Principles of Pharmacology and Pharmacy Practice

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Learning Objectives

- Explain the general characteristics of various categories of medications including prescription, over the counter (OTCs), herbals, controlled substances, brand and generic drugs.
- Identify factors that may affect a patient's response to a medication including age, interacting medications or foods or comorbid disease states.
- Given the route of administration of a drug, predict the time to onset of effect.
- Describe advantages and disadvantages of example drug information resources.
- Describe strategies to assess medication history and adherence to a drug prescribed regimen.

Pharma-*what?*

- Pharmacology
  - Pharmacokinetics
  - Pharmacodynamics
- Toxicology
- Pharmacotherapeutics
- Pharmacist

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Drug Nomenclature

- Chemical or Systematic Name
- Generic
  - "official" or "nonproprietary" name
  - The active ingredient" in the medication
- Trade Name
  - "brand" or "proprietary" name
  - Specific to manufacturer

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Drug Naming Examples

Systematic Name	Generic Name	Trade Name
N-Acetyl-*p*-aminophenol	Acetaminophen	Tylenol
N^2-[(1*S*)-1-carboxy-3-phenylpropyl]-L-lysyl-L-proline	Lisinopril	Prinivil or Zestril
(*RS*)-4-hydroxy- 3-(3-oxo- 1-phenylbutyl)-2*H*- chromen- 2-on	Warfarin	Coumadin

Classifications

Prescription Medications

Controlled Substances
Classified into "schedules" according to potential for abuse

Over the Counter Medications
Can be purchased directly by the consumer
"Safe and effective for use without medical supervision"

Behind the Counter Medications
Consumer must meet screening or recordkeeping requirements to purchase

Compounded Medications

Dietary Supplements

- Regulated as Dietary Supplements under 1994 DSHEA
- Do not need FDA approval prior to marketing
- Manufacturer ensures accuracy of ingredients listed
- Designated with a "Supplement Facts" label
- Claims of efficacy must be supported by evidence or contain disclaimer statement that they have not been FDA reviewed

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Brand and Generic Medications

- Copies of brand name medications with the same:
  - Dosage form
  - Safety
  - Strength (or bioequivalence)
  - Route
  - Quality performance characteristics
  - Indications for use
- Opportunity for cost savings
- Use caution with narrow therapeutic index drugs
- Brand prescriptions may be filled with generic versions

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Pharmacology

- Drug Receptor
- Agonist
- Antagonist
- Dose Response Curve

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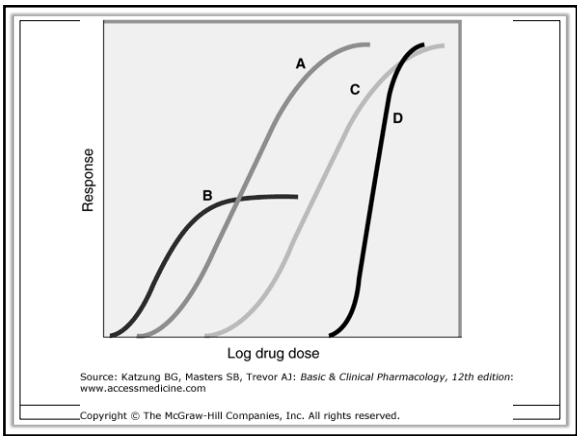

Source: Katzung BG, Masters SB, Trevor AJ: *Basic & Clinical Pharmacology, 12th edition*: www.accessmedicine.com

Pharmacokinetics

Effects of the body on the drug:

- Absorption
- Distribution
- Metabolism
- Elimination

- Begins with drug administration
  - Enteral (oral, sublingual, rectal)
  - Parenteral (inhalation, injection, topical, transdermal)

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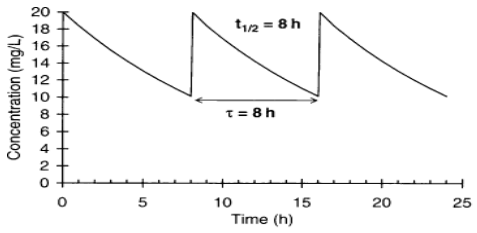
Administration Routes		**Onset Time**
Sublingual	SL	Minutes
Oral - regular release Oral – controlled release (XL, CR, ER, etc)	PO	~ 1 hour up to several hours
Rectal	PR	Minutes – few hours
Injected intravenously	IV	Minutes
Injected subcutaneously	SC	Minutes (eg rapid acting insulin) to a few hours (long acting insulin)
Injected intramuscularly	IM	Depends, usually hours (eg vaccine), but may be immediate (eg EpiPen)
Injected intrathecal	IT	Usually rapid
Transdermal		Few hours to days
Inhaled (connotes oral inhalation)		Varies from mins to days
Topical to skin or mucous membranes (ocular, nasal spray, local)		Usually slow, only localized effects desired

