, and sodium depletion (may occur with diuretics).
- Maintain adequate fluid and sodium levels.
- Withdrawal (stopping) drug should be gradual (over weeks)

□ **Antidepressants**

**1. Monoamine oxidase ( MAO) inhibitors :**

**N.B.:** They are highly toxic, prescribed only if tricyclic compounds are ineffective. They also may interfere with detoxification mechanisms which occur in the liver .

**Action:**

- MAO is one of the enzymes that break down biogenic amines (Norepinephrine, epinephrine & serotonin).
- These drugs prevents this process → therefore amines accumulate in the presynaptic granules → the concentration of neurotransmitters → nerve stimulation → antidepressant effect.

**Uses:** individualized.

**Contraindications:**

- Hypersensitivity.
- History of liver disease.
- Pheochromocytoma.
- Impaired renal function.
- Hypertension.
- Epilepsy.
- Hyperthyroidism.
- Glaucoma.

**Side effects:**

- Headache, dizziness, ataxia, euphoria, agitation, hyperreflexia.
- Urinary retention, jaundice, skin rashes, glaucoma.
- Constipation, diarrhea, nausea.

Nursing considerations:



- Teach patient to avoid food containing tyramine (dairy products, meat, fish, liver, some fruits (such as avocado, fig, and banana), chocolate, and yeast extracts. If patient ate these foods, the tyramine will break down in the GI tract (in the presence of MAO inhibitors) and release vasoconstrictors which will lead to hypertensive crisis (severe elevation in blood pressure).
- Teach patient to avoid alcohol and other sleep inducing drugs.

**Examples:**

**Phenelazine sulfate:**

**Trade name:** Nardil.

**Class.:** MAO inhibitor , antidepressant.

**Uses;** Major depression with or without melancholia.

**Dose:** P.O. 15 mg tid.

**2. Tricyclic antidepressants:**

**Clomipramine Hydrochloride:**

**Trade name:** anafranil.

**Class.:** antidepressant , tricyclic.

**Action:** prevent the presynaptic re-uptake of the neurotransmitters (norepinephrine and serotonin) which will increase their concentration at the synaptic area → alleviate depression .

**Dose:** P.O. 75-150 mg /day in 1-3 divided doses.

**Uses:**

- Treatment of obsessive- compulsive neurosis.
- Panic disorders
- Phobic disorders.

**Contraindications:** pregnancy, lactation, shock, bone marrow depression.

**Side effects:**

Hyperthermia, seizures, anemia, muscle weakness, drowsiness, ataxia, blurring of vision orthostatic hypotension , dry mouth , constipation.

**Nursing considerations:**

- Monitor vital signs before & during therapy .
- Take with foods to decrease GI upset.

### **Imipramine Hydrochloride:**

**Trade name:** Tofranil.

**Class.:** antidepressant, tricyclic.

**Action;** as anafranil.

**Uses:**

- Relief symptoms of depression.
- Enuresis in children.

**Dose:**

- For treatment of depression P.O: 50 mg bid or tid .
- For treatment of children enuresis (6 years or older): 25 mg/day  
1 hr before bedtime.

### **\*Antiparkinson Agents\***

- Parkinson's disease** is a progressive disorder of the nervous system, affecting mostly people over the age of 50 years.
- Signs & symptoms:**
  - Slowness of motor movements ( bradykinesia, akinesia) .
  - Stiffness & resistance to passive movements “ rigidity”.
  - Muscle weakness.                      - Tremors.
  - Speech impairment                      - sialorrhea (increased salivation).
  - Postural instability.
- Cause:** Unknown may be due to decrease in the neurotransmitter dopamine on the nervous system.

So that the administration of levodopa (the precursor of dopamine) will relieve the symptoms.

### **Amantadine Hydrochloride:**

**Trade name :** symmetrel.

**Class:** antiviral drug, antiparkinson agent.

**Action:**

- Prevent the penetration of virus into cell by inhibiting uncoating of the RNA virus.
- Relief symptoms of parkinsonism by potentiating the release of dopamine within the CNS.

**Uses:** - Influenza.

- Symptomatic treatment of parkinsonism ( idiopathic)

**Contraindications:** Hypersensitivity.

- Pregnancy , lactation.

**Dose:** for parkinsonism 100 mg bid .

**Side effects:**

- Nausea, vomiting , anorexia, constipation .
- Depression , convulsion, hallucinations, ataxia.
- Dizziness, orthostatic hypotension.

**Nursing considerations:**

- Note any history of seizures.
- Don't drive a car or work in a situation where alertness is important.
- Rise slowly from a prone position (to avoid orthostatic hypotension) .
- Lie down if feeling dizzy .
- Monitor vital signs before & during therapy.

## **Levodopa;**

**Trade name:** L-Dopa.

**Class.:** antiparkinson agent.

**Action:** It is a dopamine precursor , able to cross blood-brain barrier to enter the CNS. It is decarboxylated to dopamine in the basal ganglia → replenishing depleted dopamine stores → relief sings and symptoms of parkinsonism.

**Uses:** Idiopathic, arteriosclesotic & postencephalitic Parkinsonism

- Parkinsonism due to copper poisoning.

**Contraindications:**

- History of melanoma or undiagnosed skins lesion.
- Lactation.
- Hypersensitivity.
- Glaucoma

- Hypertension
- Use of monoamine oxidase (MAO) inhibitors.

**Side effects:**

- CNS effect: ataxia, hand tremors, headache and dizziness.
- Depression
- Paranoid ideation                      - insomnia
- Dementia                                      - nightmares

**Dose:** 250 mg bid-aid with food .

**Nursing considerations:**

- Crushing tablets for patients with difficulty in swallowing.
- Review medical history for drug contraindications.
- Monitor vital signs frequently.
- Observe for signs of depression.
- Offer emotional support during therapy.
- Take levodopa with food.
- Not to take vitamin B6 because it reverse the antiparkinson action of levodopa.

**Trihexyphenidyl Hydrochloride:**

**Trade name:** Artane

**Class.:** Antiparkinson, anticholenergic.

**Action:** anticholinergic, relieves rigidity, has little effect on tremor, antispasmodic on smooth muscle.

**Uses:** for all types of parkinsonism .

**Maintenance dose:** 5-10 mg 1-2 times daily.

**Side effects:** CNS stimulation (insomnia, agitation, restlessness) dry mouth , constipation, dizziness urinary retention .

**\*Centrally acting skeletal muscle relaxants\***

**Diazepam:** valium.

studied before

**Anticonvulsants**

1. **Phenytoin:** Dilantin

Studied before see antiarrhythmic.

2. **Ethosuximide:**

**Trade name:** Zarontin

**Class.:** anticonvulsant, succinimide type.

**Action:**

- The succinimide derivative, suppress the abnormal brain wave patterns associated with lapses of consciousness in absence seizures.
- Depress motor cortex & raise the threshold of the CNS to convulsive stimuli.

**Uses:** Primarily, petit mal seizure.

**Side effect:** nausea, vomiting, anorexia, dizziness, drowsiness, fatigue, lethargy.

**Contraindication:** Hypersensitivity.

**Dose:** P.O. 500 mg/day on divided doses

**Nursing consideration:**

- 1- Report any increase in frequency of tonic-clonic (grand mal) seizures.
- 2- Monitor vital signs frequently.
- 3- Take drug with food to minimize GI upset.
- 4- Frequent assessment of drug level.
- 5- Monitor presence of skin rash, fever, joint pain, unusual bleeding, dark urine.

3. **Acetazolamide:**

**Trade name:** Diamox.

**Class. :** anticonvulsant, diuretic.

**Action:** it is a sulfonamide derivative, act as an anticonvulsant by inhibition of carbonic anhydrase in the CNS  $\longrightarrow \uparrow \text{CO}_2 \text{ tension} \longrightarrow \downarrow$  neuronal conduction.

- As a diuretic: it inhibits carbonic anhydrase in the kidneys  $\longrightarrow \downarrow$  formation of bicarbonate & H ion from  $\downarrow \text{CO}_2$  availability of active transport.

**N.B.** : Has a limited use as a diuretic because it increases the incidence of metabolic acidosis.

**Uses:** - Absence of seizure (petit mal) .

- Grand-mal (tonic-clonic) seizure.
- Glaucoma.

**Contraindications:**

- Low serum level of sodium & potassium.
- Renal & hepatic dysfunction.
- Adrenal insufficiency .
- Hypersensitivity to thiazide diuretics.

**Side effects:** anorexia, polyuria, drowsiness, confusion, & acidosis.

**Dose:** Tab. 4-30 mg/kg/day in divided doses.

#### 4. Carbamazepine:

**Trade name:** tegretol

**Class.:** anticonvulsant.

**Action:** - similar to cyclic antidepressant.

- antimanic , antidiuretic, anticholinergic & antipsychotic effects.
- Anticonvulsant action unknown.

**Uses:** Epilepsy - tonic-clonic seizures - alcohol-withdrawal

- resistant schizophrenia. - trigeminal neuralgia.

**Dose :**

P.O. 200 mg bid.

Trigeminal neuralgia : 100-200 mg bid.

**Side-effects:**

Photosensitively - Drowsiness , dizziness , unsteadiness.

Aplastic anemia -nausea, vomiting , blurring of vision.

**Contraindications:**

- Bone marrow depression.
- Hypersensitivity
- Lactation
- Patients taking MAO inhibitors.

**Nursing considerations:**

- Should be taken with food.

- Obtain baseline liver & kidney function.
- Protect tablet from moisture.
- Obtain baseline eye examination.
- Blood cells evaluation weekly .
- Monitor intake & output.
- Use safety measures.
- Advise client to avoid sunlight. (photosensitivity)

## 5. Diazepam: studied before.

## 6. Magnesium sulfate

**Class:** Anticonvulsant, electrolyte, saline laxative.

**Action:**

- It is an important cation present in the extracellular fluid.
- It is an essential electrolyte for muscle contraction, certain enzyme system & nerve transmissions.
- Magnesium depresses CNS & control convulsion by blocking the release of acetylcholine at the myoneural junction.

**Uses:**

- Seizures associated with toxemia of pregnancy.
- Epilepsy
- laxative
- Hypomagnesemia
- In total parenteral nutrition

**Contraindications:**

- In the presence of heart block.
- In the presence of myocardial damage.

**Side effects:**

Magnesium intoxication → depression , flushing, hypotension , respiratory paralysis, muscle paralysis, respiratory failure .

**N.B.** : Suppression of knee-Jerk reflex can be used to determine toxicity . Respiratory failure may result if drug is given after disappearance of this reflex.

**Treatment of Magnesium intoxication:**

- 1- Use artificial ventilation immediately.
- 2- Have calcium glutinate readily available for I.V. use.

**Dose :** anticonvulsant      I.M. 1-5 g of 25% - 50% solution.

I.V. 1- 4 g of 10% - 20% solution.

**Nursing considerations:**

- For I.V. → administer. only 1.5 ml of 10% solution\minute.
- For I.M., inject the drug deep into the muscle using 50% solution.
- As a laxative, dissolve in a glass of ice water or other fluid to lessen disagreeable taste.
- Obtain baseline Mg level.
- Obtain history of kidney disease.
- Check with the physician before administering magnesium if any of the following conditions exist:
  - 1- Absent patellar or knee jerk reflex.
  - 2- R.R. less than 16\m
  - 3- Urinary output less than 100 ml\4 hrs .
  - 4- Patient has a history of heart block or myocardial damage.
- Have available I.V. calcium gluconate .
- Don't administer drug 2 hrs preceding delivery of the baby.
- If mother has received I.V. therapy of this drug 24 hours prior to delivery, assess the newborn for neurologic & respiratory depression.

**7. Paraldehyde: studied before.****8. Valproic acid:**

**Trade name:** Depakene.

**Class.:** anticonvulsant

**Action:** unknown

**Uses:** Epilepsy.

**Side effects:**

Nausea, vomiting, sedation, depression bone marrow depression, skin rashes, transient alopecia, hepatotoxicity.

**Dose:** Initial 5-10 mg\kg\day, increase at one week.



Interval 5-10 mg/kg/day increased up to 60mg/kg/day.

### **\*Narcotic Analgesics & Antagonists\***

#### **Narcotic Analgesics:**

- It include opium such as morphine, codeine & opium derivatives such as Meperidine.
- These substances have similar pharmacological properties.
- Meperidine (Demerol) is the best known.
- The relative activity of all narcotic analgesics in measured against morphine.

#### **Dependence & Tolerance:**

- Remember that all drugs of this group may lead to addiction.
- Psychological & physical dependence & tolerance develop even when using clinical doses.
- Tolerance usually develops because the patient requires shorter periods of time between doses or larger doses for relief of pain.

#### **Effects of narcotic analgesics:**

##### 1- On CNS:

- Alteration of pain perception (analgesia)      - Euphoria
- Drowsiness      - Change in mood
- Mental clouding      - Deep sleep

2- Depress respiration: over dose leads to respiratory arrest → death.

3- Depress cough reflex: codeine in small doses is used as antitussive.

4- Nauseant & emetic effect ( stimulate the chemoreceptor trigger zone).

5- Morphine → vasodilation →hypotension.

6- Pupillary constriction ( the most obvious sign of dependence) .

7- Decreases the peristaltic motility → constipation (some types used in diarrhea).

#### **Acute toxicity:**

Characterized by respiratory depression, deep sleep , stupor, coma, pinpoint pupil, R.R 2-4/m , cyanosis, hypotension, decreased urinary out put, decreased temperature, clammy skin, and finally Death (due to Respiratory failure).

**Treatment of acute overdose:**

- 1- Induce vomiting or gastric lavage.
- 2- Artificial respiration.
- 3- Give narcotic antagonist (Narcan).

**N.B. :**

Respiratory stimulants (caffeine) should not be used to treat depression from overdose of narcotics .

**Chronic toxicity:**

- The problem of chronic dependence on narcotics is well known & is not only the problem of the street but is also found often among those who have easy access to narcotics “physicians, nurses... Pharmacists”. Narcotic analgesics sometimes used for nontherapeutic purposes.
- Signs & symptoms:
  - Constricted pupil, constipation, skin infections, needle scar abscesses & itching on the anterior surface of the body.
  - Withdrawal signs appear when drugs is withheld for 4-12 hrs. & characterized by intense craving for the drug, insomnia, yawning, sneezing, vomiting, diarrhea, tremors, sweating, mental depression, muscular aches, pain, chills & anxiety. (they are rarely life- threatening).

**Action of narcotic analgesics:**

- Narcotic analgesics attach to specific receptor in the CNS resulting in analgesia- action
- Action exactly is unknown but may be by decreasing cell membrane permeability to sodium transmission of pain impulses.

**Uses:**

- Sever pain
- Hepatic & renal colic .
- Preanesthetic medication
- Postsurgical pain.
- Diarrhea & dysentery
- Pain from MI, carcinoma.
- Postpartum pain & burns.
- Antitussive.

**Contraindications:**

- Asthmatic conditions
- Emphysema
- Sever obesity
- Convulsions
- Diabetic acidosis
- Myxedema
- Addisson's disease
- Hepatic cirrhosis
- Children less than age of 6 months.

**Side effects:**

Respiratory depression , apnea, dizziness, euphoria headache, mental clouding, insomnia nausea, vomiting, constipation, dry mouth, skin rashes, laryngospasm, urinary retention, and decreased libido.

**Nursing considerations:**

- Use supportive nursing measures as relaxation techniques to relieve pain before using narcotics.
- Explore the source of pain, use non-narcotic analgesia if possible.
- Administer the medication when needed, prolonging the medication administration will decrease the effect of the medication.
- Monitor vital signs & mental status.
- Monitor Respiratory rate (drug may lead to respiratory depression).
- Monitor blood pressure ( hypotension may occur)
- Monitor pulse rare (if 60\m withhold the drug).
- Watch for constricted pupils. Document it and notify the physician.
- Monitor bowel function, since drug may cause constipation .
- Encourage client to empty bladder every 3-4 hrs (since drug may cause urinary retention).
- If client is bed ridden, use side rails.
- Inform the client\family that the drug may become habit forming and leading to addiction.
- Document any history of asthma or other contraindications.
- Have emergency equipment and narcotic antagonist available .

