SUMMARY FOR PHARMACOLOGY FOR NURSES

CHAPTER 4 — PHARMACOKINETICS (PK)

("What the body does to the drug")
الجسم شو بيعمل لما الدواء يدخل عليه

ABSORPTION – Most Tested Factors (D.S.B.L.P)
- **Dissolution**: Faster dissolution → faster absorption.
- **Surface area**: Small intestine >> stomach.
- **Blood flow**: High blood flow = high absorption.
- **Lipid solubility**: Lipophilic drugs cross membranes easily.
- **pH partitioning**: Drugs absorb best where they are non-ionized.

Bioavailability:
The fraction of unchanged drug reaching systemic circulation.

Routes:
- **IV**: 100% bioavailability, immediate, irreversible.
- **IM**: Depot preparations.
- **SubQ**: Slower than IM.
- **PO**: First-pass effect.
- **Sublingual**: Bypasses first-pass.

Distribution:
- **Blood flow**: Brain, liver, kidney highest.
- **Protein binding (albumin)**: Highly bound drugs stay in blood.

Metabolism:
- Occurs mainly **in liver** via CYP450.
- Results: ↑ renal excretion, activation/inactivation, altered toxicity.

Excretion:
Main route: Kidneys. Others: bile, lungs (anesthetics), breast milk.

Plasma Levels:
- MEC, toxic concentration, therapeutic range.
- Half-life determines dosing interval.

CHAPTER 5 — PHARMACODYNAMICS (PD)

("What the drug does to the body")
الدواء شو بيعمل بالجسم يعني تأثير الدواء

Dose–Response Curve:
- Maximal efficacy: Maximum effect possible.
- Potency: Amount needed for effect.

Receptors (4 types):
1. Ligand-gated ion channels
2. G-protein coupled receptors
3. Enzyme-linked receptors
4. Intracellular receptors

Agonists & Antagonists:
- **Agonists**: **Activate** receptors. الدواء اللي بخلي المستقبلات تتفعّل
- **Anta**gonists: **Block** receptors. الدواء اللي بقفّل المستقبلات
- **Partial agonists**: Produce **weaker activation**. الدواء اللي بفعّل المستقبلات بشكل ضعيف
- **Competitive anta**gonists: **Reversible.**
اي عند اعطاء هذا التصنيف لا يمكن ايقاف تأثيره
مثل غازات الحروب
- **Noncompetitive: Irreversible**.
يمكن ايقاف تأثيره

Therapeutic Index (TI):

المقصود بها النافذة العلاجية التي تفصل ما بين الجرعة العلاجية و الجرعة التي تؤدي الى التسمم و كلما كانت اكبر كانت اكثر امان
TI = LD50 / ED50
High TI = safer.

CHAPTER 13 — PHYSIOLOGY OF PNS

Parasympathetic ("Rest-and-digest"):

SLUDD — **S**alivation, **L**acrimation, **U**rination, **D**igestion, **D**efecation + **m**iosis, bronchoconstriction, ↓ HR.

Sympathetic ("Fight-or-flight"):
↑ HR, ↑ CO, bronchodilation, mydriasis, ↑ glucose, vasoconstriction.

Neurotransmitters:
- **ACh, NE, Epi.**
- **Sweat glands are sympathetic but use ACh (tested).**

Receptors:
- **α1**: Vasoconstriction, ↑ BP.
- **α2**: ↓ NE release.
- **β1**: Heart stimulation, renin.
- **β2**: Bronchodilation, vasodilation.
- **Dopamine**: Renal dilation.

CHAPTERS 14–16 — CHOLINERGIC DRUGS

Muscarinic Agonists (Bethanechol):
Use: Non-obstructive urinary retention. مثل حالات ما بعد العمليات
Contraindication in obstructive urinary retention like tumors
Adverse effect : Muscarinic excess (salivation, sweating, diarrhea, bradycardia).
Antidote: Atropine.

Cholinesterase Inhibitors (Neostigmine, Pyridostigmine):
Use: Myasthenia gravis, reversal of NM blockade.
MG vs Cholinergic crisis:
- **MG crisis = not enough drug (weakness).**
- **Cholinergic crisis = too much drug (SLUDD) → treat with atropine + ventilation.**

Muscarinic Antagonists (Atropine, Ipratropium):
Effects: ↑ HR, ↓ secretions, urinary retention.
Contraindications: Glaucoma, tachycardia, obstruction.
Toxicity antidote: Physostigmine.

