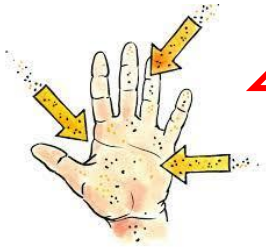
Lecture 12 - Pharmacology

Drug Therapy in Pediatric & Geriatric Age Groups

Pediatric Group – Pharmaco**kinetics ADME**			
Absorption	**Distribution**	**Metabolism**	**Excretion**
Gastro-intestinal **absorption** is **slower** in infancy	**Lower** volume of distribution of **fat**-soluble drugs (e.g. **diazepam**) in infants low fat diet	At birth, the hepatic **microsomal enzyme** system is relatively **immature**	All **renal** mechanisms (filtration, secretion and reabsorption) are **reduced** in **neonates**.
absorption from **intra-muscular** IM injection is **faster** 	Plasma **protein binding** of drugs is **reduced** in neonates 	Drugs administered to the **mother can induce neonatal enzyme** activity (e.g. **barbiturates**). Barbie=mother= induce enzyme 	Subsequently, during **toddlerhood**, it **exceeds** adult values, often necessitating **larger** doses per kilogram. E.g. the dose per kilogram of **digoxin** is much higher in toddlers than in adults
percutaneous absorption can cause **systemic toxicity** , Infant skin is **thin** 	Blood–brain barrier is more **permeable** in <u>neonates</u> and <u>young children</u>, leading to an **increased** risk of **CNS adverse effects.** 		

Pediatric Group – Pharmaco**dynamics**

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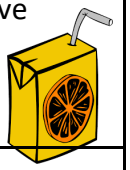
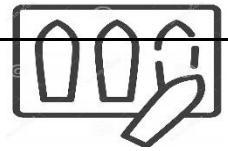
	PEDIATRIC DRUG DOSAGE	**ADVERSE EFFECTS**	**PEDIATRIC DOSAGE FORMS & COMPLIANCE**
Apparently paradoxical effects of some drugs (e.g. hyperkinesia with **phenobarbitone** , sedation of مهم hyperactive children with مهم**amphetamine**) are as yet unexplained **Augmented** responses to WAR**farin** in prepubertal patients occur at similar plasma concentrations as in adults, implying a **pharmacodynamic** mechanism	Most drugs approved for use in children have recommended pediatric doses, stated as **milligrams per kilogram**	With a few notable exceptions, drugs in children generally have a **similar** adverse effect profile to those in adults. Some specific ADR examples are: 1. **chronic** corticosteroid use, including high-dose **inhaled corticosteroids**, to **inhibit growth** **2. Tetracyclines** are deposited in growing bone and teeth, causing **staining** and occasionally **dental hypoplasia** تترا-تصبغ اسنان **3. Fluoroquinolone** antibacterial drugs may damage growing **cartilage** Queen 👑 =car 🚗 **3. Dystonias** with **metoclopramide** occur more frequently in children and young adults than in older adults (meet=destiny) **involuntary spasm** **4. Valproate hepatotoxicity** is increased in **young** children (hepa=valuable)	Children **under** the age **of five years** may have **difficulty in swallowing** even small tablets, >>> oral preparations which **taste pleasant** are often necessary to improve **compliance**. (Elixirs & Suspensions)
	Calculations of pediatric dosage: **Surface area** based (**Young's** formula): Dose = $Adult\ Dose \times \frac{Age(years)}{Age+12}$ **Body** weight based الأدق(**Clark's** rule): **Dose** = $Adult\ Dose \times \frac{Weight\ (kg)}{70}$		Pressurized aerosols (e.g. **salbutamol** inhaler) in children over the age of **ten** years, as coordinated **deep** inspiration is required. **Nebulizers** may be used. - Children find **intravenous infusions uncomfortable** and **restrictive**. - **Rectal** administration is a **convenient** alternative **1. metronidazole** to treat anaerobic infections). (metro=anaer, no air) **2. Rectal diazepam** is particularly valuable in the treatment of status **epilepticus**. 3. Rectal administration should also be considered if the child is **vomiting**.