## 1. Condeine sulfate:

**Class. :** Narcotic analgesic, morphine type.

**Action:** -

- Resembles morphine pharmacologically but produce less effect on respiratory system, less nausea & less vomiting.
- In high doses (more than 60 mg), it will irritate the cough center, but in lower doses, it is a potent antitussive and is an ingredient in many cough syrups.

**Uses:**

- Relief of mild to moderate pain.
- Antitussive.

**Dose:**

- Analgesic: 15-60 mg 9 4-6 hrs.
- Antitussive: 10-20 mg 9 4-6 hrs.

## 2. Meperidine Hydrochloride “Pethedine Hydrochloride”:

**Trade name:** Demerol

**Class. :** Narcotic analgesic, synthetic.

**Action:** Similar to opiates.

- It has no antitussive effect.
- The duration of action is less than that of opium.

**Uses:**

- Sever pain.
- Renal & hepatic colic.
- Obstetric preanesthetic medication.
- In minor surgeries.
- Spasm of GI tract, uterus.
- Prior some diagnostic procedures e.g. cystoscope.
- Post operative pain.

**Add. Contraindications:**

- Hypersensitivity.
- Convulsive states.
- Children less than 6 months.
- Head injuries.
- Diabetic acidosis.

**Add. Side effects:** Transient hallucinations, hypotension.

**Dose:**

Drug can be available in the form of tablets, syrup, I.M, S.C.

Dose is 50-100 mg Q 3-4 hr.

It can be given as I.V. continuous infusion on a concentration of 1 mg/ml.

It also can be given IV slowly, and should be diluted in a concentration of 10mg/ml.

**3. Methadone Hydrochloride:**

**Class.:** Narcotic analgesic, morphine type.

**Action:**

- Produce only mild euphoria, which is the reason it is used as a heroin withdrawal substitute & for maintenance program.
- It produces physical dependence but the abstinence syndrome develops more slowly upon termination of the therapy.
- Withdrawal symptoms are less intense but more prolonged than those associated with morphine.
- It is not effective for preoperative or obstetric anesthesia.
- It doesn't produce sedation or narcosis.

**Uses:**

- 1- Severe pain.
- 2- Drug withdrawal.

**Additional Contraindications:**

- Pregnancy since it depresses respiration of neonate.
- I.V. use.
- Liver disease.

**Additional side-effects:**

Constipation, and pulmonary edema.

**Dose:**

Can be given oral, I.M., S.C. at a dose of 2.5 – 10 mg Q 3-4 hrs.

**4. Morphine Sulfate:**

**Class.:** Narcotic analgesic, morphine type.

**Action:** See narcotic analgesic.

**Uses:**

- Intrathecally, epidurally, orally or I.V. infusion for acute or chronic pain.
- Preoperative medication.
- To facilitate induction of anesthesia or to decrease the dose of anesthesia.

**N.B.:**

It is given in lower doses for continuous pain & in higher doses in sharp intermittent & all kinds of pain.

**Additional contraindications:**

- It is given epidural or intrathecal, if infection is present at injection site.
- In patients on anticoagulant therapy .
- Bleeding disorders.
- If patients have received parenteral corticosteroids within the past 2 weeks.

**Dose:**

- Oral: 10-30 mg Q 4 hr.
- I.M.: 5-20 mg/70 kg Q 4 hr as needed.
- I.V.: bolus of 2.5-15 mg for a person of average weight of 70 kg over 4-5 minutes (slowly).
- Continuous infusion: 0.1-1 mg\ ml in 5% dextrose in water by a controlled infusion pump.

**5. Percodan:**

**Class. and content:**

- Percodan consists of 2 drugs.
  1. A non-narcotic analgesic (aspirin 325 mg)
  2. A narcotic agonist (oxycodone Hcl 4.5 mg & oxycodone terephthelate 0.38 mg).

**Action:**

Oxycodone acts at a specific opioid receptors in the CNS to produce analgesia, euphoria, and sedation. The receptors mediating these effects are thought to be the same as those mediating the effects of the endogenous opioids (enkephallins and endorphines)

**Uses:** Relief of moderate to severe pain.

**Dose:** one tablet Q 6 hrs.

## 6. tramadol hydrochloride

**Trade name:** Ultram, Tramal

**Class. :** Narcotic analgesic, synthetic.

**Action:** Unknown. A centrally acting synthetic analgesic compound not chemically related to opiates. Thought to bind to opioid receptors and inhibit reuptake of norepinephrine and serotonin.

### **Indications & dosages**

Moderate to moderately severe pain

Adults: Initially, 25 mg P.O. Adjust by 25 mg q 3 days to 100 mg/day (on divided doses).

### **Adverse reactions**

**CNS:** dizziness, vertigo, headache, CNS stimulation, anxiety, confusion, euphoria, nervousness, sleep disorder, seizures, malaise, visual disturbances.

**CV:** vasodilation.

**GI:** nausea, vomiting, constipation, dyspepsia, dry mouth, diarrhea, abdominal pain, anorexia, flatulence.

**GU:** urine retention, urinary frequency, menopausal symptoms, proteinuria.

**Respiratory:** respiratory depression.

**Skin:** pruritus, diaphoresis, rash.

### **Contraindications & cautions**

Contraindicated in patients hypersensitive to drug or other opioids, in breast-feeding women, and in those with acute intoxication from alcohol, hypnotics, centrally acting analgesics, opioids, or psychotropic drugs.

Use cautiously in patients at risk for seizures or respiratory depression; in patients with increased intracranial pressure or head injury, acute abdominal conditions, or renal or hepatic impairment; or in patients with physical dependence on opioids.

### **Nursing considerations**

Reassess patient's level of pain at least 30 minutes after administration.

Monitor CV and respiratory status. Withhold dose and notify doctor if respirations decrease or rate is below 12 breaths/minute.

Monitor bowel and bladder function. Anticipate need for laxative.

For better analgesic effect, give drug before onset of intense pain.

Monitor patients at risk for seizures. Drug may reduce seizure threshold.

In the case of an overdose, naloxone may also increase risk of seizures.

Monitor patient for drug dependence. Drug can produce dependence similar to that of codeine and thus has potential for abuse.

Withdrawal symptoms may occur if drug is stopped abruptly. Reduce dosage gradually.

Caution ambulatory patient to be careful when rising and walking. Warn outpatient to avoid driving and other potentially hazardous activities that require mental alertness until drug's CNS effects are known.

#### □ **Narcotic Antagonists:**

- The narcotic antagonists are able to prevent or reverse many of the pharmacological actions of morphine-type analgesics & meperidine as respiratory depression induced by these drugs within minutes.

#### **Naloxone Hydrochloride:**

**Trade name:** Narcan.

**Class.:** Narcotic antagonist.

#### **Action:**

- Block the action of narcotic analgesic by displacing previously given narcotics from their receptor sites or preventing them from attaching to opiate receptors.
- The duration of action of naloxone is shorter than that of the narcotic analgesic so the respiratory depression may return when the narcotic antagonist has washed off the body.

#### **Uses:**

- Respiratory depression induced by narcotics.
- Drug of choice when the depressant drug is unknown.
- Diagnosis of acute opiate overdose.

**N.B. :** Naloxine is not effective when respiratory depression is induced by hypnotic, sedative or other nonnarcotic drugs.

#### **Contraindications:**

- Sensitivity to drug.
- Narcotic addicts since it will cause severe withdrawal symptoms.
- Neonates.



**Side effects:**

- Nausea, vomiting, sweating, hypertension, tremors.
- If used postoperatively: tachycardia, pulmonary edema, hypo or hypertension.

**Dose:** 0.4-2 mg I.V. , S.C. or I.M.

**Nursing considerations:**

- 1- Determine the etiology of respiratory depression.
- 2- Assess & obtain baseline vital signs.
- 3- Monitor respiration closely after the duration of action.
- 4- Have emergency drugs & equipment available.
- 5- If the patient is comatose, turn him to his side to avoid aspiration.
- 6- Maintain safe environment (side rails & soft support).

**Non-narcotic Analgesics & Antipyretics**

- Drugs such as aspirin and acetaminophen are available without a prescription, thus consumed in large quantities for the relief of pain and fever.
- If they were used improperly, their administration may cause serious effects.
- They are responsible for accidental poisoning in small children.

 **Salicylates:****Acetylsalicylic Acid:**

**Trade name:** Aspirin

**Classification:**

Non-narcotic analgesic, antipyretic, anti-inflammatory, antirhumatic, antiplatelet, NSAID.

**Action:**

- The antipyretic effect is due to an action on the hypothalamus that results in heat loss by vasodilation of peripheral blood vessels & promoting sweating.
- The anti-inflammatory effects probably by decreasing prostaglandin synthesis & other mediators of the pain response.
- The analgesic action is not fully known but may be due to improvement of the inflammatory condition .

**N.B. :** Aspirin also produces inhibition of platelet aggregation.

**Uses:**

- Pain
- Arthralgia
- Dysmenorrhea
- Anti-inflammatory (arthritis, gout, rheumatic fever)
- To reduce the risk of recurrent ischemic attacks & strokes in men.
- Reduction of risk of death or nonfatal MI in patients with history of infarction or unstable angina pectoris.
- Myalgia
- Headache
- Antipyretic (reduce fever)

**Dose:**

- In minor conditions: 325-600 mg Q 4 hours.
- May reach up to 6 grams /day in divided doses in arthritis and rheumatic conditions.

**Contraindications:**

- Hypersensitivity to salicylates.
- Asthma in conjunction with anticoagulant therapy.
- Vitamin deficiency (risk for bleeding increase with Vitamin K deficiency).
- Chickenpox or influenza (potential risk for Reye's syndrome among children and teenagers).
- Pregnancy and lactation.
- One week before & after surgery.
- Patients receiving anticoagulants.
- Patients with bleeding disorders (ie, hemophilia)
- GI bleeding or hemorrhage from other sites.
- History of GI ulcers.

**Side effects:**

- Children e chicken pox ( Reye's syndrom).
- Heartburn, nausea, anorexia, occult blood loss..
- GI bleeding, potentiation of peptic ulcer.
- Bronchospasm.
- Anaphylaxis
- Skin rashes.
- Increase bleeding time.

### **Salicylate toxicity**

- **Salicylism** : nausea, vomiting, dizziness, tinnitus, difficulty hearing, diarrhea, mental confusion.
- **Acute aspirin poisoning:** Respiratory alkalosis, hyperpnea, tachypnea, hemorrhage, confusion, pulmonary edema, convulsion, tetany, metabolic acidosis.

### **Drug interactions:**

- Risk for bleeding increase if taken with other anticoagulants.
- Risk of GI bleeding increase if taken with steroids, alcohol, or other NSAIDs.
- Increased risk for salicylate toxicity if taken with frusimide (lasix)
- Hypotension may occur if taken with nitroglycerins.

### **Nursing considerations:**

1. Take drug with or after food or with milk to decrease GI irritation.
2. Assess for history of asthma and history of hypersensitivity.
3. Do not use with other anticoagulants.
- 4- Note any history of peptic ulcer.
- 5- Report signs of side effect e.g. gastric irritation if occurs.
- 6- Aspirin is not given 1 week before & after surgery to prevent bleeding.
- 7- If patient is diabetic, discuss the possibility of hypoglycemia occurring-  
patients should monitor their blood glucose level frequently.
- 8- Teaches patient about the toxic symptoms (ringing in the ears dizziness, mental confusion-etc) and ask him/her to report it to physician.

### **Acetaminophen: “paracetamol”**

**Trade names:** acamol, panadol

**Class. :** non-narcotic analgesic, para-aminophenol type.

### **Action:**

- Acetaminophen decrease fever by an effect on hypothalamus leading to sweating & vasodilation.
- It also inhibits the effect of pyrogens on the heat-regulating center on the hypothalamus.
- It may cause analgesia by inhibiting CNS prostaglandin syntheses

—→ So it has no anti-inflammatory effect .

- It doesn't manifest any anticoagulant effect or any ulceration of GIT.

**Uses:**

- Pain due to Headache, dysmenorrhea, arthralgia, myalgia, musculoskeletal pain, immunization, teething, tonsillectomy.
- To reduce fever due to bacterial & viral infection .
- As a substitute for aspirin when contraindicated .

**Contraindications:** renal insufficiency, anemia.

**Side effects:**

- Chronic & even acute toxicity can occur after long symptom-free usage.
- Hemolytic anemia, neutropenia, thrombocytopenia
- Skin rashes, fever, jaundice, hypoglycemia.

**Symptoms of over dosage:**

Hepatic toxicity —→ general malaise, delirium, depression seizures, coma & death, nausea, vomiting, fever, and vascular collapse.

**Treatment of overdose:**

- 1- Induction of emesis.
- 2- Gastric lavage.
- 3- Activated charcoal.
- 4- Oral N-acetylcysteine (mucomyst) is said to reduce or prevent hepatic damage by inactivating acetaminophen metabolites which cause liver effects.

**Dose:** Tab. 500 mg Q 4 hrs or up to 1g Q 6 hrs.

**Nursing considerations:**

- 1- Suppositories should be stored below 27c .
- 2- Liver function studies for long term therapy.
- 3- Note signs of met-hemoglobinemia: bluish discoloration of gum & fingernails.
- 4- Have mucomyst available for signs of toxicity.
- 5- Teach patient signs of toxicity to be reported immediately.

**Antirheumatic & Nonsteroidal Anti-inflammatory Agents**

**Action:**

As in aspirin, the therapeutic actions of these substances are believed to result from the inhibition of the enzyme cyclo-oxygenase which results in decreased prostaglandin synthesis → so it is effective in:

- ↖ Reducing joint swelling, pain & morning stiffness.
- ↖ Increasing the mobility in arthritic patients.
- ↖ Antipyretic action due to decreased production of prostaglandin from the hypothalamus.
- ↖ Having irritating effect on the GIT.

**Uses :**

- ↖ Rheumatoid arthritis
- ↖ Osteoarthritis.
- ↖ Gout
- ↖ Other musculoskeletal diseases.
- ↖ Dental pain
- ↖ Strains & sprains.

**Contraindications:**

- 1- Children less than 14 years of age.
- 2- Lactation.
- 3- Hypersensitivity (asthma, rashes, rhinitis).
  - ❖ Uses with caution in patients with a history of GI disease & reduced renal functions.

**Side effects:**

- Peptic, duodenal ulcer, GI bleeding, nausea, vomiting, dyspepsia.
- Dizziness, drowsiness.
- Hypo + hyperglycemia.
- Bronchospasm, rhinitis.
- Blurring of vision.
- Tinnitus, loss of hearing.
- Bone marrow depression
- C.H.F.

**Nursing considerations:**

- Note any history of allergic responses to aspirin or nonsteroidal anti-inflammatory agents. {NS.AID.}

- Note the age of the client.
- Determine if patient is taking oral hypoglycemic or insulin and document it.
- Take these agents with milk or meal or antacids as prescribed.
- Encourage patient to take drug regularly.
- Report signs of GI irritation.
- Instruct client to report signs of bleeding, blurring of vision, tinnitus , rashes – etc.
- If the client has Diabetes Mellitus, explain the possible in increasing hypoglycemic effect of the drugs, to test urine & blood for glucose. To adjust dose of these agents.

**1) Diclofenac Sodium:**

**Trade name:** Voltaren , Rufenal

**Class. :** Non steroidal anti-inflammatory analgesic.

**Dose:** Suppositories, tabs or injection of 150-200 mg daily in 2-4 divided doses.

**Nursing considerations:**

1. Give on full stomach to avoid GIT irritation.
2. When given IM, Give it deep into a large muscle because drug is very irritant.

**2) Indomethacin:**

**Trade name :** Indocid.

**Class. :** Anti-inflammatory, analgesic, antipyretic.

**Dose:** suppositories & caps.

25mg – 50 mg bid-tid.

