Life Span Considerations
Learning Objectives

• 1. Discuss the influences of the patient’s age on the effects of drugs and drug responses.
• 2. Identify drug-related concerns during pregnancy and lactation and provide an explanation of the physiologic basis for these concerns.
• 3. Discuss the process of pharmacokinetics and associated changes in various patient age groups, such as in pediatrics, pregnancy, and the elderly.
Learning Objectives

• 4. Summarize the impact of age-related changes on pharmacokinetics in drug therapy.
• 5. Calculate a drug dosage for a pediatric patient using a variety of formulas.
• 6. Identify the importance of a body surface area nomogram for pediatric patients.
• 7. Develop a nursing care plan for drug therapy and the nursing process for patients across the life span.
Life Span Considerations

• Pregnancy
• Breast-feeding
• Neonatal and Pediatric
• Elderly
Pregnancy

- First trimester is the period of greatest danger for drug-induced developmental defects
- Drugs cross the placenta by diffusion
- During the last trimester the greatest percentage of maternally absorbed drug gets to the fetus
- FDA pregnancy safety categories
<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category A</td>
<td>Studies indicate no risk to human fetus.</td>
</tr>
<tr>
<td>Category B</td>
<td>Studies indicate no risk to animal fetus; information for humans is not available.</td>
</tr>
<tr>
<td>Category C</td>
<td>Adverse effects reported in animal fetus; information for humans is not available.</td>
</tr>
<tr>
<td>Category D</td>
<td>Possible fetal risk in humans reported; however, consideration of potential benefit vs. risk may, in selected cases, warrant use of these drugs in pregnant women.</td>
</tr>
<tr>
<td>Category X</td>
<td>Fetal abnormalities reported and positive evidence of fetal risk in humans available from animal and/or human studies. These drugs should not be used in pregnant women.</td>
</tr>
</tbody>
</table>
Breast-feeding

• Breast-fed infants are at risk for exposure to drugs consumed by the mother
• Consider risk-to-benefit ratio
<table>
<thead>
<tr>
<th>Age Range</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Younger than 38 wk gestation</td>
<td>Premature or preterm infant</td>
</tr>
<tr>
<td>Younger than 1 mo</td>
<td>Neonate or newborn infant</td>
</tr>
<tr>
<td>1 mo to younger than 1 yr</td>
<td>Infant</td>
</tr>
<tr>
<td>1 yr to younger than 12 yr</td>
<td>Child</td>
</tr>
</tbody>
</table>

**NOTE:** The meaning of the term *pediatric* may vary with the individual drug and clinical situation. Often the maximum age for a pediatric patient may be identified as 16 years of age. Consult manufacturer’s guidelines for specific dosing information.
• Absorption
  – Gastric pH less acidic
  – Gastric emptying is slowed
  – Intramuscular absorption faster and irregular

**Neonatal and Pediatric Considerations:**

Pharmacokinetics
Neonatal and Pediatric Considerations: Pharmacokinetics (cont’d)

- **Distribution**
  - The younger the person, the greater the % of total body water
  - Greater TBW means fat content is lower
  - Decreased level of protein binding
  - Immature blood-brain barrier—more drugs enter the brain
Neonatal and Pediatric Considerations: Pharmacokinetics (cont’d)

• Metabolism
  – Liver immature, does not produce enough microsomal enzymes
  – Older children may have increased metabolism, requiring higher doses than infants
  – Other factors
Neonatal and Pediatric Considerations: Pharmacokinetics (cont’d)

• Excretion
  – Kidney immaturity affects glomerular filtration rate and tubular secretion
  – Decreased perfusion rate of the kidneys may reduce excretion of drugs
Factors Affecting Pediatric Drug Dosages

- Skin is thin and permeable
- Stomach lacks acid to kill bacteria
- Lungs have weaker mucus barriers
- Body temperatures less well regulated and dehydration occurs easily
- Liver and kidneys are immature, impairing drug metabolism and excretion
Methods of Dosage Calculation for Pediatric Patients

- Body surface area method
  - Using the West nomogram
- Body weight dosage calculations
  - Using mg/kg
Fig. 3-1. West nomogram for infants and children. S.A., Surface area.
Pediatric Considerations: Medication Administration

• General interventions
• Infants
• Toddlers
• Preschoolers
• School-aged children
• Adolescents
The Elderly

• Elderly: older than age 65
  – Healthy People 2010: older than age 55
• Use of OTC medications
• Increased incidence of chronic illnesses
• Polypharmacy
Physiologic Changes in the Elderly Patient