Rules of prescribing for Pediatric populations

- Calculate the **doses** for prescribed drugs based on **weight** of the patients.
- Ensure proper **instructions** to the **care giver الأم او الشخص المسؤول عن الطفل**, including when the child vomits the given medication after consumption.
- Ensure that all medicines are strictly **out of reach of children** at all times.
- **Avoid prolonged treatment** with drugs that have delayed complications (**Steroids**).
- Use **antibiotics** sparingly(in small quantities)and only when required.
- Medications affecting the **CNS** need to be extensively **reviewed** and routinely monitored to ensure **minimal** growth **disturbances**.

Pediatric Stages of Development

Stage	Description
Preterm	Birth <37 weeks' gestation
Neonate	Newborn to 1 month
Infant	1 month to 12 months
Toddler	12 months to 36 months
Child	3 years to 12 years

Geriatrics Group – Pharmaco**kinetics ADME**

Absorption	**Distribution**	**Metabolism**	**Elimination**
Little evidence of any major alteration in drug absorption with age. However, conditions associated with **age** may alter **rate** at which some drugs are **absorbed**. (**Diabetic gastroparesis** , **laxative abuse**)	Elderly have **reduced** lean body mass, **reduced** body water	Capacity of **liver** to metabolize drugs does **not** appear to decline consistently with age for **all** drugs	**Kidney** is major organ for clearance of drugs from body, age-related **decline** of **renal** functional capacity is important

Geriatrics Group – Pharmaco**dynamics**

Sensitivity to drugs	**Most frequent drug classes causing ADRs**	**ADRs and Age** (Adverse reactions side effects -adverse effects)
Geriatric patients believed to be much more "**sensitive**" to action of many drugs, implying a **change** in **pharmacodynamic** interaction of **drugs** with their **receptors**. BUT, most of these are a result of **changing Pharmacokinetics**!	Cardiovascular active agents Analgesics (opioid mainly) Antibiotics Hypoglycemic agents Psychotropic agents Anticoagulants	Incidence of ADR **increases** with age Elderly receive **more** medicines Incidence of ADR increases the **more** prescribed medicines taken For patients **aged>50 yrs** - ADR rates – **5% for 1 or 2 medicines** - Increased to **20% when >5 medicines**

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- Rules of prescribing for the elderly (Geriatrics)

Think about the **necessity** for drugs.

Avoid drugs with **negligible** or doubtful benefits.

Think about the **dose**.

Think about drug **formulation**.

Assume any **new symptoms** may be due to drug **side-effects**.

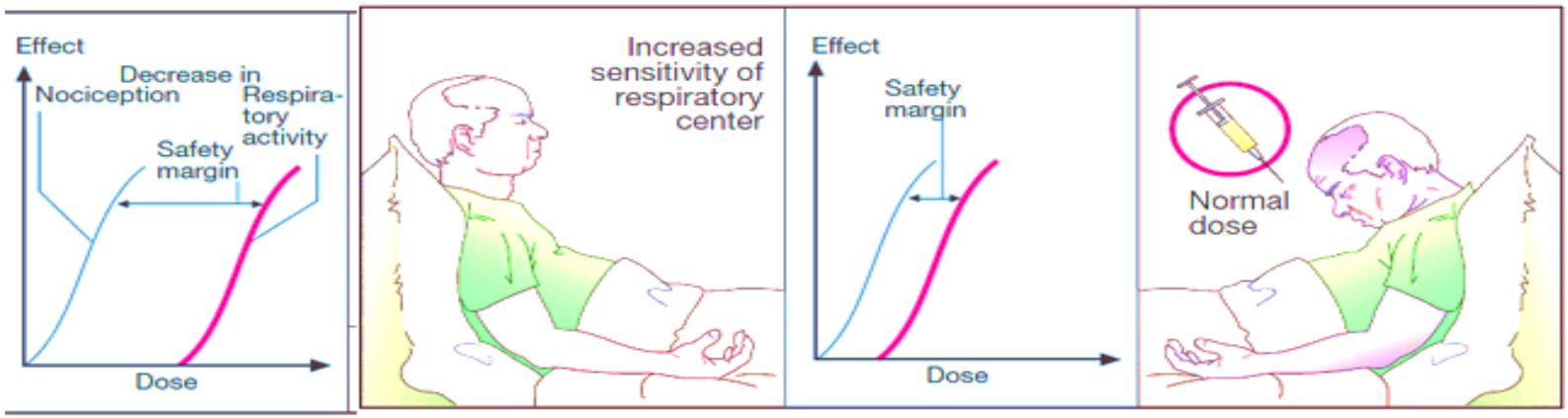
Take a careful **drug history**.