**3) Naproxen:**

**Trade name:** Naprex.

**Class.:** Non- steroidal anti-inflammatory analgesic.

**Dose:** 500 mg bid.

#### 4) **Ibuprofen:**

**Trade names:** Brufen, artofen.

**Class.:** nonsteroidal anti-inflammatory analgesic.

**Dose:** 300 mg bid.

#### **Anti-gout Agents\***

- Gout: or gouty arthritis is characterized by an excess of uric acid in the body.
- This excess results from either over production of uric acid or from a defect in its breakdown or elimination.
- When the concentration of sodium urate in the blood exceeds a certain level (6mg \100 ml), it may start to form a fine, needle-like crystals that can become deposited in the joints & cause an inflammatory response in the synovial membrane.
- Hyperuricemia some-times accompanied with some conditions such as leukemia or lymphomas.
- Treatment aims to reduce level of uric acid concentration in the blood.

#### **Allopurinol:**

**Trade names:** Zyloric Acid, Zylol, zyloral.

**Class.:**

Is a potent xanthine oxidase inhibitor which reduces both serum and urinary uric acid levels by inhibiting the formation of uric acid without disrupting the biosynthesis of vital purines.

#### **Advantages:**

- 1- Rapidly reduces uric acid levels in urine & serum.
- 2- Relieves joint pain, improves joint mobility & prevent the recurrence of acute attacks of gouty arthritis.
- 3- Acts independently of renal functions, & is even effective in uremic patients.
- 4- Minimize & prevents complications such as severe renal colic & progressive kidney disease.

**Uses:**

- Is the drug of choice for chronic gouty arthritis (not useful for treatment of acute gout).
- Hyperuricemia associated with blood diseases, renal diseases.
- Prophylaxis in hyperuricemia in patients with neoplastic conditions.
- Treatment of patients with recurrent uric stone formation.

**Contraindications:**

- Hypersensitivity.
- Hemochromatosis.
- Children except for those with neoplastic diseases.
- Lactation.

**Side effects:**

Skin rash, alopecia, fever leukopenia, arthralgia, nausea, vomiting.

**Dosage:**

Forms available: Tablets 100 mg, tablets 300 mg .

Dose is 200-600 mg/day.

**Nursing considerations:**

- Administer with food or immediately after meal to lessen gastric irritation.
- At least 10-12 eight- ounce glasses of fluid should be taken each day.
- Keep urine alkaline to prevent the formation of uric acid stones.
- Take complete drug history.
- Monitor the CBC, liver & renal function & serum uric acid on routine bases.
- If skin rash appear, report to physician.
- Avoid excessive intake of vitamin C which lead to the potential for the formation of kidney stones.
- Advise clients not to take iron salts with allopurinol since high iron concentration may occur in the liver .

**Colchicine:**

**Class. :** Antigout agent.

**Action:**

An alkaloid, does not increase the excretion of uric acid but it is believed to decrease the crystal- induced inflammation by reducing lactic acid



production by leukocytes (resulting in a decreased deposition of sodium urate).

**Uses:**

- Prophylaxis & treatment of acute attacks of gout.
- Diagnosis of gout.
- In the prophylactic treatment of familial Mediterranean Fever (FMF).

**Side effects:**

- It is a toxic agent → nausea, vomiting, diarrhea, abdominal pain.
- In case the above mentioned signs appear, discontinue drug for 48 hrs.

**Prolong administration may lead to:**

- Bone marrow depression.
- Peripheral neuritis.
- Liver dysfunction.

**Dose:**

Present in the form of tablets of 0.5 mg\ tablet.

Dose: 0.5 – 1.2 mg Q 1-2 hrs until pain is relieved.

I.V.: 2 mg (subsequently 0.5 mg Q 6 hours until pain is relieved).

**Nursing considerations:**

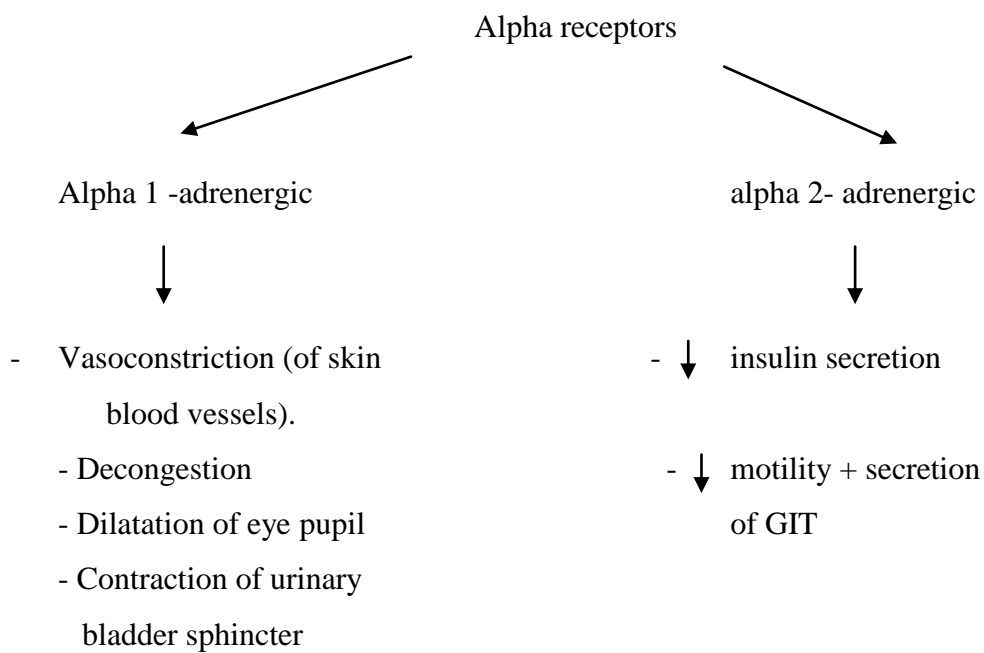
- Store at a tight , light resistance container.
- I.V. only because it is very irritant if given IM. or S.C.
- Obtain baseline hepatic function.
- Report to physician if nausea, vomiting or diarrhea occur.
- If given I.V., have atropine readily available to counteract adverse reactions.
- Assess the client frequently for signs of hepatic dysfunction as jaundice .

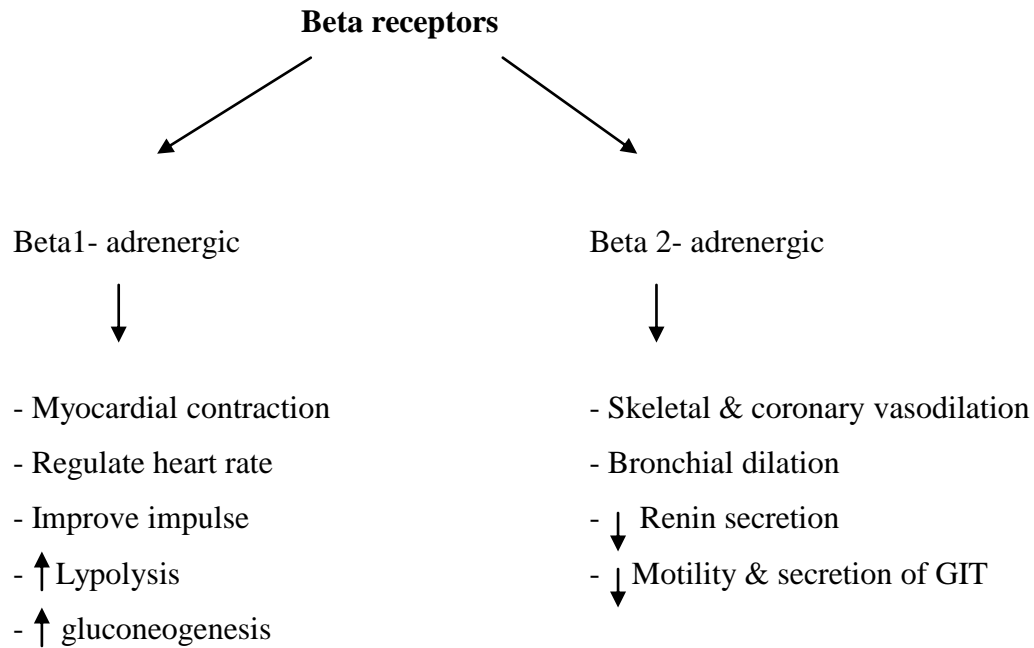
**Drugs Affecting the Autonomic Nervous system**

Sympathomimetic (Adrenergic) Drugs

- The adrenergic drugs supplement, mimic & reinforce the message transmitted by the natural neurohormones norepinephrine & epinephrine.
- These hormones are responsible for transmitting nerve impulses of the sympathetic nervous system.
- The adrenergic drugs work in 2 ways:

- 1- By mimicking the action of epinephrine and epinephrine (directly).
- 2- By regulating the release of the natural neurohormones from their storage sites at the nerve terminals (indirectly acting).
- The myoneural junction is equipped with special receptors for the neurohormones.
- These receptors are classified into: alpha receptor and Beta ( $\beta$ ) receptors) according to whether they respond to epinephrine, norepinephrine & to certain blocking agents.
- Alpha receptors are blocked by phentolamine. Where beta-receptors are blocked by propranolol & similar agents.
- Both alpha and beta receptors have been divided into subtypes:





□ **Effects of adrenergic drugs:**

**1. Heart:** increase Heart rate, increase force of contraction, increase cardiac output .

**Uses:** cardiogenic shock, bradycardia, resuscitation, heart block.

**2. Blood vessels:** - Systemic vasoconstriction → decrease blood supply to abdominal viscera, cerebrum & skin.

- B.P. in Large vessels increased & regulated .

**Uses:** Hypotension, nasal decongestion, biliary colic, nose bleeds, migraine, headache, allergic reactions.

**3. GI + GU tracts:** decrease glandular secretions, constriction of sphincters, decrease muscle tone & motility of GIT & urinary bladder, increase muscle tone & motility of the ureters.

❖ **Uses:** Enuresis, dysmenorrhea, biliary colic.

**4. Lungs:** Relaxation of muscles of bronchial tree.

❖ **Uses:** Bronchial asthma, emphysema, chronic bronchitis.

**5. Eyes:** Dilate iris, increase ocular pressure, relaxes ciliary muscle.

**6. CNS:** Excitatory action, Respiratory stimulation, wakefulness.

**7. Metabolism:** increase in glycogenesis (sugar metabolism).

Increase in lypolysis (release of fatty acids).

## Drugs

### 1) Albuterol: salbutamol

**Trade name:** ventolin

**Class.:** sympathomimetic agent, bronchodilator

**Action:** stimulate  $\beta$  2 receptors of the bronchi  $\longrightarrow$  leading to bronchodilation.

**Uses:**

- Bronchial asthma.
- Bronchospasm due to bronchitis or emphysema.
- Parenteral for treatment of status asthmaticus.

**Dosage:**

Aerosol for inhalation: 0.18 – 0.2 mg (2 inhalations) Every 4 – 8 hours.

Solution for inhalation: 1.25 mg in 2 – 5 ml.

Oral syrup, tablets: 2 – 6 mg tid – qid.

**Side effects:**

Tachycardia, arrhythmias, anginal pain.

Nausea, vomiting.

Dizziness, sweating, flushing.

Headache, weakness, vertigo, and insomnia.

**Nursing considerations:**

- Don't exceed the recommended dose.
- The contents of the container are under pressure, don't store near heat or open flames.
- When given by nebulization, use facemask or mouth-piece.
- Compress O<sub>2</sub> or air at 6 – 10 L/min for 5-15 minutes.
- Observe client for evidence of allergic response.
- NEVER give the solution prepared to be given as inhalation by the IV route. It may cause severe tachycardia.

### 2) Dopamine Hydrochloride:

**Trade names:** Intropin, docard

**Class.:** Direct & indirect acting adrenergic agent.

**N.B. :** Available for hospital use only on 5 ml ampules containing 200 mg dopaminic hydrochloride.

**Action:**

- It is the immediate precursor of epinephrine in the body.
- It produces direct stimulation of  $\beta_1$  receptors resulting in increasing myocardial contraction, <sup>↑</sup>cardiac output as well as increase renal blood flow & sodium excretion.
- It exerts little effect on diastolic B.P. & induce fewer arrhythmias that seen on other adrenergics.
- Alpha receptors, which are stimulated by higher doses of dopamine exerts vasodilation effects which can override the vasodilating effect.
- In higher doses it stimulates alpha receptors leading to peripheral vasoconstriction.

**Indications:**

- Cardiogenic shock specially in M.I. associated with sever C.H.F. .
- Hypotension due to poor cardiac output.
- Shock associated with septicemia, trauma, heart surgery, renal failure & C.H.F.
- Cardiomyopathy.
- In lower doses (1-5 Mcg/kg/min) used in renal failure.

**Contraindications:**

- Pheochromocytoma, uncorrected tachycardia, arrhythmias.
- Hypovolemia.
- Safety and efficacy is not established in children.

**Side effects:**

- GI: Nausea and vomiting.
- CV: Ectopic heart-beats, tachycardia or bradycardia, anginal pain, palpitation, hypotension or hypertension, dyspnea, wide QRS complex.
- Others: headache.

**Dosage and administration:**

**N.B.** : This is a potent drug . It must be diluted before administration to the patient.

**Suggested dilution:**

Transfer contents of one ampule (5ml containing 200 mg of dopamine) by aseptic technique to either 250 or 500 ml bottle of sterile I.V. solution

(saline, dextrose 5% or reinger lactate). These dilutions will yield a final concentration for administration as follows.

- 250 ml dilution contains 800 mcg/ml of dopamine.
- 500 ml dilution contains 400 mcg/ml of dopamine.

**N.B. :**

- 1- Solution stable after dilution for 24 hours.
- 2- Don't add dopamine to NaHCO<sub>3</sub> or other alkaline I.V. solutions since the drug is inactivated in alkaline solution.

**Rate of administration.:**

Through a suitable I.V. needle or a catheter & through an electronic infusion pump, rate is regulated according to required dose.

**Dose:**

Renal dose: 1-5 Mcg/kg/minute.

Cardiac dose: start initially of 5 Mcg/kg/min then increase by increments up to a rate of 20-50 Mcg/kg/min.

**Nursing considerations:**

- Administer only by IV INFUSION (Not IV bolus nor IM)
- Drug must be diluted before use.
- Administer drug through a central line or a big vein (vein in the antecubital fossa is preferred over those in the hand).
- Stop the drug by small increments.
- Solution is stable for 24 hrs, protect it from light.
- Monitor B.P. & ECG continuously during drug administration.
- Monitor intake & output.
- Monitor patient for occurrence of side effects.
- Check I.V. site for signs of extravasation.
- Drug should be administered through electronic infusion device.

### 3) Ephedrine sulfate:

**Trade names:** Numacin, efedron nasal "nasal decongestant".

**Class. :** Direct & indirect- acting adrenergic agent.

**Action:**

Release norepinephrine from storage sites, stimulate alpha,  $\beta_1 + \beta_2$  receptors  $\longrightarrow$  bronchodilation, nasal decongestant,  $\uparrow$  strength of skeletal muscle so it may be used on myasthenia gravis .

**Uses:**

- Bronchial asthma
- Topically as a nasal decongestant.
- Myasthenia gravis.

**Side effects:**

Urinary retention, painful urination, dry mouth, drowsiness, blurring of vision.

**Dose :**

As a nasal decongestant 2-3 drops at each nostril every 4 hours.

**N.B. :** Not recommended for children under 6 years.

Not to be used for 3-4 consecutive days.

**4) Epinephrine:**

**Trade name:** Adrenaline

**Class. :** Direct acting-adrenergic agent.

**Action:**

A natural hormone produced from adrenal medulla, induce marked stimulation of alpha,  $\beta_1 + \beta_2$  receptors causing cardiac stimulation, bronchodilation & decongestion.