• Cardiovascular
• Gastrointestinal
• Hepatic
• Renal
<table>
<thead>
<tr>
<th>Medication</th>
<th>Common Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analgesics</td>
<td>Confusion, constipation, urinary retention, nausea, vomiting, respiratory depression, decreased level of consciousness, falls</td>
</tr>
<tr>
<td>Opioids</td>
<td>Edema, nausea, abdominal distress, gastric ulceration, bleeding, renal toxicity</td>
</tr>
<tr>
<td>Nonsteroidal antiinflammatory drugs</td>
<td>Major and minor bleeding episodes, many drug interactions, dietary interactions</td>
</tr>
<tr>
<td>Anticoagulants (heparin, warfarin)</td>
<td>Blurred vision, dry mouth, constipation, confusion, urinary retention, tachycardia</td>
</tr>
<tr>
<td>Anticholinergics</td>
<td>Sedation and strong anticholinergic adverse effects (see above)</td>
</tr>
<tr>
<td>Antidepressants</td>
<td>Nausea, hypotension, diarrhea, bradycardia, heart failure, impotence</td>
</tr>
<tr>
<td>Antihypertensives</td>
<td>Visual disorders, nausea, diarrhea, dysrhythmias, hallucinations, decreased appetite, weight loss</td>
</tr>
<tr>
<td>Cardiac glycosides (e.g., digoxin)</td>
<td>Sedation, weakness, dry mouth, confusion, urinary retention, ataxia</td>
</tr>
<tr>
<td>CNS depressants (muscle relaxants, narcotics)</td>
<td>Confusion, daytime sedation, ataxia, lethargy, forgetfulness, increased risk of falls</td>
</tr>
<tr>
<td>Sedatives and hypnotics</td>
<td>Electrolyte imbalance, rashes, fatigue, leg cramps, dehydration</td>
</tr>
<tr>
<td>Thiazide diuretics</td>
<td></td>
</tr>
<tr>
<td>Condition</td>
<td></td>
</tr>
<tr>
<td>Bladder flow obstruction</td>
<td>Anticholinergics, anhistamines, decongestants, antidepressants</td>
</tr>
<tr>
<td>Clotting disorders</td>
<td>NSAIDs, aspirin, antiplatelet drugs</td>
</tr>
<tr>
<td>Chronic constipation</td>
<td>Calcium channel blockers, tricyclic antidepressants, anticholinergics</td>
</tr>
<tr>
<td>COPD</td>
<td>Long-acting sedatives/hypnotics, narcotics, β-blockers</td>
</tr>
<tr>
<td>Depression</td>
<td>Some antihypertensives: methyldopa, reserpine, quinethidine</td>
</tr>
<tr>
<td>Heart failure and hypertension</td>
<td>Sodium, decongestants, amphetamines, OTC cold products</td>
</tr>
<tr>
<td>Insomnia</td>
<td>Decongestants, bronchodilators, MAO inhibitors</td>
</tr>
<tr>
<td>Parkinson’s disease</td>
<td>Antipsychotics, phenothiazines</td>
</tr>
<tr>
<td>Syncope/falls</td>
<td>Sedatives, hypnotics, narcotics, CNS depressants, muscle relaxants, antidepressants, antihypertensives</td>
</tr>
</tbody>
</table>
The Elderly: Pharmacokinetics

• Absorption
  – Gastric pH less acidic
  – Slowed gastric emptying
  – Movement through GI tract slower
  – Reduced blood flow to the GI tract
  – Reduced absorptive surface area due to flattened intestinal villi
The Elderly: Pharmacokinetics (cont’d)

• Distribution
  – TBW percentages lower
  – Fat content increased
  – Decreased production of proteins by the liver, resulting in decreased protein binding of drugs (and increased circulation of free drugs)
The Elderly: Pharmacokinetics (cont’d)

• Metabolism
  – Aging liver produces fewer microsomal enzymes, affecting drug metabolism
  – Reduced blood flow to the liver
The Elderly: Pharmacokinetics (cont’d)

• Excretion
  – Decreased glomerular filtration rate
  – Decreased number of intact nephrons
The Elderly: Problematic Medications

- Analgesics, including NSAIDs
- Anticoagulants
- Anticholinergics
- Antidepressants
- Antihypertensives
- Cardiac glycosides (digoxin)
- Sedatives and hypnotics
- Thiazide diuretics
## US Controlled Drug Schedule

<table>
<thead>
<tr>
<th>Schedule</th>
<th>Abuse Potential</th>
<th>Physical Dependence</th>
<th>Psychological Potential</th>
<th>e.g.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Highest</td>
<td>High</td>
<td>High</td>
<td>heroin, marijuana, LSD</td>
</tr>
<tr>
<td>II</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>narcotics such as meperidine, methadone, morphine, oxycodone; amphetamines; and barbiturates</td>
</tr>
<tr>
<td>III</td>
<td>Moderate</td>
<td>Moderate</td>
<td>High</td>
<td>nonbarbiturate sedatives, nonamphetamine stimulants,</td>
</tr>
<tr>
<td>IV</td>
<td>Lower</td>
<td>Lower</td>
<td>Lower</td>
<td>some sedatives and anxiety agents, nonnarcotic analgesics</td>
</tr>
<tr>
<td>V</td>
<td>Lowest</td>
<td>Lowest</td>
<td>Lowest</td>
<td>small amounts of narcotics (codeine) used as antitussives or antidiarrheals</td>
</tr>
</tbody>
</table>
THE ROLE OF THE NURSE IN DRUG ADMINISTRATION
Rights of Drug Administration