Neuromuscular Blockers:
- **Depolarizing**: Succinylcholine — risk of MH & hyperkalemia.
- **Nondepolarizing:** Pancuronium, etc.

Paralyze but DO NOT sedate or relieve pain.

CHAPTERS 17–18 — ADRENERGIC DRUGS

Adrenergic Agonists:
- **Epinephrine:** α1, α2, β1, β2 → anaphylaxis, cardiac arrest.

- **Dopamine:** Dose-dependent receptor activity.
- **Dobutamine:** β1 → HF.
- **Phenylephrine:** α1 → nasal congestion.
- **Albuterol:** β2 → asthma.

Adrenergic Antagonists:

Alpha-Blockers (Prazosin, Tamsulosin):
Use: Hypertension, BPH.
Adverse effect : First-dose syncope → take at bedtime.

Beta-Blockers: hint A–M = **selective**; N–Z = **nonselective**
Nonselective (Propranolol), **selective** (Metoprolol), **mixed** (Labetalol).

Key Points:
- **Do NOT stop abruptly.**
- **May mask hypoglycemia.**
- **Nonselective contraindicated in asthma.**
- **Check HR before administration.**

Memory Table

Pharmacokinetics (PK)

Factor	High-Yield Point
Dissolution	**Faster dissolution → faster absorption.**
Surface Area	**Small intestine >> stomach.**
Blood Flow	**Higher blood flow = higher absorption.**
Lipid Solubility	**Lipophilic drugs cross membranes more easily.**
pH Partitioning	**Drugs absorb best where they are non-ionized.**

Pharmacodynamics (PD)

Concept	Definition
Maximal Efficacy	Maximum possible effect a drug can produce.
Potency	Amount of drug needed to produce effect.
Competitive Antagonist	Reversible; overcome by ↑ agonist.
Noncompetitive Antagonist	Irreversible; decreases maximal response.

Memory Table: Receptors → Drugs → Nursing Implications

Receptor	Drug Examples	Key Nursing Implications
α1	Phenylephrine, Epinephrine	Monitor BP ↑; risk of hypertension and vasoconstriction.
α2	Clonidine, Methyldopa	Watch for sedation; rebound hypertension if stopped abruptly.
β1	Dobutamine, Dopamine, Epinephrine	Monitor HR and rhythm; risk of tachycardia, angina.
β2	Albuterol, Terbutaline	Assess lungs, tremors; avoid overuse to prevent tachycardia.
Muscarinic	Atropine, Bethanechol	For agonists: monitor for SLUDD; for antagonists: watch for retention & dry mouth.
NicotinicM	Succinylcholine, Pancuronium	Ensure ventilation; paralysis DOES NOT include sedation.

Adrenergic Agonists

Drug	Receptors	Uses & monitoring
Epinephrine	α1, α2, β1, β2	Used for anaphylaxis; monitor BP, HR; can cause hyperglycemia.
Dopamine	DA → β1 → α1 (dose-dependent)	Monitor renal perfusion & HR.
Dobutamine	β1	Improves cardiac output; monitor for tachyarrhythmias.
Phenylephrine	α1	Vasoconstriction; monitor for hypertension.

Adrenergic Antagonists

Drug Class	Examples	Key Nursing Considerations
Alpha-1 Blockers	Prazosin, Tamsulosin	First-dose syncope; orthostatic hypotension.
Beta-Blockers (β1 selective)	Metoprolol, Atenolol	Hold if HR < 60; masks hypoglycemia.
Nonselective Beta-Blockers	Propranolol	Avoid in asthma due to bronchoconstriction.
Mixed Blockers	Carvedilol, Labetalol	Monitor BP closely; used in HF.

CHAPTER 47 – DRUGS FOR HYPERTENSION

Most important Definitions

- **Primary (essential) hypertension:** no identifiable cause → *most common*.
- **Target BP for ALL patients: <130/80 mmHg** (HIGH YIELD).
- **HTN cutoffs**:
  - **≥140/90** → no comorbidities
  - **≥130/80** → DM or CKD

Antihypertensive Drug Classes

1) Diuretics

Thiazides (hydrochlorothiazide) → FIRST-LINE for essential HTN

- ↓ Blood volume → ↓ BP.
- **Caution:** gout (↑ uric acid), diabetes (↑ glucose).
- → **Exam tip :** Thiazides cause **HYPO-K** (never combine with loop unless necessary).

Loop diuretics (furosemide)

- Used in **renal impairment** or **low GFR**, **not first-line**.