**Uses:**

- 1- Relief of respiratory distress due to bronchospasm.
- 2- Rapid relief of hypersensitivity reactions.
- 3- Cardiac arrest.
- 4- Open- angle glaucoma.
- 5- To prolong the action of anesthesia.
- 6- Topically to stop bleeding.

**Contraindications:**

- Narrow angle glaucoma.
- Shock
- Lactation.
- Tachycardia
- During labor (it may delay the 2<sup>nd</sup> 8 loge do labor).

**Side effects:**

Fatal ventricular fibrillation.

Cerebral hemorrhage urinary retention, headache, necroses at injection side, blurring of vision, photophobia.

**Dose:**

Available in ampules of 1ml containing 1 mg adrenaline

Can be given by I.M injection., I.V. & S.C.

0.2 – 0.5 mg, IM or S.C. + Q 20 min – 4 hr as needed.

**N.B.** : For cardiac resuscitation 0.5 mg diluted to 10 ml with normal saline may be administered I.V. or intracrdiac to restore myocardial contractility.

**Nursing considerations:**

- Never administer 1 : 100 solution IV., use 1 : 1000 mg sol. For I.V. use.
- Use tuberculine (1cc) syringe to measure adrenaline.
- Administer adrenaline using piggyback set to adjust the rate of infusion.
- Administer infusion by electronic infusion device for safety & accuracy.
- Closely monitor patients receiving I.V. adrenaline infusion.
- Note the client for signs of shock “loss of consciousness, clammy, cold skin, cyanosis.... etc.).
- Briskly massage site of S.C. or I.M. injection to hasten the action of the drug.

**\*Adrenergic blocking (sympatholytic) Agents\***

**Beta blockers:** were discussed before.

**Parasympathomimetic (cholinergic) Drugs**

- The neurohormone acetylcholine is necessary for nerve impulses transmission in the parasympathetic (cholinergic) portion of the autonomic nervous system.
- The receptors of parasympathetic nervous system are classified into muscarinic type and nicotonic type.
  - Cholinergic drugs can be divided into 2 classes:
    - 1- Directly acting drugs that mimic the action of acetylcholine.



- 2- Indirectly acting drugs that increase the concentration of acetylcholine, usually by inhibiting acetylcholinesterase.
- Cholinergic drugs have the following pharmacological effects on various structures:
- 1- **GIT:** - Enhance secretion by gastric & other glands & this may cause:
    - ❖ Belching, heartburn, nausea & vomiting.
    - ❖ Increase smooth muscle tone & stimulate bowel movement.
  3. **GU system:** Stimulation of ureter & relaxation of urinary bladder resulting in micturition .
  4. **Cardiac muscle:**
    - Slowing heart rate (Bradycardia).
    - Decrease atrial contractility, impulse formation & conductivity.
  5. **Blood vessels:** Vasodilation → ↑ skin temperature & local flushing.
  6. **Respiration:** ↑ Mucus secretion & bronchial constriction → wheezing, coughing, shocking (specially in asthmatic patients).
  7. **Eyes:** Pupillary constriction (miosis), ↓ in intraocular pressure.
  8. **Skin:** activation of sweat & salivary glands.

### Drugs:

#### 1. Pyridostigmine Bromide:

**Trade name:** Mestinon.

**Class. :** Indirectly acting, cholinergic – acetylcholinesterase inhibitor.

**Action:** By inhibiting the enzyme cholinesterase, that lead to increase the concentration of acetylcholine at the myoneural junction which facilitate the transmission of nerve impulse across the myoneural junction, that lead to increase muscle strength in myasthenia gravis.

**N.B. :**

- It has a slower onset, longer duration of action & fewer side effects than neostigmine.
- Atropine may be given to control side effects.

**Uses:**

Myasthenia Gravis.

**Contraindication:**

- Hypersensitivity
- Bradycardia
- Hypotension
- Asthma

- Hyperthyroidism

- GI obstruction peptic ulcer.

**Side effects:**

Skin rash, thrombophlebitis after I.V. use

Nausea, vomiting, diarrhea.

Bradycardia, Hypotension, headache, dizziness.

Urinary frequency (Incontinence) , bronchosporn.

**Dose:** Tab. 600 mg daily.

**2. Neostigmine Bromide:**

**Trade name:** Prostigmin.

**Dose:** Tab. 150 mg daily.

All information as pyridostigmine.

**3. Ophthalmic cholinergic (Miotic) Agents:**

- Commonly used for the treatment of glaucoma.

**Action:**

These agents inhibit the enzyme cholinestrase which lead to accumulation of acetylcholine & stimulate the ciliary muscles & increases contraction of the iris sphincter muscle. This opens the angle of the eye & results in increased the outflow of aqueous humor & consequently in decreased of intraocular pressure .

**Uses:**

- Glaucoma.
- Diagnosis & treatment of esotropia.
- Antidote against harmful effects of atropine-like drugs in patients suffering from glaucoma.

**Contraindications:**

Hypertension, inflammatory eye diseases (critis)

Asthma, History of retinal detachment, Bradycardia, peptic ulcer.

**Side effects:**

Pain in eye, blurring of vision, Headache.

Failure to accommodate to darkness, retinal detachment.

Diarrhea, hypotension, salivation, bronchial constriction.

**Nursing considerations:**

- 1- Have adrenaline & atropine available for emergency treatment.
- 2- Stress the importance of taking eye drops exactly as prescribed
- 3- Minimize side effects by taking medication at bed-time.
- 4- Advice client not to drive a car for 1-2 hrs after administering eye drops.
- 5- Notify the physician, if side effects occurred.
- 6- Cold compresses for painful eye spasms.
- 7- Frequent eye examinations.

**1) Carbachol:**

**Trade name:** Isopto carbachol.

**Uses:** glaucoma.

**Dose:** 1 gtt of the solution in the conjunctiva 1-2 times daily.

**2) Physostigmine salicylate:**

**Trade name:** Eserine salicylate.

**Uses:** glaucoma.

**Dose:** 1 gtt of the 0.25 or 0.5 % solution bie-tid.

**3) Pilocarpine nitrate:**

**Uses:** glaucoma.

**Dose:** 1 gtt of 1-4 % solution gid.

**□ Cholinergic Blocking (Parasympatholytic) Drugs\*****Action:**

These agents prevent the neurotransmitter acetylcholine from combining with receptors on the muscarinic site & nicotonic site.

**The main effects:**

- 1- Reduce spasm of smooth muscle such as spasm of the urinary bladder or intestines.
- 2- To block vagal impulses to the heart which will increase heart rate & conductivity.
- 3- To suppress or decrease gastric secretions, perspiration, salivation and secretion of bronchial mucus.

- 4- To relax the sphincter muscles of the iris & cause pupillary dilation (mydriasis) & loss of accommodation for near vision.
- 5- Act on CNS producing such reactions as depression (scopolamine) or stimulation (toxic dose of atropine) to produce antiparkinsonism effect.

**Contraindications:**

Glaucoma, tachycardia, myocardial ischemia  
Prostate hypertrophy, myasthenia gravis, paralytic ileus,  
Mental impairment, lactation, hepatic disease.

**Side effects:**

Nausea, vomiting, dry mouth, constipation, heartburn, dizziness, drowsiness, headache, insomnia, blurring of vision, photophobia, flushing, euphoria, hallucination flushing of the skin.

**1) Atropine sulfate:**

**Class.:** Cholinergic blocking agent.

**Action:**

It is a parasympatholytic agent which cause relaxation of smooth muscles & inhibition of secretory glands: “ See parasympatholytic”.

**Uses:**

- Adjunct in peptic ulcer treatment.
- Irritable bowel syndrome.
- Treatment of spastic disorders of biliary tract .
- During anesthesia to control salivation & bronchial secretions.
- Parkinsonism.
- Anti-arrhythmic (prophylaxis).
- Prophylaxis and treatment of toxicity due to cholinesterase inhibitor including organophosphate pesticides.
- Ophthalmologic treatment of uveitis.

**Contraindications:** See parasympatholytics

**Side effects:** See parasympatholytics

**Dose:**

Tablets: 0.3 – 1.2 mg Q 4-6 hr

Available in 1ml-ampoule containing 1 mg atropine.”

IM, I.V. & S.C. 0.4 – 0.6 mg Q 4-6 hour for anticholinergic action.

**N.B. :**

For treatment of toxicity from cholinesterase inhibitors

“ organophosphorus poisoning”, give 2-4 mg IV initially then 2 mg every 5-10 minutes until muscarinic symptoms disappear and signs of atropine toxicity begins to appear like dilation of pupils, flushing of face & tachycardia.

**Nursing considerations:**

- Check dosage & measure the drug exactly.
- Assess for history of asthma, glaucoma, ulcer .. etc.
- Determine the age of the client.
- Frequent mouth care.
- Assess client for change in pulse rate.
- In case of blurring of vision, assist on ambulating & give safety measures.

**2) Scopolamine Hydrobromide :**

**Trade name:** Hyoscine.

**Class.:** cholinergic blocking agent.

**Action :**

It is a parasympatholytic agent, depress the cerebral cortex, especially the motor area, act as a powerful hypnotic.

**Uses:**

- 1- Motion sickness ( prevention and control of nausea and vomiting).
- 2- Preanesthetic.
- 3- Antiarrhythmic.
- 4- Mydriatic and cycloplegic.
- 5- Adjunctive with other drugs to treat GIT ulcers.
- 6- With other narcotics to treat biliary colic.

**Contraindications:**

- |                     |                       |
|---------------------|-----------------------|
| - Hypersensitivity. | - Glaucoma            |
| - Bronchial asthma  | - Cardiac arrhythmias |
| - Pregnancy         | - Lactation.          |

**Dose:**

Oral: 0.25 mg I hour before travel ( for motion sickness).

Parenteral: 0.32-0.6 mg SC or IM.

**Side effects:**

Pupil dilation, photophobia, blurred vision, headache, drowsiness.

Dry mouth, constipation, nausea, vomiting.

tachycardia, arrhythmia

Suppression of lactation, flushing, nasal congestion.

**Nursing considerations:**

As atropine.

**Drugs affecting the respiratory system****1. Antiasthmatic Drugs\*****❖ Theophylline Derivatives:****Action:**

They belong to the xanthine family.

They stimulate the CNS , relax the smooth muscles of the bronchi and pulmonary blood vessels which result in relieve bronchospasm.

They also have a slight diuretic effect , stimulate gastric acid secretions & increase the force and rate of the heart.

**Uses:**

- Prophylaxis and treatment of bronchial asthma.
- Reversible bronchospasm associated with C.O.P.D.

**Contraindications:**

- Hypersensitivity
- Hypotension
- Coronary artery disease (angina pectoris).

**Side effects:**

- Nausea, vomiting, epigastric pain.
- Rectal irritation following use of suppositories.
- Headache, dizziness, Hypotension, arrhythmias ( tachycardia)

**N.B. :**

Aminophylline given by rapid I.V. may produce hypotension , flushing, precordial pain, Headache & dizziness.

**Overdose:**

Toxicity is usually associated with parenteral administration & oral administration especially in children.

Early signs include anorexia, nausea, vomiting, restlessness & irritability.

Later symptom include: agitation, manic behavior, frequent vomiting, extreme thirst & convulsions.

**Formulation:**

Theophylline derivatives are available as I.V. injections, modified release tablets, capsules, rapid release tablets, syrup, and suppositories.

**Dose:** individualized.

**Nursing considerations:**

- 1- Dilute drugs & maintain proper infusion rate.
- 2- Assess client for any history of hypersensitivity.
- 3- Obtain baseline blood pressure and pulse prior to starting therapy, monitor B.P. & pulse closely during therapy.
- 4- Observe closely for signs of toxicity.
- 5- To avoid epigastric pain ( when administred orally) give the medication with meals.
- 6- Monitor for serum level of theophylline.
- 7- Instruct the client to increase intake of fluids to liquefy secretions.

**Examples:**

**1-Aminophylline:**

**Class:** Antiasthmatic , bronchodilator

“ Theophylline + ethylenediamine”

**Action:** Relaxes smooth muscles of bronchi causing bronchodilation and increasing vital capacity of the lungs.

**Additional use :** neonatal apnea and bradycardia.

**Forms:** Ampule 250 mg/10 ml

Tablets 100mg – 200mg.

Pediatric suppositories: 100mg

I.V. administration: 5mg/kg over a period of 10 - 20 minutes.

**Dose:**

IV administration: 250 mg Q 6-8 hours.

Rectal: 500 mg bid.

## **2- Theophylline:**

**Class. :** antiasthmatic, bronchodilator.

**Trade name:** theotrard.

**Forms:** Capsules containing 50 , 100, 200 , 300 mg

## **2. Antitussives\***

- ❖ The cough is a useful protective reflex mechanism through which the body attempts to clear the respiratory tract of excess mucus or foreign particles. Coughing may accompany upper respiratory tract infections, it may also indicate an underlying organic disease whose cause should be ascertained.
- ❖ There are 2 types of cough
  1. Productive (cough accompanied by expectoration of mucus & phlegm).
  2. Nonproductive (dry cough)
- ❖ All important treatment of cough is also proper humidification and intake of fluid .
- ❖ Codeine: See narcotic analgesics

## **3. Expectorants\***

- ❖ Theoretically, the expectorants liquefy mucus and facilitate it's removal from the lungs through coughing. There is no scientific basis for this.

## **4. Combination drugs**

- ❖ Used for coughs, colds, and congestion.

### **Actifed:**

**Class. \contents:** Each capsule or tablet contains:

- 1- Antihistamine: Triprolidine Hcl 2.5mg.
- 2- Decongestant: Pseudoephedrine 60 mg.

Each 5 ml of syrup contains ½ the amount of the above drugs.

**Uses:** Treatment of nasal congestion, runny nose , itching of nose, itchy or watery eyes due to the common cold, allergic rhinitis or other U.R.T. problems.

**Dose:** one tab.\caps every 6 hours.



### **Phenergan with codeine syrup:**

**Class.** \content:

- 1- Antihistamine: Promethazine Hcl 6.25 mg \ 5ml
- 2- Antitussive: codeine phosphate 10 mg \ 5ml.

**Uses:** Relief of cough & upper respiratory tract (U.R.T.) problems associated with the common cold or with allergy.

**Dose:** 5ml Q 6 hr.

### **Solvex:**

**Class. :** Expectorant

**Content :** Each tablet contains bromhexine Hcl 8mg.

Each ml of solution ( 20 drops) contains 2mg.

**Action:** It is a mucolytic, expectorant which stimulate the mucous glands to produce a secretion which is viscid & has a reduced content of acid glycoprotein fiber.

**Indications:**

A condition of U.R.T. & lower R.T. associated with the retention of viscid mucous secretions e.g. as in bronchitis & sinusitis.

**Contraindication:** Hypersensitivity.

**Side effects:** G.I. discomforts. The solution has a bitter taste.

**Dose:** 1-2 tablets 3-4 times daily.

4-8 ml of solution 3-4 times daily.

## **5. Mucolytic\***

**Acetylcystine:**

**Trade name :** Mucomyst.

**Class.:** Mucolytic

**Action :**

It reduces the viscosity of purulent and non purulent pulmonary secretion and facilitate it's removal.

**Uses:**

- 1- Adjunct with the treatment of chronic. Bronchitis, emphysema, tuberculosis, pneumonia, bronchiectasis, and atelectasis.

- 2- Routine care of patients with tracheostomy.
- 3- Pulmonary complications of cystic fibrosis.
- 4- Antidote in acetaminophen poisoning to reduce hepatotoxicity.

**Contraindications:**

Hypersensitivity.

**Side effects:**

- Increases the incidence of bronchospasm in patients with bronchial asthma.
- Increase the amount of liquefied secretions (pulmonary). Which must be removed by suction if cough is inadequate.
- Bronchial & trachial irritation, tightness in chest.
- Nausea, vomiting, rhinorrhea, rash, and fever.

**Dose :**

Nebulization into face mask: 2-10 ml of 10% solution 3-4 times daily.

