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Drugs Used in Paediatric and Geriatric Patients

Pharmacology

Age-related pharmacological changes, paediatric dosage principles, geriatric pharmacology, drug safety and special nursing considerations.

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CHAPTER 18 / PHARMACOLOGY 18. Drugs Used in Paediatric and Geriatric Patients

1. Introduction

Age influences absorption, distribution, metabolism, excretion and tissue response. Children are not small adults, and older adults are heterogeneous rather than a single dosing group. Developmental physiology, functional status, comorbidities and formulation suitability affect medicine safety.

2. Paediatric pharmacokinetics

Process	Developmental considerations
Absorption	Gastric pH, gastric emptying, skin permeability and muscle blood flow vary with age.
Distribution	Newborns have relatively high total body water and altered protein binding; water-soluble drugs may distribute differently.
Metabolism	Hepatic enzyme maturation varies; some pathways are immature in neonates and some clearances may later exceed adult weight-normalized values.
Excretion	Glomerular filtration and tubular function mature after birth; premature infants require particular attention.

3. Paediatric dosing principles

Use age-specific approved references, actual current weight in kg, gestational/postnatal age for neonates, dosing interval and maximum dose. For selected drugs, BSA is used. Verify concentration and delivery device, especially when small volumes are required. See Chapter 04 for worked calculations. Historical age-based adult-dose fractions are not reliable modern rules.

Practice case: A fictional order is 8 mg/kg/dose every 8 hours for a child weighing 12 kg. Each dose = 96 mg; three doses/day = 288 mg/day. A solution of 80 mg/5 mL requires 6 mL per dose. Verify the clinically appropriate dose and actual formulation before use.

4. Paediatric dosage forms and administration

- Use an oral syringe or other calibrated device for liquids; household spoons are unreliable.

- Verify mg/mL and whether a suspension needs shaking or reconstitution. Explain storage and expiry after reconstitution.

- Do not mix medicine into a full bottle of food or milk because incomplete intake can cause underdosing. Use an approved method and small suitable amount if advised.

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- Check developmental ability to swallow tablets. Use age-appropriate explanations and caregiver participation.
- Avoid automatically repeating a dose after vomiting; consult the drug-specific protocol and assess timing.

5. Examples of paediatric precautions

Medicine group	Important considerations
Aspirin	Avoid routine use for viral fever because of Reye syndrome risk; specialist indications exist.
Opioids and sedatives	Respiratory depression; age-specific restrictions, particularly codeine and tramadol.
Antibiotics	Use weight/age-specific regimens; neonatal ceftriaxone/calcium and bilirubin precautions.
Antihistamine / cough products	May cause sedation, paradoxical excitation or toxicity; avoid unsuitable OTC products in young children.
Paracetamol	Weight-based prescribed dosing and maximum total exposure; check multiple products.

6. Geriatric pharmacokinetics and pharmacodynamics

Older adults may have reduced renal reserve, altered hepatic metabolism, reduced total body water and lean mass, increased body fat proportions and changes in sensitivity to CNS or cardiovascular drugs. Low muscle mass may conceal renal impairment when serum creatinine appears normal. Frailty, swallowing difficulties, poor nutrition and multimorbidity influence therapy. Some long-acting lipid-soluble drugs can accumulate; dose adjustment depends on the actual drug and patient.

7. Polypharmacy and potentially inappropriate medicines

Polypharmacy often refers to five or more concurrent medicines, but the clinical issue is inappropriate or burdensome treatment, not a number alone. A prescribing cascade occurs when a medicine's adverse effect is mistaken for a new disease and treated with another medicine. Review indications, expected benefit, interactions, duplicate ingredients and patient goals.

Group	Potential older-adult risks
Benzodiazepines / Z-drugs	Falls, cognitive effects, sedation and dependence.
Strong anticholinergics	Confusion, constipation, retention and blurred vision.
NSAIDs	GI bleed, renal injury, BP and fluid retention.
Insulin / sulfonylureas	Hypoglycaemia, especially with irregular intake.
Antihypertensives / diuretics	Orthostatic symptoms, electrolyte changes and falls.
Anticoagulants	Bleeding risk; benefit must be considered alongside individualized risk.

Tools such as Beers Criteria and STOPP/START support medicine review, but they are not substitutes for clinical

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judgment or automatic prohibitions. Deprescribing is planned and supervised, with tapering when necessary.

8. Nursing care for older adults

Perform medication reconciliation including OTC and herbal products. Assess vision, hearing, memory, dexterity, financial and transport barriers. Use accessible instructions, teach-back, appropriate organizers and caregiver support with consent. Monitor sedation, falls, delirium, orthostatic BP, hydration, bowel function and renal tests. Avoid restraints or sedation simply for convenience; identify underlying causes of agitation.

9. Comparison of special populations

Feature	Paediatric	Geriatric
Key dose concerns	Growth, weight, maturation	Renal function, frailty, interactions
Common formulation issue	Accurate liquid measurement	Swallowing, device handling, multiple medicines
Monitoring emphasis	Weight changes, feeding, behaviour	Falls, cognition, function, organ reserve
Education	Child and caregiver, developmentally appropriate	Patient-centred, accessible, caregiver support if preferred

10. Examination questions

Long answer questions

1. 1. Explain age-related pharmacokinetic changes in children and older adults.
2. 2. Describe paediatric dosage and geriatric medication safety with nursing responsibilities.

Short answer questions

- Neonatal dosing; polypharmacy; oral syringe; prescribing cascade; deprescribing.

Very short answer questions

- Which weight unit is preferred for paediatric dosing? - Kilograms.
- Can creatinine alone rule out reduced renal function in a frail older person? - No.
- What is a prescribing cascade? - Treating a medicine adverse effect as a new illness with another medicine.

11. Quick revision

Children require validated weight- and age-specific dosing. Older adults need organ-function and frailty assessment. Both populations benefit from medication reconciliation, accessible education and close monitoring.

Conclusion

Age-sensitive drug care prevents avoidable dosing errors, adverse effects and loss of function, while preserving the benefits of appropriate treatment.

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Practice questions

Choose one best answer. The answer key and explanations follow the questions.

1. Which neonatal characteristic can alter the distribution of water-soluble medicines?

A. Uniform adult-like water distribution

B. Relatively high total body water

C. Relatively high body fat with low tissue water

D. Fully mature adult-like protein binding

2. Why can a normal serum creatinine be misleading in an older adult with low muscle mass?

A. It proves increased renal reserve

B. It rules out the need for medicine review

C. Low muscle mass may conceal renal impairment

D. It guarantees normal drug clearance

3. Which device is appropriate for measuring a small prescribed oral liquid dose for a child?

A. An ordinary household teaspoon

B. A household tablespoon estimated by eye

C. An unmarked drinking cup

D. An oral syringe or another calibrated device

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Answer key and explanations

1. B - Relatively high total body water

Newborns have relatively high total body water and altered protein binding.

2. C - Low muscle mass may conceal renal impairment

Low muscle mass can mask renal impairment despite apparently normal creatinine.

3. D - An oral syringe or another calibrated device

Calibrated devices improve measurement; household spoons are unreliable.

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