Pharmacology in the Elderly

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Age changes

Ageing causes a number of changes in drug absorption, distribution and elimination.

This can occur as a consequence of living habits such as diet, alcohol use, smoking, concomitant use of other drugs, liver enzyme changes and disease processes.
Figure 1: Pathway of Drug Delivery and its Effect

- drug dose
- ingestion
- absorption
- distribution (plasma concentration)
- metabolism
- clearance

Blood brain barrier (or other membrane transport)

Target organ
- drug-receptor binding
- post-receptor activation
- change in cellular metabolism
- drug effects & side-effects
Pharmacokinetics

Important factors:
- Increase in Gastric pH
- Reduction of gastrointestinal motility
- Reduction in blood flow
- Decrease absorption surface in the gastrointestinal tract
Pharmacokinetics

- Distribution is influenced by:
  - Blood flow
  - Plasma protein binding
  - Physico-chemical properties of the drug itself

- Also influenced by lean and non-lean body mass:
  - Adipose tissue increases
  - Total body water is reduced
Pharmacokinetics

- Liver blood flow decreases with age
- Genetic influences on liver enzymes
  - Cytochrome P450 enzymes
  - Fast metabolisers vs. Slow metabolisers
- Liver metabolism is also influenced by smoking, liver disease, alcohol nutritional status and influence of other drugs
Pharmacokinetics

- Aging causes reduced renal function
- 30-35% reduction in glomerular filtration and renal blood flow
- Drugs that are excreted through glomerular filtration such as lithium are potentially toxic in the elderly
Some drugs can have varying effects in the elderly

This occurs due to several reasons:
- Changes in the number of receptors
- Changes in the binding affinity
- Deficits in homeostatic mechanisms
Pharmacodynamics

- Changes in drug receptors/target organ responses - alter sensitivity to effect of drugs (> CNS effects of benzodiazepines).
- Impairment of secondary compensatory mechanisms - predispose to adverse effects (orthostatic hypotension with diuretics or TCAs).
Need to be careful to try and achieve an efficacious pharmacological response with the lowest dosage

Go LOW and go SLOW principle
Conventional Antipsychotics

- Increased risk of EPSE and tardive dyskinesia
- Increased cardiovascular risk – QTc interval
Illustration showing prolonged QT interval on an electrocardiogram (ECG)
Atypical Antipsychotics

- Generally lower risk for EPSE and cardiovascular issues
- Metabolic syndrome
- Orthostatic Hypotension
Antidepressant medication

- **Tricyclic antidepressants** – anticholinergic, sedative and cardiovascular effects
- Narrow therapeutic index
- Concomitant administration of inhibitors and inducers of liver enzymes
- Generally 2nd line treatment in the elderly
Antidepressant Medication

- SSRI - Selective Serotonin Reuptake inhibitors
- Wide therapeutic index
- Effected by metabolism in the liver
- Loss of therapeutic effect in the elderly
- Serotonin syndrome
Benzodiazepines

- Adverse events reported more frequently in the elderly
- Daytime drowsiness, dizziness and light headedness
- Also associated with memory problems, rebound insomnia and withdrawal
- Cumulative effects
- Falls – Hip fractures
Effect of adverse events

- Falls – sedation levels, hypotension
- Higher rates of morbidity – longer hospitalisation
- Delirium
- Mortality
Limitations in treating the Elderly

- Medical co-morbidities
- Less efficacy of certain medications
- Limited dosing flexability
- Prolonged illness
Non-compliance

- Unintentional - result confusion, forgetfulness
- Intentional - to minimise adverse effects or save money.
Minimising adverse effects

- Whenever possible, use non-pharmacological treatments
- Lowest feasible dose (often less than half usual adult dose)
- Smallest number of medications/simplest dose regimens
- Be familiar drug effects in elderly
- Simple verbal/written instructions for every medication
- Presenting symptoms may be a result of medications (not old age)
- Regular review chronic - may be possible to stop medications or reduce dose if renal function declines
- Make sure the carer understands treatment