The (5) Rights offer guidelines for safe drug administration:
• Right patient
• Right medication
• Right dose
• Right route
• Right time
• Right documentation
• Right REASON
• Right of client to refuse
• Patient’s Rights

Because of the risks involved in drug administration, patients have the right to:

- be informed of the name, purpose, action & potential side effects of drugs

- refuse a medication regardless of the consequences

- receive labelled medications safely in accordance with the five (5) rights

- be adequately informed of the experimental nature of any drug and sign a written consent

- not receive unnecessary medications
The nurse is also responsible for ensuring that they have the knowledge to ensure the correct administration of drugs. This includes pharmacology, anatomy and physiology, and legal issues.
WHAT CONSTITUTES A LEGAL MEDICATION ORDER

Medication charts are legal documents and must be completed accurately and unambiguously in order to ensure that patients receive safe and optimal drug therapy.
WHAT CONSTITUTES A LEGAL MEDICATION ORDER

Medication Charts should be written legibly in the prescriber’s own handwriting and include:

- Patient’s surname, first name, medical record number (MRN), ward/clinic
- if a patient ID label is used it must be affixed to every medication chart and signed for verification by the prescriber
WHAT CONSTITUTES A LEGAL MEDICATION ORDER

- Drug name (generic), dosage form, strength and dose required

- Complete, clear and unambiguous directions for each item – directions should be written in plain English (only approved abbreviations may be used)
WHAT CONSTITUTES A LEGAL MEDICATION ORDER

- Prescriber’s printed name, signature and date of order - the prescriber’s full signature and date of order must be written for EACH DRUG ordered

- Weight should be provided for any drug dosed by weight.
WHAT CONSTITUTES A LEGAL MEDICATION ORDER

- N.B. Each medication order must be legible, complete and unambiguous so that the correct patient is administered the correct drug at the appropriate dose. A nurse cannot administer the drug and a pharmacist cannot dispense a drug to a patient unless all details are correct and complete.
THE ROLE OF THE NURSE IN DRUG ADMINISTRATION

Every registered nurse is legally responsible for the correct administration of drugs. This includes the five “rights” of administration:

• Right patient
• Right drug
• Right dose
• Right route
• Right time
THE ROLE OF THE NURSE IN DRUG ADMINISTRATION

• Right Patient

  – check the patient name & hospital number against the chart & I.D. band.
  – ask the patient to state his/her name, & their date of birth (D.O.B)
THE ROLE OF THE NURSE IN DRUG ADMINISTRATION

• **Right Drug**
  Identify the drug from the M.O.’s order. Clarify with the M.O. if in doubt.
  Check the drug three times:
  - before removing it from the trolley or shelf
  - when the drug is removed from the container
  - before the container is returned to storage
  - check the expiry date of the drug

Check the drug with another RN for S4 & S8 drugs
THE ROLE OF THE NURSE IN DRUG ADMINISTRATION

• Right Dose
  - check the dose, read the container label, calculate the dose & check with a RN if necessary
  - use proper measuring devices for liquids, do not crush tablets or open capsules unless directed to by the pharmacist. (do not crush enteric coated tablets).
  - if a drug is required in another form you may get it from the pharmacy.
THE ROLE OF THE NURSE IN DRUG ADMINISTRATION

• Right Route
  - make sure the M.O.’s order is clear & only give the medications by the route designated.
  - know the abbreviations for the different routes.
THE ROLE OF THE NURSE IN DRUG ADMINISTRATION

• Right Time
  - check the time interval ordered by the M.O. & give the medication at the prescribed time.
  - drugs should be given within 20 minutes of the prescribed time.
THE ROLE OF THE NURSE IN DRUG ADMINISTRATION

• Allergies

Check if your patient:

1. has any known drug allergies
2. has had any previous adverse drug reaction
Another responsibility of the nurse is to monitor the effect of the drugs that are administered to a client, i.e.
- whether the drug had the required effect
- little or no effect or
- if any adverse reactions occurred.
Terms and Definitions

• *Drug Interactions*

• The combined effect of two (2) or more drugs acting simultaneously. Each drug may have either a positive or negative effect on the working of the others, i.e. they may be

  • *antagonistic*- lessening the effectiveness of another drug
  • *synergistic*- enhancing or improving the effectiveness of another drug
Terms and Definitions

• *Adverse Reactions*
  - unwanted and/or unintended effects of the administration of a drug.