Acetaminophen overdose: P.O. 140 mg/kg then 70 mg/kg every 4 hr for a total of 17 doses.

**Nursing considerations:**

- The 10% solution may be used undiluted.
- Use water for injection or saline for dilution of 20% solution.
- Administer the medication via face mask or Oxygen tent by positive pressure breathing machine as indicated.
- Closed bottles of solution remain stable for 2 years at 20 c.
- Opened bottles are stored at 2- 8 C for 96 hours, so record time and date of opening on the bottle.
- It is incompatible with antibiotics, must be used separately.
- Have suction machine available.
- If bronchospasm occurs, have a bronchodilator available.
- Position the client on a position that helps to facilitate the removal of secretions.
- Monitor vital signs.
- Wash the client's face following nebulization, usually the face becomes sticky.

## Antihistamines “H1 Blockers”

- ❖ Histamine is stored in almost every type of tissue in the body.
- ❖ Appropriate stimuli including: tissue injury, antigen- antibody (allergic) reactions, and extreme cold trigger the release of histamine from its storage sites into the vascular system where it induces the following responses:
  - 1- Dilation & increased permeability of the small arterioles & capillaries results in → increasing permeability to fluid leading to hypotension & edema nasal congestion & laryngeal edema “associated with allergies”.
  - 2- Contraction of some smooth muscles such as those of bronchioles leading to bronchoconstriction “the role of histamine plays in bronchial asthma” . & Uterine contraction.
- 3- Stimulation of acid secretion in the stomach & salivary, bronchoial & intestinal secretions.
- 4- Dilation of cerebral vessels → Headache.
- 5- Pain & itching because it stimulates the sensory nerve endings.

### **Action:** “of antihistamines”

- The effect of histamines may be reversed either by drugs that block histamine receptors (antihistamine) or by drugs that have effects opposite to those of histamine e.g. epinephrine.
- Antihistamines used for the treatment of allergic conditions are referred to as H1-receptor blockers while those used for treatment of GI disorders as peptic ulcer are referred as H2-receptor blockers.
- They don't prevent the release of histamine
- They prevent or reduce increased permeability → ↓ edema & itching, & bronchospasm.
- H1-blockers manifest varying degrees of CNS depression, anti-cholinergic & antiemetic effect.

### **Uses:**

- Treatment of seasonal allergic rhinitis, allergic conjunctivitis.
- Treatment of urticarial transfusion reactions.
- Treatment of topic dermatitis.
- Treatment of insect bites.
- Sneezing & rhinorrhea due to common cold.

- Prophylaxis & treatment of motion sickness “nausea & vomiting”.
- Night – time sleep aid.

**Contraindications:**

- Hypersensitivity.
- Pregnancy.
- Glaucoma
- Prostatic hypertrophy
- CNS depression (phenothiazine type).
- Bone marrow depression
- Comatose patients.

**Side effects:**

- Sedation - deep sleep - Dizziness - Headache - muscle weakness - disturbed coordination - epigastric distress - dry mouth - nausea - vomiting - urinary frequency, anemia ( pancytopenia) .
- Paradoxical excitation (especially in children & elderly) → Restlessness, irritability, insomnia , hysteria, tremors euphoria, nervousness, hallucinations , disorientation & convulsion.
- Usually caused by overdose (acute toxicity).

**Treatment of overdose:**

- Symptomatic & supportive.
- Vomiting is induced with syrup of ipecac.
- Gastric lavage .
- Vasopressors (to treat hypotension) –e.g. Dopamine , adrenaline.
- Phenytoin for treatment of convulsion.

**N.B.** : Don’t use CNS depressants including diazepam.

**Nursing Considerations:**

- Inject I.M. preparations deep into muscles.
- Oral preparations may cause gastric irritation, so give drug with meals.
- Note if the client has any medical history of ulcer, glaucoma & if the client is pregnant.
- Obtain a baseline B.P. , Pulse & respiration .
- Note signs of CNS depression (signs of overdose so induce vomiting).
- If in hospital, use side rails (safety measures).
- Advice client to report signs of side effects immediately.

- Instruct client to avoid undue exposure to sun.
- If the drug is being used for motion sickness, it should be taken 30 minutes before transporting.
- Caution the client not to drive a car or operate other machinery.

**\*Drugs in this group:**

**1- Astemizole:**

**Trade name :** Hismanil

**Class.:** antihistamine

**Action:** It has no sedative, antiemetic or anticholinergic effects.

**2- Brompheniramine Maleate:**

**Trade name:** ahiston.

**Class. :** Antihistamine.

**Action:** It has little sedative effect.

**Dose:** each tablet contains 2 mg

1-2 tablets 3-4 times daily.

**3- Chlorpheniramine maleate:**

**Trade name:** Anaphyl

**Class:** Antihistamine

**Action:** sedation is less pronounced.

**Dose:** syrup each 5ml contains 5mg

2 teaspoonful 3-4 times daily.

**4- Promethazine Hcl:**

**Trade name:** phenergan, prothiazine.

**Class:** It is a phenothiazine derivative. It is a potent antihistamine with prolonged action. It may cause severe drowsiness. It also provides antiemetic effect (it ↓ chemo receptor trigger zone ).

It also has a sedative action, effective in vertigo → ↓ vestibular apparatus

**Uses:**

- Motion sickness.

- Nausea & vomiting due to anesthesia.

**Forms:**

Syrup: 5ml contains 5 mg , 25 mg.

Ampule: 50 mg \2ml.

**Dose:**

Antihistamine: 125 mg 4 times daily.

Sedative: 25 mg – 50 mg.

Antivertigo: 25 mg 2 times daily.

**\*Drugs affecting the G.I.T. \***

**1. Antacids\***

**Action :**

- Antacids act by neutralizing or reducing gastric acidity , thus increasing the pH of the stomach and relieving hyperacidity. If the pH is increased to 4 , the activity of pepsin is inhibited.
- Ideally, antacids should not be absorbed systemically “NaHco<sub>3</sub> & CaCo<sub>3</sub> may produce systemic effects”.
- Antacids containing magnesium have a laxative effect .
- Antacids containing aluminum or calcium have a constipating effect.

**Uses:**

- Treatment of hyperacidity. (Heart- burns).
- Peptic ulcer
- Duodenal ulcer.
- Gastroesophaged reflux.

**Contraindications:**

- Sodium containing products are contraindicated in C.H.F., hypertension, and other conditions requiring low sodium diet.
- Pregnancy
- Children less than 6 years of age.

N.B. : chronic use of aluminum containing antacids may contribute to development of Alzheimer’s disease.

**Nursing considerations:**

- It is recommended that most antacids be taken at 3 hours after meals & at bed – time .
- Tablets should be thoroughly chewed before swallowing & followed by a glass of milk or water.
- Shake liquid suspensions thoroughly before pouring the medication .
- Client's taking aluminum or calcium containing antacids should take 2500-3000 cc of fluids to prevent constipation.
- Advise clients to report persistent diarrhea or constipation physician.

**Drugs in this group:**

**1- Aluminum Hydroxide Gel:**

**Class.:** Antacid

**Action:** has no systemic activity, has demulcent activity & is constipating .  
Al (OH)<sub>3</sub> & phosphorus form insoluble phosphates that are eliminated in feces prevent phosphates urinary stones.

**Additional uses:** prevention of urinary stones , hyperphosphatemia.

**Side-effects:** constipation , intestinal obstruction, bone pain, muscle weakness.

**Dose:** 500-1800 mg 3-6 times daily after meals, between meals & at bed time.

**2- Calcium carbonate:**

**Class:** antacid.

**Action:**

Nonsystemic, since calcium carbonate is constipating it is often alternated or mixed with Mg<sup>++</sup> salts.

**Additional uses:** calcium deficiency .

**Side effects:**

constipation, flatulence, eructation, intestinal obstruction, metabolic alkalosis, hypercalcemia , rebound hyperacidity.

**Dose :** 0.5 – 1 g as necessary.

**3- Maalox:**

**Class. / content:** Tablet :antacids Al(OH)<sub>3</sub> 200 mg + Mg (OH)<sub>2</sub> 200 mg.

Suspension : antacids 225 mg of  $\text{Al}(\text{OH})_3$  /5ml + 200mg  
Of  $\text{Mg}(\text{OH})_2$ .

**Additional uses** : hiatus hernia

**Dose:**

2-4 tabs - 20-60 m after meals & at bed time .

Suspension: 10- 20 ml aid- 20-60 m after meals & at bed time .

#### 4- Magnesium Hydroxide (magnesia) :

**Class:** antacid , laxative

**Action** : Acts as an antacid by neutralizing Hcl , it doesn't produce  
alkalosis & has a demulcent effect .

As a laxative , it increases the bulk of the stools by attracting &  
holding large amounts of fluids. The increased bulk results in the  
mechanical stimulation of peristalsis.

**Uses:**

- antacid
- laxative to empty the bowel prior to diagnostic or surgical  
procedures .

**Contraindications:**

- poor renal function .

**Side effects:** Diarrhea , abdominal pain , nausea, vomiting.  
hypermagnesemia .

#### 5- Sodium Bicarbonate: $\text{NaHCO}_3$

**Class:** Alkalinizing agent , antacid , electrolyte .

**Action:** Is due to neutralization of Hcl by forming sodium chloride &  
 $\text{CO}_2$ .

- **NB:-** Rarely used as antacid because of:
  - 1- It's high sodium content.
  - 2- Short duration of action.
  - 3- Ability to cause alkalosis.

**Uses:**

- Hyperacidity                      - severe diarrhea ( increased loss of  $\text{HCO}_3^-$  )
- Metabolic acidoses (shock , dehydration, renal diseases..... )



**Contraindications:**

- C.H.F.
- Renal impairment
- Edema
- Cirrhosis of the liver
- Metabolic or respiratory alkalosis .
- Children less than 6 years of age.

**Side effects:**

Metabolic alkalosis (nausea, vomiting, cramps, dizziness, decreased breathing).

Extravasation following I.V. use may manifest: ulceration, sloughing, cellulitis or tissue necrosis

**Nursing considerations:**

- I.V. dose should be determined by Arterial Blood Gases analysis.
- Should be administered. slowly.
- Periodically assess patient serum pH during the therapy.
- Observer for signs of edema.

**\*Antiulcer Drugs\*****1- Cimetidine:**

**Trade name :** Tagamet

**Class:** Histamine H<sub>2</sub>-receptor blocking agent.

**Action:** decreases the acidity of the stomach by blocking the action of histamine which involved in triggering gastric acid secretion. It blocks the action of histamine by competitively occupying the histamine H<sub>2</sub>-receptors in the gastric mucosa leading to decrease secretion of HCl.

**Uses:**

- Short-term (up to 8 wks) & maintenance treatment of duodenal ulcer & treatment of benign gastric ulcer .
- Management of hypersecretion of gastric acid .
- Reflux esophagitis.

**Contraindications:**

- Children under 16 years.
- Lactation
- Impaired renal & hepatic function.

**Side effects:**

Diarrhea, hepatic fibrosis, Hepatitis, Pancreatitis ,  
Hallucinations , Dizziness, Headache, confusion, ataxia, double vision .  
Hypotension, Arrhythmias following I.V. administration. .  
Aplastic anemia, thrombocytopenia.

**Dose:** 300 mg, 4 times daily with meals & at bedtime.

**Nursing considerations:**

- Administer oral medication with meals, if I.V. dilute as prescribed.
- Note the general condition of the patient ( If take chemotherapy or radiation)
- Note signs of infection.
- For diarrhea, maintain adequate hydration.
- Monitor renal function.
- Be alert for mold swings that may occur.

**2- Ranitidine Hcl:**

**Trade name :** Zantac , Randine “ampule 50 mg \2m.” Tab. 150 , 300 mg.

**Class.:** H<sub>2</sub>-receptor antagonists.

**Action:** It competitively inhibits gastric acid secretion by blocking the effect of histamine on histamine H<sub>2</sub>-receptors.

**Uses:** see cimetidine (The same).

**Contraindications:**

Liver cirrhosis, impaired renal & hepatic function .

**Side effects:**

Constipation , nausea , vomiting, diarrhea, headache  
Dizziness , malaise , vertigo , bradycardia or tachycardia  
Pancytopenia , rashes, bronchospasm , alopecia.

**Dose:** 150 mg 2 times daily .

Maintenance 150 mg at bed-time.

**Nursing considerations:**

- Dilute for I.V. use ( 50 mg in 20 ml of 0.9% Nacl) .
- Note any evidence of renal or liver disease.
- Obtain baseline liver & kidney function.
- Note for signs of infection .

- Adequate hydration for problem of diarrhea.

## **Omeprazole**

**Trade name:** Losec, Pepticum, Mepral

### **Uses:**

Gastroesophageal reflux disease, esophagitis, Duodenal ulcer (short-term treatment),

to eradicate H. pylori, Short-term treatment of active benign gastric ulcer

### **Action**

Inhibits activity of acid (proton) pump and binds to hydrogen-potassium adenosine triphosphatase at secretory surface of gastric parietal cells to block formation of gastric acid.

Dose: 20-40 mg daily for 4-8 weeks

### **Side effects:**

CNS: headache, dizziness.

GI: diarrhea, abdominal pain, nausea, vomiting, constipation, flatulence.

Musculoskeletal: back pain.

Respiratory: cough, upper respiratory tract infection.

Skin: rash.

### **Contraindications & cautions**

Contraindicated in patients hypersensitive to drug or its components.

Use cautiously in patients with hypokalemia and respiratory alkalosis.

### **Nursing considerations**

Dosage adjustments may be necessary in patients with hepatic impairment.

Tell patient to swallow tablets or capsules whole and not to open, crush, or chew them.

Instruct patient to take drug 30 minutes before meals.

Caution patient to avoid hazardous activities if he gets dizzy.

## **\*Laxatives\***

### **1-Saline laxatives:**

**Action:** It increase the bulk of the stools by attracting & holding large amounts of fluid. The increased bulk results in the mechanical

stimulation of peristalsis.

**N.B. :** The saline cathartics should be administered with sufficient fluid so as not to cause dehydration .

**Onset :** 0.5 – 3 hrs.

It contains Mg<sup>++</sup> salts so observe for signs of magnesium intoxication (drowsiness, dizziness, other signs of CNS depression .

**Uses:**

- To empty the bowel prior to diagnostic or surgical procedures.
- To eliminate parasites following anthelmintic therapy.
- To remove toxic substances following poisoning.

## **2-Mineral oil:**

**Class.:** Emollient laxative.

**Action:** This mixture of liquid hydrocarbons obtained from petroleum lubricates the intestines, it also decreases absorption of fecal water from the colon.

**Onset:** P.O. Q 6-8 hrs, enema 2-15 minutes.

**Uses:**

- Constipation:
- To avoid straining in certain conditions e.g. hemorrhoid & certain cardiovascular conditions.
- To soften feces during fecal impaction.

**Contraindications:** nausea, vomiting, abdominal. Pain, intestinal obstruction.

**Side effects:**

- Pneumonia due to aspiration of mineral oil.
- Pruritus.
- In pregnancy, it decreases vitamin k absorption leading to hypoprothrombinemia in the newborn.

## **3-Glycerin Suppositories:**

**Class:** miscellaneous laxative.

**Action:** promote defecation by irritating the rectal mucosa as well as by hyperosmotic action, It also softens & lubricates fecal material.

**Onset** 15-60 minutes.

**Uses:**

- To evacuate the colon prior to rectal & bowel examination or surgery.
- To establish normal bowel function in patients dependent on laxatives.

**Contraindications:**

Anal fissure, fistula, ulcerative hemorrhoids.

**\*Digestants\***

**Pancreatin:**

**Class:** Digestant.

**Action:** This mixture of enzymes (pancreatine , lipase, & amylase) is obtained from hog pancreas. The preparation increases digestion of food.

**Uses:** Pancreatic deficiency as pancreatitis , cystic fibrosis & pancreatectomy.

**Side effects:**

Rash, sneezing, lacrimation (allergic) .

