

## SUMMARY FOR PHARMACOLOGY FOR NURSES

### Part 2 : CHAPTER 52: Anticoagulant, Antiplatelet & Thrombolytic Drugs

#### CORE DISTINCTIONS

<i>Class</i>	<i>What it prevents</i>	<i>Key Exam Phrase</i>
<i>Anticoagulants</i>	<i>Clot formation</i>	<i>“Prevent fibrin formation”</i>
<i>Antiplatelets</i>	<i>Platelet aggregation</i>	<i>“Prevent platelet plug”</i>
<i>Thrombolytics</i>	<i>Existing clots</i>	<i>“Dissolve clots”</i>

#### ANTICOAGULANTS

##### *Heparin*

###### *Mechanism*

- *Activates antithrombin III → inhibits thrombin & factor Xa*
- *Route: IV / SC only*
- *Monitoring: aPTT*
- *Antidote: Protamine sulfate*

*Major risk: BLEEDING*

*HIT (Heparin-Induced Thrombocytopenia) → paradoxical clotting*

###### *Nursing implications*

- *Monitor aPTT, platelets*
- *Watch for bleeding gums, hematuria*
- *No IM injections*

##### *Warfarin*

###### *Mechanism*

- *Inhibits vitamin K–dependent clotting factors (II, VII, IX, X)*
- *Monitoring: INR*
- *Antidote: Vitamin K*
- *Delayed onset (NOT for emergencies)*

**Contraindicated in pregnancy**

**DOACs (New Oral Anticoagulants)**

*Examples: apixaban, rivaroxaban, dabigatran*

- *No routine lab monitoring*
- *Fewer food interactions*
- *Still → bleeding risk*

**ANTIPLATELETS**

*Aspirin*

- *Irreversibly inhibits COX-1 → ↓ thromboxane A<sub>2</sub>*

*Stop before surgery (7 days)*

*Clopidogrel*

- *ADP receptor blocker*

**THROMBOLYTICS**

*Alteplase (tPA)*

*Function: converts plasminogen → plasmin → dissolves clot*

***Active bleeding = ABSOLUTE CONTRAINDICATION***

**Nursing implications**

- *Monitor neuro status (ICH risk)*
- *Avoid invasive procedures*

**CHAPTER 28: Opioid Analgesics, Antagonists & Nonopioid Centrally Acting Analgesics**

**DEFINITIONS**

- *Opioids: act on  $\mu$  (mu) receptors → analgesia + sedation*
- *Tolerance: need ↑ dose for same effect*
- *Dependence: withdrawal if stopped abruptly*

## **OPIOID AGONISTS**

*Examples: morphine, fentanyl, codeine*

### **Effects**

- *Analgesia*
- *Respiratory depression = leading cause of death*
- *Constipation*
- *Miosis (pinpoint pupils)*

### **Nursing implications**

- *Monitor RR (hold if <12/min)*
- *Fall precautions*
- *Stool softeners required*

## **OPIOID ANTAGONIST – Naloxone**

### **Mechanism**

- *Competitive  $\mu$ -receptor antagonist*  
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- *Shorter half-life than opioids → repeated doses needed*

## **NONOPIOID CENTRALLY ACTING ANALGESIC**

### **Acetaminophen**

- *Analgesic + antipyretic*
- *NO anti-inflammatory action*

*Toxicity: LIVER DAMAGE*

*Antidote: N-acetylcysteine*



## CHAPTER 26: Local Anesthetics

### MECHANISM

- *Block sodium channels → prevent nerve impulse conduction*

### TYPES

Type	Example	Key Exam Point
Ester	Procaine	More allergy
Amide	Lidocaine	Most commonly used

### EPINEPHRINE COMBINATION

#### Purpose

- *Prolongs action*
- *Decreases bleeding*

#### DO NOT use in:

- *Fingers*
- *Toes*
- *Nose*

### TOXICITY

- *CNS excitation → seizures*
- *Cardiovascular depression*

### Nursing implications

- *Aspirate before injection*
- *Monitor ECG with IV lidocaine*

## CHAPTER 27: General Anesthetics

### DEFINITION

- *Produce reversible loss of consciousness*



## **TYPES**

### **Inhalational**

- *Isoflurane, nitrous oxide*

### **IV**

- *Propofol*

## **PROPOFOL**

- *Rapid onset*
- *Causes hypotension + respiratory depression*

## **MALIGNANT HYPERTHERMIA**

### **Triggers**

- *Inhalational anesthetics*
- *Succinylcholine*

### **Signs**

- *High fever*
- *Muscle rigidity*

### **Antidote**

- *Dantrolene*

## **NURSING IMPLICATIONS**

- *NPO before anesthesia*
- *Monitor airway, BP, temperature*
- *Emergency cart ready*