Use fixed **combinations** of drugs **rarely**.

Check **Compliance**.

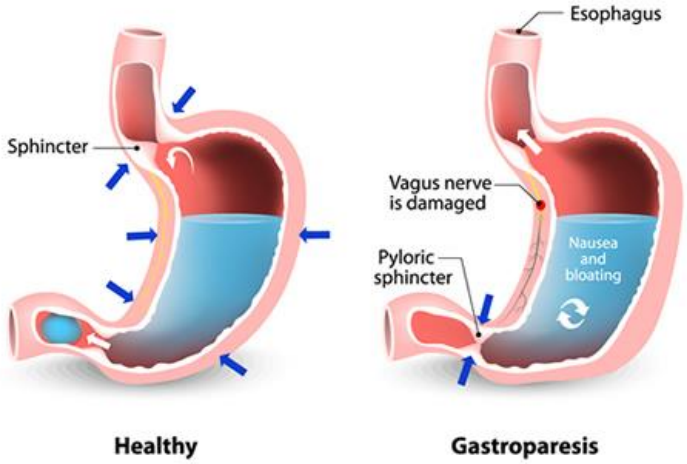
Think before adding a **new drug** to the regimen.

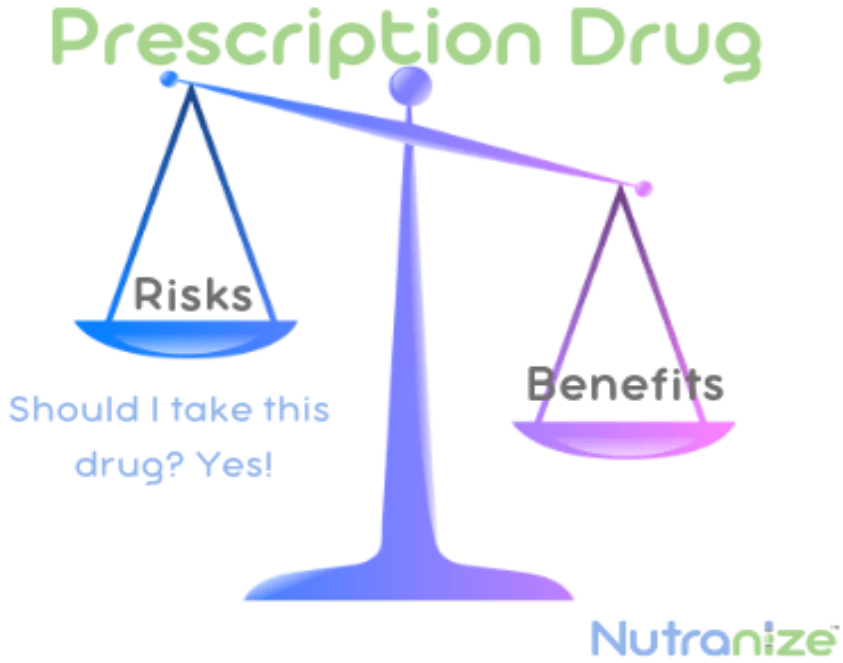
Stopping is as important as **Starting**.



B. Adverse drug effect: increased sensitivity

GASTROPARESIS





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