May be:  Iatrogenic
          Drug sensitivity/allergy
Terms and Definitions

• *Adverse Reactions (con’t)*

iatrogenic disease- caused unintentionally by drug therapy, i.e.induced by medical practitioners.
Terms and Definitions

• *Adverse Reactions (con’t)*

Drug sensitivity/allergy - occurs in an individual who has been previously exposed to the drug and has developed antibodies. Drug allergies can be manifested in a variety of symptoms ranging from minor to serious.
Terms and Definitions

• *Adverse Reactions (con’t)*
  
  - the reaction can occur immediately after the client received the medication, or be delayed for hours to days.
  
  - some of the signs and symptoms are skin rash, urticaria (itching), nausea and vomiting.
Terms and Definitions

ANAPHYLAXIS

A life-threatening immediate reaction is called anaphylaxis. There is respiratory distress, sudden severe bronchospasm, and cardiovascular collapse. It may result in death if not treated immediately.
NAMES OF DRUGS

Drugs can have three types of names:

a. chemical
b. generic
c. trade/brand/proprietary
a. Chemical name:

- A very precise description of the drug’s chemical composition, identifying the drug’s atomic and molecular structure.
- This name is of significance to the pharmacist.
b. Generic name:
- the name assigned by the manufacturer who first develops the drug. Often the generic name is derived from the chemical name.
- the official name is the name by which the drug is identified in the official publication.
c. Trade/ Brand/ Proprietary name:

- is selected by the drug company selling the drug and is copyrighted
- a drug can have several trade names when produced by different manufacturers
NAMES OF DRUGS

e.g. Chemical name = Acetylsalicylic acid

Generic name = Aspirin

Trade names include Aspro, Disprin

Be aware that in different countries generic and trade names will also differ, e.g. in Australia & the United States one drug has the generic names of paracetamol & acetaminophen, i.e. Panadol/Tylenol.
## Drug Nomenclature (Names)

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Generic Name</th>
<th>Trade Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-chloro-1,3-dihydro-1-methyl-5 phenyl 2H-1, 4-benzodiazepin 2-one</td>
<td>diazepam</td>
<td>Valium®</td>
</tr>
<tr>
<td>Ethyl 1-methyl 4-pheylisonipecotate hydrochloride</td>
<td>meperidine</td>
<td>Demerol®</td>
</tr>
<tr>
<td>acetylsalicyclic</td>
<td>aspirin</td>
<td>Ecotrin®</td>
</tr>
</tbody>
</table>
Prescriptions

- Written, legible prescriber’s order includes:
  - Patient name
  - Drug name
  - Dose
  - Route
  - Frequency
  - Date
  - Signature
Types of Medication Orders

- **STAT order**: needed immediately
- **Single order**: given only once
- **PRN order**: given as needed
- **Routine orders**: given within 2 hours of being written and carried out on schedule
- **Standing order**: written in advance carried out under specific circumstances.
Medication Orders

• Two ways to obtain legal drugs:
  • Prescription (Rx)- order written authorizing patient to receive medication. Prescriptions taken to pharmacy whereby the pharmacist dispenses the drug.
  • Over the counter (OTC)- patient treats self and doesn’t need a prescribers order. Buys medications where ever they are available (Walmart, 7-11, etc.)
Categories/Classifications of Drugs

Drugs can be classified from different perspectives e.g. drugs may be classified by -

(a) body systems
   i.e. drugs affecting the respiratory system
   drugs affecting the cardiovascular system

OR

(b) the symptom relieved by the drug, or the clinical indication for the drug i.e. analgesic, antibiotic
COMMON ABBREVIATIONS USED IN MEDICATION ORDERS/frequency

- MANE
- MIDI
- NOCTE
- BD
- TDS
- QID
- STAT
- PRN

- morning
- midday
- Night
- twice a day
- three times a day
- four times a day
- give immediately
- when required when necessary
COMMON ABBREVIATIONS USED IN MEDICATION ORDERS/frequency

- ac
- pc
- q.h. or 1/24
- q2h or 2/24
- q4h or 4/24

- before meals
- after meals
- every hour
- every two hours
- every four hours
COMMON ABBREVIATIONS USED IN MEDICATION ORDERS/route

- BUC • inside cheek
- O/P.O • oral/per oral
- S/L • sublingal (under the tongue)
- ID
- IM • intradermal
- IMI • intramuscular
- SC • intramuscular injection
- SC • subcutaneous
COMMON ABBREVIATIONS USED IN MEDICATION ORDERS/route

- SCI  • subcutaneous injection
- IVI  • intravenous injection
- IVT  • intravenous therapy
- NEB  • nebuliser
- PR   • per rectum
- TOP  • topical/skin
- VAG  • vaginal