Holding tab. in mouth causes stomatitis & ulceration of the mouth.

High doses may cause hyperuricemia.

**Emetics / Antiemetics**

**Emetics:** are used in cases of acute poisoning to induce vomiting when it is desirable to empty the stomach promptly & completely after ingestion of toxic materials. Vomiting can be elicited either by direct action on the chemoreceptor trigger zone in the medulla or by indirect stimulation of the GIT.

**1- Apomorphine Hcl:**

**Class:** Emetic .

**Action:** is a synthetic derivative of morphine which produce vomiting by stimulating the CTZ.

**Uses:** In drug overdose. - Poisoning.

**Contraindications:**

- Shock

- Drug induced CNS depression.
- Ingestion of corrosive substance as lye.
- Patients sensitive to morphine.

**Side effects:**

Depression , euphoria, tremors, tachypnea .

Overdose may lead to excessive emesis, cardiac depression and finally death.

**Dose:** 5-6 mg as a single dose.

**Nursing considerations:**

- Before administration, give client 300 ml of water.
- Store solution in dark closed container.
- Have a naloxone available “ for respiratory distress” .
- Note any sensitivity to morphine.

**2- Ipecac syrup:**

**Class. :** Emetic

**Action:** An alkaloid extracted from Brazil root, acts both locally on the gastric mucosa & centrally on the CTZ.

**N.B. :** Ipecac syrup must not be confused with ipecac fluid extract which is 14 times as potent.

**Uses:** Drug overdose, poisoning to empty stomach.

**Contraindications:**

- With corrosives
- Shock.
- Unconscious patients.
- Children under 6 months.

**Dose:** 5-10 ml preceded or followed by 240 ml of water.

**Antiemetics:**

Nausea & vomiting can be caused by a variety of conditions such as infections, drugs, motion, organic disease or psychological factors. The underlying cause of the symptoms must be elicited before emesis is corrected. The act of vomiting is complex. The vomiting center in the medulla responds to stimulation from many peripheral areas as well as stimuli from CNS itself, the CTZ in the medulla, the vestibular apparatus of the ear & the cerebral cortex.

The selection of antiemetic depends on the cause of the symptom as well as on the manner in which the vomiting is triggered.

Many drugs used for other conditions such as antihistamine, phenothiazines & barbiturates have antiemetic properties & can be so used.

**Drug interaction:**

Because of their antiemetic and antinauseant action the antiemetics may mask overdose caused by other drugs.

**Nursing considerations:**

- 1- Take a complete history, if it is unusual occurrence or if it is a recurring phenomenon.
- 2- Assess for other untoward symptoms as increased intracranial pressure or intestinal obstruction (antiemetic may mask signs of underlying pathology)
- 3- Caution the client that drug tends to cause drowsiness & dizziness, advise him\her to avoid hazardous tasks.

**Metoclopramide Hcl:**

**Trade name:** Pramin

**Class:** Antiemetic

**Action:** It is dopamine receptor antagonist acts both centrally & peripherally, centrally due to the effect in the CTZ ( inhibition) , Peripherally it stimulate the motility of the upper GIT without affecting gastric & biliary or pancreatic secretions. It relaxes the pyloric sphincter & increases the peristalsis of the duodenum resulting in accelerated gastric emptying & intestinal transit.

**Indications :**

- 1- Digestive disorders leading to relief GIT pain , Dyspepsia & regurgitation in peptic ulcer, reflux esophagitis & postanesthetic vomiting.
- 2- Nausea & vomiting as in chemotherapy.
- 3- Facilitate diagnostic procedure e.g. barium meal.

**Side effects:**

GI disturbances, transient hypertension, supraventricular tachycardia, dizziness & extrapyramidal effect “convulsion”.

**Forms:**

Ampule	10 mg\2ml
Ampule	50 mg\10ml
Tablet	10mg
Syrup	5mg\5ml
Suppository.	20mg (adult) , 5mg ( children).

**Dose:**

-10 mg, 30 minutes before meal & at bed time .

-For chemotherapy 2 mg /kg , 30 minutes before chemotherapy.

**Contraindications:** Seizure (epilepsy) , Pheochromocytoma ,intestinal obstruction.

**Nursing considerations:**

- 1- Don't give pramin to patients with epilepsy, pheochromocytomes or patients with intestinal obstruction.
- 2- Administer oral medication 30 minutes before meal & at bed time .
- 3- Administer I.V. injection slowly over 1-2 minutes.
- 4- Be aware of the extrapyramidal symptoms specially in children .

 **Other antiemetics:**

Diphenidol Hcl “ ventrol” .

Trimetho benzamide Hcl “ Tigan” .

**\*Hormones & Hormone Antagonists\*****Insulin:**

- 
- 2 main hormones are secreted from the pancreas :
- 1- Insulin which is secreted by  $\beta$  -cells of islets of langerhans & stored in the pancreas ( $\beta$  -cells ) as a large protein known as **proinsulin** .
  - 2- Glucagon which is thought to oppose the action of insulin. It is secreted by the --- cells of islets of langerhans, it converts glycogen to glucose & elevates blood glucose level.
- 
- Diabetes mellitus is a disease in which the islets of langerhans in the pancreas produce either no insulin or insufficient quantities of insulin . It is classified as



insulin dependent ( type 1 or juvenile-onset) & noninsulin dependent (type II or maturity –onset) .

- It can be treated successfully by the administration of insulin isolated from the pancreas of cattle or hogs or of human insulin made either semisynthetically or derived from recombinant DNA technology .
- The structure of insulin from pork - sources more closely resembles human insulin than that from beef sources.

**Insulin:**

1- Rapid- acting insulin.

- a) Insulin injection ( regular, crystalline zinc insulin) .
- b) Prompt insulin zinc suspension.

2- Intermediate- acting insulin

- a) Isophane insulin suspension (NPH)
- b) Insulin zinc suspension (lente)

3- Long-acting insulin

- a) Protamine zinc insulin suspension (PZI)
- b) Extended insulin zinc suspension (ultralente)

**N.B.** : Insulin preparations with various times of onset & duration of action are often mixed to obtain optimum control in diabetic patients.

**Action:**

- 1- Facilitates the transport of glucose into cardiac & skeletal muscles & adipose tissue.
- 2- Increases synthesis of glycogen in the liver .
- 3- Stimulates protein synthesis & lipogenesis.
- 4- Inhibits lipolysis & release of free fatty acids from fat cells.
- 5- Causes intracellular shifts of potassium.

**N.B.** : Since insulin is a protein , it is destroyed in the GIT thus it must be administered parenterally.

- It is metabolized mainly in the liver.

**Uses:**

- Replacement therapy in type I diabetes.
- Indicated in type II diabetes when other measures have failed or with surgery , trauma, infection, fever , endocrine dysfunction , pregnancy , gangrene , kidneys or liver disease .

- Regular insulin is used in I.V. hyperalimentation.
- Regular insulin is used in I.V. dextrose to treat severe hyperkalemia.

**Contraindications:**

Hypersensitivity to insulin.

**Side effects:**

1- Hypoglycemia due to overdose, decreased food intake or hard exercise, "Hunger, weakness, fatigue, nervousness, pallor or flushing, profuse sweating, headache, numbness of mouth, tingling in the fingers, blurred vision, hypothermia & loss of consciousness."

"Severe prolonged hypoglycemia may cause brain damage."

2- Allergic urticaria, lymphadenopathy. "Use human Insulin product".

3- At the site of injection: developing of swelling, itching, atrophy or hypertrophy of S.C. fat tissue so rotate site of injection to minimize the problem.

4- Insulin resistance caused by obesity, infection, trauma, surgery ....etc.

5- Hyperglycemic rebound (Somogyi effect) in patients who receive chronic overdose.

- Diabetic coma is usually precipitated by the patient's failure to take insulin.

**\*\*\* Treatment of diabetic coma:**

- 20 – 30 units of insulin, then 20 units every 30 minutes.
- To avoid hypoglycemia give 1 g dextrose for each unit of insulin is administered with supplemental electrolytes (K<sup>+</sup>) & fluids.
- Monitor vital signs.
- Urine samples for analysis.

**\*\*\* Treatment of hypoglycemia:**

- Mild hypoglycemia: relieved by oral administration of CHO as orange juice.
- In comatose patients: administer 10 – 30 ml of 50% dextrose solution I.V.

**Dose:**

Usually administered S.C.

**N.B. :** Regular insulin is the **ONLY** preparation that may be administered I.V. This route should be used only for patients with severe ketoacidosis or diabetic coma.

- Always expressed in units.
- Dosage is individualized, it is established & monitored by blood glucose, urine glucose & acetone test.

**Insulin antagonists:**

- 1- Growth hormone elevates glucose level & decreases glycogen synthesis.
- 2- Glucocorticoids enhance conversion of protein to glucose.
- 3- Adrenaline decreases insulin release & enhance glycogenolysis.
- 4- Thyroid hormone promote gluconeogenesis.
- 5- Glucagon.

**Nursing considerations:**

- 1- Read the product information & any important notes inserted into the package.
- 2- Refrigerate stock supply of insulin but avoid freezing.
- 3- Follow the guidelines with respect to mixing the various types of insulin.
- 4- Invert the vial several times to mix before the material is withdrawn “avoid vigorous shaking”.
- 5- Assist patient for self-administration of insulin.
- 6- Rotate the sites of S.C. injections to prevent the problem of hypertrophy or atrophy at injection site.
- 7- Allow insulin to remain at room temperature 1 hour before administration.
- 8- Apply pressure for 1 minute, don’t massage since it may interfere with rate of absorption.
- 9- If breakfast must be delayed, delay the administration of morning dose of insulin.
- 10-Obtain a thorough nursing history from the client / family.
- 11-If the client has symptoms of hyperglycemia reaction:
  - Have regular insulin available for administration.
  - Monitor client closely after administration.
  - Check blood glucose, urine glucose, and acetone.
- 12-Check for early symptoms of hypoglycemia.
- 13-Assess diabetic more closely for infection or emotional disturbances that may increase insulin requirements.

- 14-Explain the necessity for close regular medical supervision.
- 15-Explain to patient how to test the urine for sugar & acetone.
- 16-Explain the use & care of equipment & the storage of medication.
- 17-Explain the importance of exercise & adhering to the prescribed diet.
- 18-Explain the importance of carrying candy or sugar at all times to counteract hypoglycemia should it occur.
- 19-Provide the client & family with a printed chart explaining symptoms of hypoglycemia , hyperglycemia & instructions concerning what to do for each.
- 20-Instruct client that blurring of vision will subside within 6-8 weeks.
- 21-Advise client to check vials of insulin carefully before each dose. Regular insulin should be clear, where as other forms may be cloudy.

### **1- Human Insulin:**

**Class :** Human insulin from semisynthetic or recombinant DNA sources.

**Action:**

Derived from recombinant DNA technology utilizes genetically modified E.Coli . These organisms synthesize each chain of insulin into the same aminoacid sequence as human insulin. The chains are then combined & purified to produce human insulin see information for insulin.

- See information for insulin

### **2- Insulin Injection (Regular, crystalline Zinc insulin)**

**Class:** Rapid- acting insulin.

**Kinetics:**

Onset ½ -1 hr (S.C) , 10-30m (I.V.).

Peak 2-4 hr (S.C) , 15-30m (I.V.) .

Duration 5-7 hr (S.C) , 30-60m (I.V.) .

**Uses:** suitable for treatment of diabetic coma, acidosis (diabetic) or other emergency situations.

**Dose:** individualized, initial 5-10 units 15-30 minutes before meals & at bedtime.

Diabetic acidosis 0.1 unit / kg given by continuous I.V. infusion.

### 3- Isophane Insulin Injection (NPH) :

N = neutral solution P= stand of PZI

H= means that it is originated in Hagedron's laboratory.

**Class:** Intermediate – acting insulin.

**Kinetics:** onset 3-4 hr, duration 18-28 hr.

Peak 6-12 hr.

**Dose:** S.C. Individualized , initial 7-26 units as a single dose 30-60 minutes before breakfast .

### 4- Protamine Zinc Insulin (PZI):

**Class:** long –acting insulin

**Kinetics:** onset 4-6 hr , peak 14-24 hr , duration 36 hr.

**Dose :** see NPH.

See information for Insulin.

## Oral Antidiabetic (Hypoglycemic) Agents

- Several oral antidiabetic agents are available for patients with noninsulin dependent diabetes.
- Oral hypoglycemic agents are classified as either first or second generation.
- Generation refers to structural changes in the basic molecule.
- Second–generation oral hypoglycemic agents are more lipophilic & have greater hypoglycemic potency (200 times) than first generation .

### Classification:

#### 1- First – generation sulfonylureas compounds such as:

- a) Tolbutamide (orinase).
- b) Chlorpromide (diabenase).
- c) Glibenclamide (Daonil).

#### 2- Second-generation sulfonylureas compounds such as:

-Glyburide (Micronase).

### Action of oral antidiabetic agents :

- 1- Increases the sensitivity of pancreatic islet cells.
- 2- Increases insulin secretion by ... -cells.

- 3- The peripheral tissues become more sensitive to insulin due to an increase in the number of insulin receptors & increase the insulin ability to combine with receptors.

**Indication :**

Non- insulin dependent diabetes mellitus (NIDDM) (type II).

- Patients should be subjected to a 7 day therapeutic trial .
- Decrease in blood sugar, decrease in glucosuria & disappearance of polyuria, polydipsia, & polyphagia indicate that patient can be managed on oral antidiabetic agents.

**Contraindications:**

- Type I of D.M.
- Renal & liver disease.
- Diabetes complicated by recurrent episodes of ketoacidosis.

**Side effects:**

- Hypoglycemia (most common) .
- Nausea, heartburn, diarrhea
- Headache, dizziness, general weakness.
- Pancytopenia.
- Chronic use increases risk of cardiovascular mortality.
- Cholestatic jaundice (rare).

**Nursing considerations:**

- See nursing considerations for insulin.
- Drugs may be taken with food to minimize GI upset.
- Stop the medication if signs of side-effects or ketoacidosis appear.

**1- Chlorpromide:**

**Trade name :** Diabenase.

**Class:** first generation sulfonylurea.

**Dose:** initial 250 mg daily as a single or divided doses.

Maintenance 100-250 mg daily as a single or divided doses.

**Doses:** More than 750 mg are not recommended.

**2- Glyburide:**

**Trade name :** Micronase.

**Class:** Second-generation sulfonylurea .

**Dose:** Initial 2.5-5 mg daily given with breakfast ( or the first main meal ) then increased by 2.5 mg weekly to achieve the desired response.

### 3- Tolbutamide :

**Trade name :** Orinase.

**Class:** First-generation sulfomylurea.

**Dose:** Initial 0.5 – 2 g daily , so adjust the dose depending on response (Maintenance 0.25 –3 g daily) ( not exceed 3g ) .

### 4- Glibenclamide :

**Trade name:** daonil.

**Class:** First generation snlfonylurea .

**Dose:** ½ -1 tablet (5mg) daily , increased by 2.5 – 5 mg weekly to achieve the desired response.

## Insulin antagonist

### Glucagon:

**Class:** Insulin antagonist.

#### Action :

It is a hormone produced by the alpha-islets cells of pancreas. It increases blood glucose by :

- 1- Breakdown of glycogen to glucose.
- 2- Stimulate gluconeogenesis from aminoacids & fatty acids.
- 3- Inhibit conversion of glucose to glycogen.

Blood glucose within 5-20 minutes, Duration 1-2 hrs.

**Uses:** Hypoglycemic crisis (to terminate insulin induced shock in diabetic or psychiatric patients) .

**N.B. :** The drug should only be used under medical supervision & according to instructions received from the physician.

-Failure to respond may be an indication for I.V. administration of glucose.