Drug Distribution and Elimination

- Drug distribution
  - The extent to which a drug is present in various body compartments (or remains sequestered in one area)
- Drug elimination has 2 major components:
  - Metabolism
    - Mainly occurs in liver. May also occur in lungs, GI, skin, kidney
    - Enzymes are responsible for metabolic processes
  - Excretion via kidney
- Drug Clearance and Half-life

Drug Elimination



Source: Bauer LA: *Applied Clinical Pharmacokinetics, 2nd Edition*: http://www.accesspharmacology.com

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Factors that Affect Drug Kinetics

- Age
- Comorbid disease
- Drug interactions
  - Drugs
  - Foods
- Genetic predisposition

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Medications and Adverse Reactions (ADRs)

- Medications have many effects
  - Therapeutic effects
  - Adverse drug effects (ADEs)
  - Adverse drug reactions (ADRs)
  - "side effects"
- ADRs are not medication errors

Pediatric Concerns

- Many drugs not specifically studied or formulated for children
- Concerns:
  - Appropriate dosing given variations in surface area, organ function, and body composition
  - Adverse effects, especially effects on growth and development
  - Caregiver training in dosing and measurement of OTC
- Health care clinicians should promote conservative use and good measuring technique

Geriatric Concerns

- Elderly patients at **much** greater risk of ADRs because of:
  - Reduced capacity for metabolism and elimination
  - Reduced physiologic reserve
  - "polypharmacy"
- Assume any new symptom could be a drug reaction until proven otherwise
- "Start low, go slow" with dose titration

Drug References

What do you need out of your drug information source?

- What kind of things do you need to know?
  - Drug monographs
  - Pill ID
  - Interaction checker
  - Herbals, OTCs or FDA approved drugs
- Print or digital?
- How portable do print references need to be?
- Need for updates?
- Cost?

General Drug Information

- Medline Plus
  - www.medlineplus.gov
- WebMD / RxList / Medscape
- Specialty Drug Handbook
- Micromedex
- E-pocrates
- Physicians' Drug Reference (PDR)
- Wikipedia.org

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Using DI Resources

- Is Kava Kava extract safe?
- What are these capsules scattered on the table?

- Do warfarin and ibuprofen interact?
- What is Xarelto?

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Taking the Medication History

Use open-ended questions:

- What medications do you take every day?
- What meds have you taken in the last 24 hours?

Avoid leading questions:

- "You're taking captopril 3 times a day, right?"
- "And you take calcium with that fosamax?"

If name is unknown, talk about the description:

- Color, markings, shape, but **be sure** to note the patient's response and **verify** if it's a match

Taking the Medication History

Once you have the names, ask for the actual dose taken and frequency of use

- Obtain typical times
- Investigate discrepancies from the record
- Clarify "PRN" use:
  - What do 'occasionally' or 'rarely' mean?
  - How many doses per day/week/month?
  - How often do you pick up a refill?

Taking the Medication History

- Other assessments of medication use:
  - Ask why the patient takes each medicine
  - Ask how well the medication is working for the condition named
  - Ask *what* concerns/ questions the patient has about the medicine
  - Avoid "do you have any questions about…"

Taking the Medication History

Ask generally about non-Rx med use:

- Medicines not bought from the pharmacy counter
- What do you buy from the Internet? Outside the US?
- Vitamins, herbals, supplements, OTCs

Consider prompting and screening about:

- Think about meds that interact
- Think about meds that treat ADRs

Assessing Medication Adherence

Ask by asking:

- "Describe your daily routine for taking your pills"
- "This is a lot of pills! How do you do it every day?"
- "What day of the week do you take your Fosamax on?"

Ask by NOT asking:

- Refill dates
- Condition of bottles
- Pill counts
- Clinical response or drug levels

Med Reconciliation in the Patient's Home

- Create medication list from history or visual inspection
- Compare to prescribed regimen
- Check for:
  - OTCs, herbals, supplements
  - Duplicates (generic/brand, tablet strength)
  - Expired, damaged medications
- Compile 'final' list and communicate to patient and provider

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Questions?

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