Potassium-sparing (spironolactone)

- **Risk: hyperkalemia**—never combine with **ACEI/ARBs**.

2) Beta Blockers

- **Contraindication in**: **asthma**, **bradycardia**, **AV block**.
- ↓ HR and contractility.
- **Exam tip :** Do NOT stop abruptly → rebound tachycardia/HTN.

3) ACE Inhibitors (captopril, enalapril)

- **Prevent formation of angiotensin II.**
- **MOST EFFECTS :**
  - **Cough** *dry cough*
  - **Angioedema**
  - **Hyperkalemia**

Contraindicated in pregnancy

DO NOT COMBINE:

- **ACEI + ARB**
- **ACEI/ARB + K-sparing diuretics**

4) ARBs (valsartan, candesartan)

- **no cough**, low angioedema risk.
- **Same contraindications as ACEI regarding pregnancy**.

5) CCBs

Verapamil / Diltiazem (non-DHP):

- **↓ HR + ↓ contractility**
- Contraindication in **HF** + **AV block**.

Dihydropyridines (nifedipine, amlodipine):

- Vasodilators.
- Can cause **reflex tachycardia**.

Hints for Exam

Avoid:

- ACEI + ARB → NO BENEFIT + ↑ harm.
- ACEI/ARB + spironolactone → dangerous **hyperkalemia**.
- Beta-blockers in asthma, bradycardia, AV block.

Use With Caution:

- Thiazides in: diabetes, gout.
- CCB + beta-blocker → risk of heart block (if non-DHP).

Nursing Focus :

Always check **BP + HR** before antihypertensive administration.

- Teach home BP monitoring.
- Gradually titrate dose upward.
- Lifestyle modifications remain essential:

-DASH diet

-↓ alcohol

-exercise

-↓ sodium intake

-smoking cessation

CHAPTER 51 – DRUGS FOR ANGINA PECTORIS (EXAM HIGH-YIELD SUMMARY)

Most Important Concept

Angina = Imbalance between oxygen demand vs. oxygen supply

O_2 Demand Determined by:

- **HR**
- **Contractility**
- **Preload**
- **Afterload**

O_2 Supply Determined by:

- **Coronary blood flow** (vasodilation)

Types of Angina

1) Stable Angina (exertional)

Cause: **Atherosclerosis → fixed obstruction**
Goal: ↓ O_2 demand

Treatment :

- **1st line: beta blockers**
- CCBs
- Long-acting nitrates
- SL nitroglycerin → acute attacks

2) Variant (Prinzmetal's) Angina

Cause: **Coronary artery spasm**
Goal: ↑ **O_2 supply** by vasodilation

Treatment :

- **CCBs (first line)**
- **Long-acting nitrates**

Beta blockers CONTRAINDICATED

3) Unstable Angina

- Emergency
- Severe O_2 supply ↓
  Requires MONA + anticoagulants

Antianginal Drugs — Hints

1) Nitrates (Nitroglycerin, isosorbide dinitrate/mononitrate)

Mechanism

- Vasodilation → ↓ preload → ↓ O_2 demand
- Coronary dilation → ↑ O_2 supply (variant angina)

Sublingual NTG Rules

- Take 1 tablet → wait 5 min
- If pain persists → call EMS
- Take up to 3 doses, 5 min apart
- Store in **dark, closed bottle**
- Replace every **24 months**

Adverse effect :

- **Headache** → most common
- **Orthostatic hypotension**

- **Reflex tachycardia** (prevent with BB or non-DHP CCB)

Contraindicated With:

- **PDE5 inhibitors:** sildenafil, tadalafil → fatal hypotension
- Alcohol
- Other antihypertensives (caution)

2) Beta Blockers

- Only for **stable angina**
- ↓ HR + ↓ contractility = ↓ O_2 demand

Not for variant angina.

3) Calcium Channel Blockers

Non-DHP (verapamil, diltiazem)

- ↓ HR
- ↓ contractility
- Vasodilation

DHP (nifedipine, amlodipine)

- Strong vasodilation
- Good for variant angina

4) Ranolazine

- Used as **add-on therapy only** (never first-line)
- ↓ Na^+ and Ca^{2+} overload

Nursing Focus

BEFORE nitroglycerin:

- Assess BP
- Assess HR
- Assess pain characteristics

TEACH:

- Sit down before taking SL NTG
- Rising slowly (orthostatic risk)
- Avoid alcohol + PDE5 inhibitors
- Keep NTG tablets properly stored
- Seek emergency help if pain persists after 1st dose