**Side effects:** Nausea , vomiting , respiratory distress , hypotension .

**Dose:** I.V., I.M. or S.C. 0.5-1 mg. (1-2 additional doses may be given at 20 minutes intervals if necessary).

**Nursing considerations:**

- Once the hypoglycemic client is respond, supplemental CHO should be given to prevent secondary hypoglycemia.
- Administer with glucose solution (dextrose) not saline (precipitate may from) .
- Discuss with the client & family the need to keep the dose of insulin.

**\*Adrenocorticosteroids and analogs\***

**Action:**

- They are a group of natural hormones produced by the adrenal cortex.
- They are used for a variety of therapeutic purposes.
- Many slightly modified synthetic variants are available today.
- Some patients respond better to one substance than to another.
- These hormones influence many metabolic pathways & all organ systems & are essential for survival.
- The release of corticosteroids is controlled by hormones such as corticotropin- releasing factor produced by the hypothalamus & ACTH produced by the anterior pituitary.

□ **Corticosteroids have the following effect:**

- 1- **CHO metabolism :**
  - Deposition of glucose as glycogen in the liver & conversion of glycogen to glucose when needed.(Gluconeogenesis).
- 2- **Protein metabolism:** The stimulation of protein loss from many organs.
- 3- **Fat metabolism :** The deposition of fatty tissue in facial , abdominal & shoulder regions.
- 4- **Water & electrolyte balance:** Alteration of glomerular filtration rate, increase sodium & fluid retention, also affect the excretion of potassium, calcium & phosphorus.
5. Have anti-inflammatory effect: they decrease prostaglandin synthesis.
6. The immunosuppresant effect : they decrease number of T-lymphocyte, monocytes, and eosinophils.



7. They aid the organism to cope with stressful situations e.g. trauma & severe illness.

▪ According to their chemical structure, they fall into 2 classes.

- 1- Glucocorticoids e.g. cortisone & hydrocortisone:- regulate the metabolism of CHO, protein & fat .
- 2- Mineralocorticoids e.g. Aldosterone & desoxycorticosterone:- increase reabsorption of Na<sup>+</sup> (+water ) & excretion of potassium & hydrogen.

#### **Uses:**

Therapy with glucocorticoids is not curative & many situations should be considered as adjunctive rather than primary therapy:-:

- 1- Replacement therapy : adrenal insufficiency (Addison's disease) .
- 2- Rheumatic disorders : rheumatoid arthritis & osteoarthritis.
- 3- Collagen diseases: systemic lupus erythematosus, rheumatic cardiac.
- 4- Allergic diseases: drug hypersensitivity , urticarial transfusion reaction.
- 5- Respiratory diseases: bronchial asthma , rhinitis.
- 6- Ocular diseases : allergic & inflammatory conjunctivitis, keratitis ... .
- 7- Dermatological diseases: psoriasis, contact dermatitis, urticaria.
- 8- Diseases of the GIT: ulcerative colitis.
- 9- Nervous system : Myasthenia gravis.
- 10-Malignancies: leukemia, lymphoma.
- 11-Nephrotic syndrome.
- 12-Hematologic diseases: hemolytic anemia, thrombocytopenic purpura.
- 13-Miscellaneous: septic shock, liver cirrhosis, stimulation of surfactant production, prevention of organ rejection.

#### **Contraindications:**

- 1- If infection is suspected (Mask signs & symptoms).
- 2- Peptic ulcer.
- 3- Acute glomerulonephritis.
- 4- Cushing's syndrome .
- 5- Congestive heart failure.
- 6- Hypertension.
- 7- Hyperlipidemia.

**Side effects:**

Prolonged therapy may cause cushing-like syndrome & atrophy of the adrenal cortex & subsequent adrenocortical insufficiency.

**N.B:** steroid withdrawal syndrome may lead to : anorexia, nausea, vomiting, weight loss , headache , myalgia & hypotension.

Side effects include: Edema, alkalosis, hypokalemia, hypertension, CHF muscle wasting , weakness, osteoporosis, nausea & vomiting.

Headache , hypercholesterolemaea , hirsutism, amenorrhea, depression.

Redistribution of body fats: thin extremities and fat trunk, moon-like face, buffalo hump.

**Dose:** Highly individualized according to the condition & response of the patient.

**N.B.:** It is most important that therapy not be discontinued abruptly.

**Nursing Considerations:**

- 1- Administer oral forms with food to minimize ulcerogenic effect.
- 2- For chronic use, give the smallest dose possible.
- 3- Corticosteroids should be discontinued gradually if used chronically.
- 4- Document baseline weight , B.P. , Pulse & temperature.
- 5- Frequently take BP, monitor body weight (signs of Na<sup>+</sup> & H<sub>2</sub>O retention).
- 6- Periodic serum electrolytes, blood sugar monitoring.
- 7- Report signs & symptoms of side effects (cushing-like syndrome).
- 8- Discuss with female client potentials of menstrual difficulties.
- 9- Instruct the client to take diet high in protein & potassium.
- 10-Instruct the client to avoid falls & accidents (osteoporosis causes pathological fracture).
- 11-Remind the client to carry a card identifying the drug being used.
- 12-Stress the need for regular medical supervision.
- 13-Advise the client to delay any vaccination while taking these medications (weakened immunity).
- 14-Explain the need to maintain general hygiene & cleanliness to prevent infection.

**1- Betamethasone:**

**Trade name:** celestone.

**Class:** Adrenocorticosteroid, synthetic, glucocorticoid type.

**Additional Uses:** prevention of respiratory distress syndrome in premature infants

**2- Dexamethasone:**

**Trade name :** dexacort.

**Class :** adrenocorticosteroid –synthetic , glucocorticoid type.

**Forms :** Tablets 0.5 mg.

Ampule 4 mg , 20 mg.

**3- Hydrocortisone:**

**Trade name:** solu –cortef , hydrocortone.

**Class:** adrenocorticosteroid , naturally occurring, glucocorticoid.

**Forms:** Vials 100 mg, 500 mg.

**4-Prednisone :**

**Trade name :** deltasone.

**Class:** adrenocorticosteroid , synthetic.

**Forms:** Tablets 5mg, 20mg.

**5-fludrocortisone acetate:**

**Trade name :** florinef.

**Class:** adrenocorticosteroid , synthetic , mineralocorticoid.

**Uses:** Mainly used for treatment of Addison’s disease .

**Forms:** 0.1 mg tablet.

**4- Betamethasone ointment:**

**Trade name :** Betacortin

**\*Posterior Pituitary Hormones\***

**1-Methylergonovine Maleate:**

**Trade name:** Methergine.

**Class:** Oxytocic agent.

**Action:** Is a synthetic agent stimulates the rate, tone & amplitude of uterine

contractions. It also stimulates smooth muscles surrounding certain blood vessels by interacting with adrenergic & dopaminergic receptors.

**Uses:**

- 1- Management & prevention of postpartum & postpartum hemorrhage by producing firm contraction & decrease uterine bleeding.
- 2- Incomplete abortion.
- 3- Migraine headache

**Contraindications:**

- Pregnancy
- To induce labor
- Prior to delivery of placenta
- Hypertension
- Toxemia

**Side effects:**

Nausea, vomiting, diarrhea, allergic reaction, Dizziness, headache, tinnitus.

**N.B.:** use of this substance during labor may result in uterine tetany with rupture, cervical laceration, embolism of amniotic fluid & intracranial hemorrhage in infant.

**Dose:**

**Forms:** Tablet 0.2 mg (0.2- 0.4 mg /6-12 hr for 48 hrs).

I.V. in emergency situations.

**2-Oxytocin:**

**Trade name:** Pitocin

**Class:** oxytocic agent.

**Action:**

- It has uterine stimulant, vasopressive & antidiuretic properties.
- Mimics uterine contractions of normal labor.
- Facilitates ejection of milk from the breasts by stimulating smooth muscles.

**Onset:** I.V. immediately , I.M 3-5minutes.

**Peak** 40m,

**duration** I.V. 20m. I.M. 30-60 m.

**Uses:**

- Antepartum induction or stimulation of labor.
- Uterine inertia (hypotonic contractions).
- For induction of labor in case of preeclampsia, eclampsia ,maternal diabetes & other conditions.
- To hasten uterine involution .
- Intranasally for postpartum hemorrhage & uterine atony.

**Contraindications:**

- Hypersensitivity
- cephalopelvic disproportion (C.P.D. )
- Malpresentation
- undilated cervix
- History of cesarean delivery.

**N.B.:** Oxytocin should never be given I.V. undiluted in high concentration .

**Side effects:**

Tetanic uterine contraction, rupture uterus Hypertension , tachycardia.

To Fetus :- it may cause death, intracranial hemorrhage, brady or tachycardia

**Dose:** I.M. or I.V. infusion for induction or stimulation of labor.

I.V. infusion 10 units (1ml) diluted in 1000 ml of normal saline or 5% dextrose

Initial 0.001 – 0.002 unit /minute, increased by small increments after 15 minutes intervals

**Nursing Considerations:**

- 1- The physician should be available during administration of the drug.
- 2- Use Y-tubing for I.V. administration (one bottle contain oxytocin & another free) .
- 3- Note any history of hypersensitivity & other contraindications.
- 4- Check for cervical dilation & uterine contractions patterns.
- 5- Remain with the client throughout the administration of medication.
- 6- Monitor fetal heart rate at least every 10 minutes.
- 7- Check vital signs every 15minutes.
- 8- Prevent uterine rupture & fetal damage by clamping off I.V. oxytocin , start medication – Free fluid , provide O2 & notify the physician in case of hypertonic uterine contraction & abnormal fetal heart rate patterns.

### **3-Vasopressin Tannate:**

**Trade name :** Pitressin Tannate.

**Class:** Pituitary ( antidiuretic hormone ).

**Action:**

The ADH (vasopressin) , released from the posterior pituitary regulates water conservation by promoting reabsorption of water by increasing the permeability of the collecting ducts of the kidney.

**Uses:** Neurogenic diabetes insipidus.

**Contraindications:**

- Angina pectoris                      - chronic nephritis
- to be given I.V.

**Side effects:**

Nausea, vomiting, increased intestinal activity leading to belching & increased desire to defecate, allergic reaction, tremor, bronchoconstriction.

**N.B.:**

- If used I.V. causes sever vasoconstriction & tissue necrosis.
- If used I.M causes pain & abscess formation at site of injection.

**Dose:** I.M. 1.5 – 5 units /1-3 days.

**Nursing considerations:**

- 1- Administer 1-2 glasses of water prior to use of medication to minimize side effects.
- 2- Warm the vial of vasopressin tannate in oil in hands & mix until the hormone is distributed throughout the solution before withdrawing the dose.
- 3- Note any history of vascular disease.
- 4- Monitor intake & output.
- 5- Check for signs of dehydration (thirst , skin turgor).
- 6- Weigh the patient daily.

## **\*Calcitonin & Calcium salts\***

- Appropriate calcium levels in the body are required to maintain homeostasis for many processes including blood coagulation, regulation of heart rhythm & skeletal muscle contraction.
- Maintenance of extracellular calcium levels is controlled by parathyroid hormone utilizing a feedback mechanism similar to that of other hormones.
- Dysfunction of the parathyroid may result in hypocalcemic tetany , seizures & death.

### **1) Calcitonin “ Human or salmon”**

**Trade name:** calcimar

**Classification:** calcium regulator.

**Action :**

Calcitonins are polypeptide hormones produced by the parafollicular cells of the thyroid gland in response to elevated serum  $Ca^{++}$  level. It antagonizes the action of PTH through independent mechanism:

- 1- Reduce the rate of turnover of bone, to decrease absorption of calcium & may stimulate of bone formation.
- 2- Increase renal excretion of  $Na^+$ ,  $Ca^{++}$  & phosphate.

**N.B.:** Calcitonin isolated from salmon (calcimar) has the same therapeutic effect as the human hormone except for a greater potency per milligram & somewhat longer duration of action.

- Calcitonin-human is a synthetic substance that has the same sequence of amino- acids as the natural hormone.

- Uses**
- 1- For early treatment of hypercalcemia.
  - 2- With calcium & vitamin D to treat postmenopausal osteoporosis.
  - 3- Hyperparathyroidism.
  - 4- Moderate to severe Paget’s disease.
  - 5- Vitamin D intoxication.

**Contraindication:** Hypersensitivity.

**Side effects:**

skin rash , nausea , vomiting , abdominal pain , diarrhea, inflammation at site of injection.

Headache , dizziness, eye pain and nasal congestion.

**Calcium Salts:**

**Classification:** Electrolyte, mineral

**Action:**

It is essential for maintenance of normal function of nerves, muscles, skeletal system & permeability of cell membranes & capillaries.

- Necessary for activation of many enzymes, contraction of cardiac, skeletal & smooth muscles, nerve impulses, respiration, and blood coagulation.
- Normal calcium serum concentration is 9-10.2 mg/dl .

**N.B.:** Hypocalcemia is characterized by muscular fibrillation, twitching, skeletal muscle spasm, leg cramps, tetanic spasms, cardiac arrhythmias , mental depression & anxiety.

- Excessive chronic hypocalcemia is characterized by brittle defective nails , poor dentation & brittle hair .
- Daily requirements for adult of calcium is 0.8 g /day .

**N.B.:** calcium is well absorbed from the upper GIT, severe tetanic hypocalcemia is well treated by I.V calcium gluconate.

**Uses:**

\*\* I.V.: 1- Acute hypocalcemic tetany secondary to :

- \* Renal failure
- \* Hypoparathyroidism.
- \* Premature infants.

2- To treat depletion of electrolytes.

3- During cardiac resuscitation.

\*\* I.M. or I.V:

1- To reduce spasm (renal & intestinal) .

2- To relieve sensitivity reactions of insect bites.

\*\* P.O:

1- Chronic hypoparathyroidism.

2- Osteoporosis

3- Osteomalacia.

4- Rickets



- 5- Myasthenia gravis
- 6- Supplement for pregnant women.

**Contraindications:**

- 1- Digitized patients.
- 2- Some renal & cardiac patients.
- 3- Cancer with bone metastasis.

**Side effects:**

Hypercalcaemia characterized by lassitude – fatigue, skeletal muscle weakness, confusion & constipation.

Renal calculi, bradycardia, arrhythmias & renal impairment.

\*\* Following P.O: constipation & gastrointestinal irritation may occur.

\*\* Following I.V: venous irritation, tingling sensation, feeling of heat chalky taste.

**N.B.:** Rapid I.V. administration. may result in vasodilation , decreased B.P. & H.R. , cardiac arrhythmias, syncope and cardiac arrest.

\*\* Following I.M.: Burning feeling , necrosis & cellulitis.

**Nursing considerations:**

A-Oral :

- administer 1-1.5 hr after meals, alkalis & large amounts of fat decrease the absorption of calcium.
- If the client has difficulty swallowing large tablets , obtain a calcium in water suspension by diluting the calcium in hot water then cooled by administration.

B-I.V:

- Administer slowly.
  - Observe vital signs closely for evidence of bradycardia & hypotension.
  - Prevent any leakage of medication into the tissue since it is extremely irritating
- C-I.M :
- Rotate the injection sites.
  - Obtain baseline renal function.
  - In case of hypocalcemic tetany , provide safety precautions to prevent injury.

## **Examples:**

### **1- Calcium Carbonate**

**Trade name:** Apocal

**Class:** calcium salt.

**Dose:** capsules , tablets, suspensions 1.25 – 1.5 g 1-3 times daily.

### **2-Calcium Gluconate**

**Class:** calcium salt.

## **\*Thyroid & Antithyroid Drugs\***

The thyroid manufactures 2 active hormones, thyroxine and Triiodothyronine, both which contain iodine .

Diseases involving the thyroid fall into 2 groups:

1- **Hypothyroidism:** decreased thyroid hormones.

- Cretinism in infancy & early life.
- Myxedema in adult.

\* Cretinism leads to decreasing in physical & mental development .

\* Myxedema causes: dry swelling , edema (nonpitting)

-- primary results from atrophy  
of the thyroid &

-- secondary as a result of hypofunction of pituitary gland or  
prolonged administration of antithyroid drugs.