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**RECEPTOR → DRUG → EFFECT → NURSING IMPLICATION MAP**

**CHAPTER 52: Anticoagulants, Antiplatelets & Thrombolytics**

<b>Receptor / Target</b>	<b>Drug</b>	<b>Effect</b>	<b>Critical Nursing Implication</b>
<i>Antithrombin III</i>	<i>Heparin</i>	<i>Inhibits thrombin &amp; factor Xa</i>	<i>Monitor aPTT, antidote = protamine, bleeding precautions</i>
<i>Vitamin K-dependent factors (II, VII, IX, X)</i>	<i>Warfarin</i>	<i>Prevents clotting factor synthesis</i>	<i>Monitor INR, contraindicated in pregnancy, vitamin K antidote</i>
<i>Factor Xa</i>	<i>Apixaban, Rivaroxaban</i>	<i>Prevents thrombin formation</i>	<i>No routine labs, still bleeding risk</i>
<i>COX-1 (platelets)</i>	<i>Aspirin</i>	<i>Inhibits platelet aggregation</i>	<i>Stop 7 days before surgery</i>
<i>ADP (P2Y12) receptor</i>	<i>Clopidogrel</i>	<i>Prevents platelet activation</i>	<i>Bleeding risk, aspirin alternative</i>
<i>Plasminogen</i>	<i>Alteplase (tPA)</i>	<i>Dissolves existing clots</i>	<i>Absolute CI: active bleeding, ICU monitoring</i>

**CHAPTER 28: Opioid Analgesics & Antagonists**

<b>Receptor</b>	<b>Drug</b>	<b>Effect</b>	<b>Key Nursing Implication</b>
<i>μ (mu) opioid receptor</i>	<i>Morphine, Fentanyl</i>	<i>Analgesia, sedation, euphoria</i>	<i>Monitor RR (hold &lt;12/min), fall precautions</i>
<i>μ receptor (antagonist)</i>	<i>Naloxone</i>	<i>Reverses opioid effects</i>	<i>Short duration → repeat doses may be needed</i>
<i>Central COX (CNS)</i>	<i>Acetaminophen</i>	<i>Analgesic, antipyretic</i>	<i>Hepatotoxicity, antidote = N-acetylcysteine</i>

## CHAPTER 26: Local Anesthetics

Target	Drug	Effect	Nursing Implication
Voltage-gated Na <sup>+</sup> channels	Lidocaine	Blocks nerve impulse conduction	Aspirate before injection
Na <sup>+</sup> channels + vasoconstriction	Lidocaine + Epinephrine	Prolonged anesthesia	Never use in fingers, toes, nose, penis

## CHAPTER 27: General Anesthetics

Receptor / Site	Drug	Effect	Nursing Implication
GABA-A receptor	Propofol	Sedation, hypnosis	Hypotension + respiratory depression
Ryanodine receptor (muscle)	Volatile anesthetics	Malignant hyperthermia	Antidote = Dantrolene

## Part 3 : CHAPTER 84 – PENICILLINS

Bactericidal – weaken bacterial cell wall

### CORE DEFINITIONS

- *Penicillins:  $\beta$ -lactam antibiotics that inhibit bacterial cell wall synthesis, leading to lysis and death.*
- *Bactericidal  $\neq$  bacteriostatic  $\rightarrow$  kills bacteria.*

### CONCEPTS

#### 1. Mechanism

- *Inhibit peptidoglycan cross-linking  $\rightarrow$  weak cell wall  $\rightarrow$  osmotic lysis.*

#### 2. Resistance

- *Bacteria produce  $\beta$ -lactamase (penicillinase).*
- *Solution: combine with  $\beta$ -lactamase inhibitors*
  - *Clavulanate*
  - *Sulbactam*
  - *Tazobactam*

### 3. Spectrum Differences

Type	Example	Key Exam Point
Narrow spectrum	Penicillin G	Gram-positive mainly
Broad spectrum	Amoxicillin, Ampicillin	↑ Gram-negative coverage

### 4. Acid Stability

- Penicillin G: NOT acid stable → IV/IM only
- Penicillin V, Amoxicillin: Acid stable → oral

### 5. ELIMINATION

- Renal excretion → dose adjustment in renal impairment

### ADVERSE EFFECTS

#### ALLERGY

- Rashes → anaphylaxis (life-threatening)
- Cross-allergy:
  - All penicillins cross-react
  - ~1% cross-reactivity with cephalosporins

#### A rule:

Severe penicillin allergy = **NO penicillins + NO cephalosporins**

#### Safe alternatives:

- Vancomycin
- Erythromycin
- Clindamycin

### NURSING IMPLICATIONS

- Take allergy history **FIRST**
- Skin test if ordered
- Observe patient 30 minutes after parenteral dose
- Anaphylaxis treatment: epinephrine + airway support



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- *Teach patient to finish full course*

## **CEPHALOSPORINS & RELATED DRUGS**

### **CORE CONCEPT**

- *Cephalosporins =  $\beta$ -lactam antibiotics  $\rightarrow$  same mechanism as penicillins.*