2-**Hyperthyroidism:**

- Increased production of thyroid hormones.
- Graves disease characterized by protruding eyes & extreme nervousness.

## **Thyroid hormone preparations:**

- Levothyroxine sodium (T4) (synthroid)
- Liothyronine sodium (T3) (cytomel)
- Liotrix (Mixture of T4+ T3 ) (Euthroid, thyrolar).

**Action of thyroid hormones:**

- 1- Essential for normal physical & mental development of the fetus & infants.
- 2- Increase the BMR & blood sugar level, increase synthesis of fatty acids, and decrease plasma cholesterol & triglycerides.
- 3- Increase H.R. & peripheral resistance.
- 4- Decrease thyroid releasing hormone (TRH) & TSH from the hypothalamus & anterior pituitary.

**Indications:**

- Replacement therapy in primary & secondary myxedema, nontoxic goiter, and chronic thyroiditis .
- With antithyroid drugs for thyrotoxicosis to prevent hypothyroidism.
- Surgical removal of thyroid gland.

**Contraindications:**

- Uncorrected adrenal insufficiency.
- M.I.
- Hyperthyroidism.

**N.B.:**

- Should not be used to treat obesity or infertility in either males or females.
- In adrenal insufficiency corticosteroids should be initiated first before administration of thyroid preparations.

**Side effects:**

C.N.S.: Nervousness, headache , insomnia, tremor.

C.V.S.: Arrhythmias, palpitations, angina pectoris, dyspnea & hypertension.

GIT: Abdominal Cramps., appetite changes, nausea , vomiting, diarrhea & loss of weight .

Others: Menstrual irregularities , hyperthyroidism, sweating, allergic reaction, hyperglycemia.

**Nursing considerations:**

- 1- The treatment is initiated slowly (with small doses) & gradually increased.
- 2- Store medications in cool dark place.
- 3- Take complete nursing history .
- 4- Note if the client is taking antidiabetic drugs & document .

- 5- Take baseline ECG. then at regular intervals.
- 6- Monitor thyroid function closely.
- 7- Observe client for side effects.
- 8- Monitor PT & PTT closely since the drug increases hypoprothrombinemia.
- 9- Monitor HR & B.P. closely for cardiac patients.
- 10- Instruct the client to report side effects e.g. weight loss & nervousness to physician.
- 11- Have dietitian counsel clients regarding diet according to the energy demands.
- 12- Female client should record menstrual irregularities .
- 13- Encourage the client to keep follow-up visits.

### **\*Antithyroid Drugs\***

Anti-thyroid drugs include thiourcil derivatives & large doses of iodide.

**Action:**

Inhibit partially or completely the production of thyroid hormones by the thyroid gland .

**N.B.:**

Since these agents don't affect release or activity of performed hormone, it may take several weeks for the therapeutic effect to become established.

**Uses:**

- Hyperthyroidism
- In preparing the patient who must undergo surgery or radioactive iodine therapy.

**Cotraindications :** Lactation.

**Side effects:**

- Loss of taste, enlargement of salivary glands .
- Thrombocytopenia, Leukopenia, Agranulocytosis.
- Skin rash & hypoprothrombinemia.

**Examples:**

- 1- Methimazole (Tapazole) is 10 times stronger than (PTU).
- 2- Propylthiouracil (PTU).

**\*\*Radioactive Agents:**

Sodium Iodide I 131

**Trade name :** Idothope.

**Class:** Radioactive agent.

**Action:**

It is distributed throughout the extracellular fluids following oral ingestion, it concentrates in the thyroid gland where it selectively damage or destroy the thyroid tissue.

**Indications:**

- Hyperthyroidism .
- **Thyroid cancer .**

**Contraindications:**

- Patient with vomiting & diarrhea .
- Lactation.
- Patients under 30 years of age.

**Side-effects:** specially when used for thyroid carcinoma.

Bone marrow depression : anemia, leukopenia , thrombocytopenia

Nausea, vomiting, swelling or tenderness in neck .

Pain on swallowing, sore throat , sickness, alopecia.

**Nursing considerations:**

- Only given to hospitalized patients.
- Solution may be darken upon storage , this not affect efficacy.
- Take complete nursing history (for sensitivity) prior to administration.
- If patient take antithyroid drugs 2-3 days before discuss with the physician & reassure patient.
- Institute proper measures to protect visitors & health personnel.
- Increase fluid intake to promote excretion. (through the kidney).

**\*\*Oral Contraceptives\*\***

**Estrogen- Progesterone Combinations**

- The most effective form of birth control available.
- There are 3 types of combinations:
  - 1- Monophasic: contain the same amount of estrogen & progesterone in each tablet.

2- Biphasic : contain the same amount of estrogen in each tablet but the progestin content is lower for the first 10 days of the cycle & higher in the last 11 days.

3- Triphasic: The estrogen content may be the same or may vary throughout the medication cycle. The progestin content vary.

**N.B.** :The purpose of biphasic & triphasic products is to give or provide hormones in a manner similar to that occurring physiologically.

-Other types of oral contraceptives is the progestin-only (mini-pill) product which contain a small amount of progestin in each tablet.

**Action:**

- Inhibit ovulation due to inhibition of L.H. & F.S.H. (by negative feedback mechanism) which are necessary for development of the ova, changes in the endometrium & cervical mucosa so that the penetration of sperm & implantation of ova not take place .
- Promote the regularity of the cycle .
- Decrease incidence of dysmenorrhea.
- Decrease blood loss during menstruation.
- Decrease incidence of endometrial cancer, ectopic pregnancy & pelvic inflammatory diseases.

**Uses:**

- Contraception
- Menstrual irregularities
- Menopausal symptoms
- Endometriosis & hypermenorrhea.

**Contraindications:**

- History of cerebrovascular diseases.
- Hypertension
- Cancer breast
- Impaired hepatic function
- Renal or cardiac diseases.

**Side effects:**

- Hypertension, weight gain , oily skin, hirsutism
- Headache, nausea, dizziness
- Breast tenderness, increase in breast size.
- Anxiety & decrease in menstrual flow.

- Decrease the quantity & quality of breast milk.

**Nursing considerations:**

- 1- Tablets should be taken approximately at the same time each day, with meal or at bedtime.
- 2- Spotting bleeding may occur 1-2 first days of the cycle, if continue notify the physician.
- 3- For the 21 day regimen ,tablet is taken daily beginning on day 5 of the cycle (No tablets are taken for 7 days).
- 4- For the 28 day regimen , tablets are taken for the first 21days following by 7 days of iron containing tablets.
- 5- If a woman fails to take one or more tablets, the following recommendations should be followed: ]
  - If 1 tablet is missed, It should be taken as soon as it is remembered, alternatively 2 tablets can be taken the following day .
  - If 2 tablets are missed, 2 tablets can be taken each day for 2 days , alternatively 2 tablets can be taken on the day the missed tablets are remembered with the second missed tablet being discarded.
  - If 3 tablets are missed , a new medication cycle should be initiated 7 days after the last tablet was taken & additional contraceptive method should be used until the start of the next menstrual period .
- 6- Advise the client if she develops pain in the legs or chest, dizziness to discontinue the therapy & notify the physician.
- 7- Advise the client prior to initiate therapy that there is a high risk for cancer of breast.
- 8- Instruct client to avoid smoking.
- 9- If a woman is a breasted, instruct her to find other form of contraception.

**N.B.:**

“ACHES” system: Pill danger signs.

A = Abdominal pain (sever).

C = chest pain (sever) or shortness of breath.

H= Headache (sever) .

E= Eye problems (loss of vision, blurred vision).

S= Sever leg pain (calf or thigh).

## **\*Diuretics\***

The kidney is a complex organ with 3 main functions:

- 1- Maintain the acid-base balance.
- 2- Elimination of waste materials & return of useful metabolites to the blood.
- 3- Maintenance of an adequate electrolyte balance which in turn governs the amount of fluid retained in the body.

\*\* Malfunction of one or more of these regulatory processes may result in the retention of excessive fluid by various tissues (edema).

\*\* Edema is an important manifestation of many conditions such as pregnancy & congestive heart failure.

### **Action of diuretics:**

It increase the urinary output of water and sodium “ prevention or correction of edema” through one of the following mechanisms:

- 1- Increasing the glomerular filtration rate .
- 2- Decreasing the rate at which sodium is reabsorbed from the glomerular filtrate by the renal tubules, therefore water is excreted along with sodium .
- 3- Promoting the excretion of sodium & therefore water by the kidney.

**Uses:** Congestive heart failure, hypertension, edema.

### **1- Carbonic Anhydrase Inhibitor Diuretics:**

Acetazolamide

**Trade name :** Diamox. (Studied before)

### **2- Loop Diuretics:**

Furosemide

**Trade name :** Fused , Lasix

**Class:** Loop diuretic.

#### **Action :**

- It inhibits the reabsorption of sodium and chloride in the ascending loop of Henle resulting in the excretion of sodium, chloride & to a lesser degree potassium & bicarbonate ions. Also it decrease the reabsorption of sodium & chloride & increase the excretion of potassium in the distal tubule.



- It has a slight antihypertensive effect.

**Uses:**

- Edema associated with:
  - Congestive heart failure
  - Liver cirrhosis.
  - Nephrotic syndrome.
- Acute pulmonary edema.
- Hypertension.

**Contraindications:**

- hepatic coma associated with electrolyte depletion.
- Anuria
- Sever renal diseases .
- Hypersensitivity.

**Side effects:**

- Dehydration, hypovolemia.
- Hypokalemia ,hyperglycemia, Hyponatremia
- Nausea, vomiting, diarrhea, anorexia.
  - Tinnitus, blurring of vision, headache, orthostatic hypotension, rashes & photosensitivity.
- \*After I.V use: Thrombophlebitis & cardiac arrest.
- \*After I.M use: pain at injection site.

**N.B.:**

Because the drug potentates the effects of muscle relaxants, it is recommended to discontinue oral medication 1 week before surgery & the I.V. 2 days before surgery

**Forms:**

tablets 40 mg.  
Ampules 20 mg /2ml , 250 mg /10 ml.

**Dose:** oral: 20-80 mg as a single dose.

I.V: 20-40 mg as a single dose.

For hypertensive crisis:100-200 mg.

**Nursing considerations:**

- 1- When high doses are required, administer lasix by infusion.
- 2- Store in a light-resistant container.

- 3- Monitor serum electrolytes & for signs of hypokalemia.
- 4- Observe client for signs of dehydration & circulatory collapse .
- 5- Monitor pulse & blood pressure.
- 6- Advise the client to take medication in the morning to avoid interruption of sleep.
- 7- Discuss the need for a diet high in potassium.

### **3- Osmotic Diuretics:**

#### **Mannitol**

**Trade name :** Osmitol

**Class :** Osmotic diuretic.

#### **Action :**

Increase the osmolarity of the glomerular filtrate which decrease the reabsorption of water while increasing the excretion of sodium and chloride.

#### **N.B.:**

It also increases the osmolarity of the plasma which cause increase flow of water from tissues to the interstitial fluid & plasma, thus cerebral edema, increased intracranial pressure & CSF volume & pressure are reduced.

#### **Uses:**

- Acute renal failure
- Cerebral edema
- To decrease intracranial pressure
- Glaucoma

#### **Contraindications:**

- Anemia
  - Dehydration
  - pulmonary edema
- “ Progressive heart failure or pulmonary congestion after mannitol therapy”.

#### **Side effects:**

Hypernatremia , electrolyte imbalance, acidosis  
Dehydration, dry mouth , thirst, edema, hypotension & hypertension , blurring of vision , headache , dizziness.

#### **Dose:**

50 ml of 25%, 75 ml of 20 % or 100 ml of 15% solution infused over 3-5 minutes.

**Nursing considerations:**

- 1- Mannitol should not be added to other I.V. solutions nor should it be mixed with other medications .
  - 2- If blood is to be administered at the sometime , add 20 mEq of sodium chloride to each liter of mannitol to prevent pseudoagglutination.
  - 3- Monitor & record vital signs .
  - 4- Observe for signs of electrolyte imbalance or dehydration.
  - 5- Observe for signs, & symptoms of pulmonary edema (dyspnea,cyanosis, frothy sputum).
- “ Slow the rate & notify the physician”.

**4 . Potassium – Sparing Diuretics:**Spironolactone

**Trade name :** Aldactone.

**Class:** Diuretic – potassium sparing.

**Action:**

- Is a mild diuretic that acts on the distal tubule to inhibit sodium exchange for potassium which results in increased secretion of sodium and water & conservation of potassium .
- It is also aldosterone antagonist.
- It has slight antihypertensive effect .

**N.B.:**

It also interferes with syntheses of testosterone & may increase formation of estradiol from testosterone thus leading to endocrine abnormalities.

**Uses:**

- Edema due to congestive heart failure
- liver cirrhosis.
- Nephrotic syndrome .
- Essential hypertension.
- Primary hyperaldosteronism.
- Hypokalemia (as in CHF).

**Contraindications:**

- Acute renal insufficiency.
- Progressive renal failure.

- Patients receiving potassium supplement.
- Hyperkalemia.

**Side effects:**

- Hyperkalemia, hyponatremia ( dry mouth , lethargy, thirst & easy fatigability).
- Vomiting , diarrhea, cramps.
- Menstrual irregularities, gynecomastia, hirsutism & deeping of voice , impotence.
- Skis rashes & breast carcinoma .

**Dose:** 100 mg (1 tab) per day.

**Nursing consideration:**

- protect drug from light.
- Food may increase absorption of aldactone.
- Obtain serum electrolyte levels prior to starting therapy.
- Record vital signs, intake & output & body weight.
- Advise the client to avoid food high in potassium.

**5-Thiazides & related diuretics:**

**Action:**

Promote diuresis by decreasing the rate at which sodium & chloride are reabsorbed by the distal renal tubules of the kidney , thus force excretion of additional water , also increase the excretion of potassium & the excretion of calcium & uric acid .

**N.B.:**

- It is chemically related to sulfonamides.
- It has antihypertensive effect by direct dilation of arterioles as decrease total blood volume.

**Uses:**

Edema due to congestive heart failure , nephrosis , liver cirrhosis & renal failure.

**Contraindications:**

- hypersensitivity
- impaired renal function
- edema due to toxemia of pregnancy (adverse of effect on the newborn) .
- hypokalemia.

**Side effects:**

- Hypokalemia ( cardiac arrhythmias).
- Hyponatremia ( nausea, vomiting , lethargy , epigastric distress).
- Dry mouth, diarrhea , easy fatigability .
- Skin rashes , muscle cramps.
- Hyperglycemia.

**Nursing considerations:**

See Furosemide ( lasix) .

Example

Hydrochlorothiazide

**Trade name :** Esidrex.

**Potassium Chloride**

**Trade name:** KCL for IV preparation, Slow K for oral preparations.

**Classification:** Electrolyte, mineral.

**Uses:**

Patients receiving high doses of potent diuretics.

Patients having secondary hyperaldosteronism.

When there is excessive loss of potassium in feces.

When potassium intake is not adequate (especially in elderly).

**N.B.** maintenance of adequate potassium level is necessary for patients receiving digoxin to avoid digitalis toxicity.

**Dose:**

Available in slow release tablets of 600mg/tablets and in ampules of 20 mmol/10 ML.

Vary according to patients' needs

Maintenance dose for patients who receive normal diet is 2-4 gm daily in divided doses.

IV: 20 mmol is added to 500 ML of IV solution (D5W or NS) and to infuse slowly over 2-3 hours.

**Contraindications:**

Severe renal failure.

If serum potassium level is over 5 mmol/liter.

**Side effects:**

Hyperkalemia

Phlebitis at injection site.

Heart toxicity if infused rapidly.

With oral tablet: Dyspepsia, nausea and vomiting, esophageal or bowel ulceration.

**Nursing considerations:**

Mix solution well.

Administer solution slowly (500 ML of solution over 2-3 hours)

Monitor serum potassium level.

Assess insertion site for signs of phlebitis.

Give oral preparation on full stomach.