### **GENERATIONS**

*As generation  $\uparrow$   $\rightarrow$  gram-negative  $\uparrow$ ,  $\beta$ -lactamase resistance  $\uparrow$ , CSF penetration  $\uparrow$*

- 1st Strong gram-positive*
- 3rd Good CNS penetration*
- 5th MRSA coverage (ceftaroline)*

- *Renal elimination  $\rightarrow$  dose reduction*  
**EXCEPTION:** *Ceftriaxone (biliary elimination)*

### **BLEEDING RISK**

- *Cefotetan & Ceftriaxone*
  - *$\downarrow$  Vitamin K  $\rightarrow$  bleeding*

### **ALCOHOL INTERACTION**

- *Cefazolin & Cefotetan*
- *Cause disulfiram-like reaction*

### **C. difficile**

- *Broad-spectrum cephalosporins  $\rightarrow$  CDI*
- *Tx: Metronidazole or Vancomycin*

### **NURSING IMPLICATIONS**

- *Ask about penicillin allergy*
- *Monitor:*
  - *Bleeding*
  - *Renal function*
  - *Diarrhea (CDI)*

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- *Avoid alcohol with specific agents*

## **CHAPTER 86 – TETRACYCLINES & MACROLIDES**

*Bacteriostatic – inhibit protein synthesis*

### **TETRACYCLINES**

#### **Mechanism**

- *Inhibit 30S ribosomal subunit*

#### **DO NOT give with:**

- *Milk*
- *Antacids*
- *Iron*

#### **CONTRAINDICATIONS**

- *Pregnancy*
- *Breastfeeding*
- *Children < 8 years bc it Causes permanent teeth discoloration*

#### **ADVERSE EFFECTS**

- *Photosensitivity*
- *GI irritation*
- *Superinfection (C. difficile, Candida)*

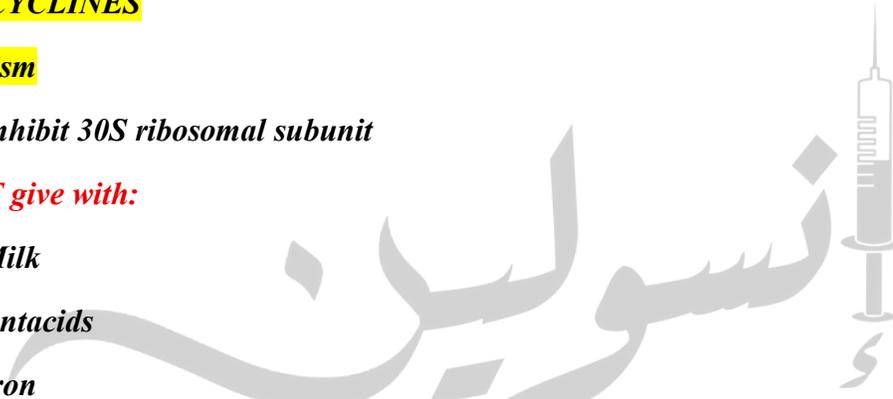
#### **RENAL IMPAIRMENT**

- *Doxycycline = safest in renal disease*

### **MACROLIDES**

#### **Erythromycin**

- *Alternative for penicillin-allergic patients*
- *Similar spectrum to penicillin G*



## **CHAPTER 87 – AMINOGLYCOSIDES**

*Bactericidal – protein synthesis inhibitors*

### **DEFINITIONS**

- *Aminoglycosides: bactericidal antibiotics active against aerobic gram-negative bacilli*

### **MECHANISM**

- *Inhibit 30S ribosomal subunit*
- *Cause rapid bacterial death*

### **ABSORPTION**

- *NOT absorbed orally*
- *Used IV/IM for systemic infections*

### **TOXICITY**

#### **1. Ototoxicity (IRREVERSIBLE)**

- *Hearing loss*
- *Vestibular damage*

#### **2. Nephrotoxicity (REVERSIBLE)**

- *Monitor creatinine*

#### **3. Neuromuscular blockade**

- *Worsens myasthenia gravis*

### **DRUG INTERACTIONS**

*Avoid combination with:*

- *Vancomycin*
- *Loop diuretics*
- *Amphotericin B → ↑ toxicity*

### **NURSING IMPLICATIONS**

- *Monitor:*
  - *Renal function*
  - *Hearing & balance*



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- *Ensure slow IV infusion*
- *Do NOT mix with penicillins in same IV line*
- *High-risk patients: renal disease, elderly*

### **COMPARISON TABLE**

<i>Class</i>	<i>Cidal/Static</i>	<i>Major Risk</i>
<i>Penicillins</i>	<i>Bactericidal</i>	<i>Allergy</i>
<i>Cephalosporins</i>	<i>Bactericidal</i>	<i>Bleeding, CDI</i>
<i>Tetracyclines</i>	<i>Bacteriostatic</i>	<i>Teeth, photosensitivity</i>
<i>Aminoglycosides</i>	<i>Bactericidal</i>	<i>Ototoxicity, nephrotoxicity</i>



**NURSING TEAM**