

# Medicines and Aging

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# Primary Aging Affecting Pharmacokinetics

- ▶ Absorption
- ▶ Distribution
- ▶ Hepatic Metabolism
- ▶ Renal Excretion

\* The degree of decline varies greatly in individuals

# Absorption

- ▶ Decreased acid production
- ▶ Increased gastric PH
- ▶ Decreased absorptive surface
- ▶ Decrease gastrointestinal blood flow & motility

*Resulting in...*

- ▶ Slows the action of acid-dependent drugs
- ▶ Rate of absorption may be slowed, leading to delayed onset

# Distribution

- ▶ Decreased cardiac output & volume
- ▶ Decreased lean muscle mass
- ▶ Increased adipose tissue
- ▶ Decreased total body water
- ▶ Reduced concentration of serum albumin
- ▶ Less effective blood-brain barrier

## *Resulting in...*

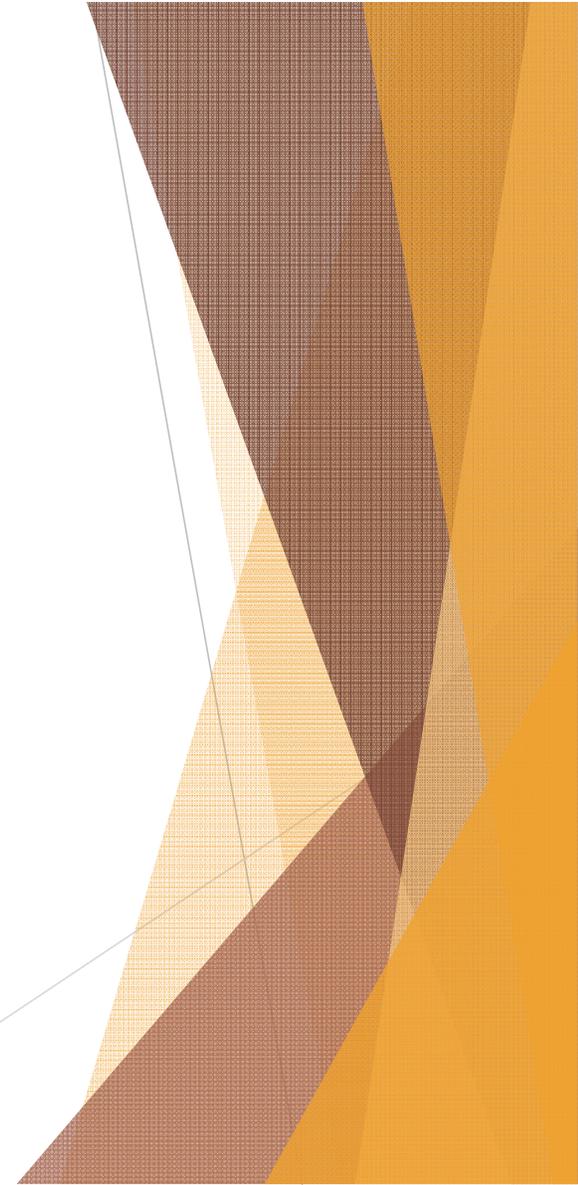
- ▶ Water soluble drugs in a smaller volume, can lead to decrease distribution or higher drug concentration
- ▶ Increased storage of lipid-soluble drugs-more slowly release into blood stream
- ▶ Decreased protein binding, causing levels of free (unbound) drugs to rise
- ▶ Higher level of drugs than normal penetrate the brain

# Metabolism - Biotransformation

- ▶ Decreased hepatic mass
- ▶ Decreased hepatic blood flow
- ▶ Decreased hepatic clearance

Resulting in....

- ▶ Drugs half-life increased - causing prolong drug effect
- ▶ Declined ability to transform active drugs to inactive metabolites

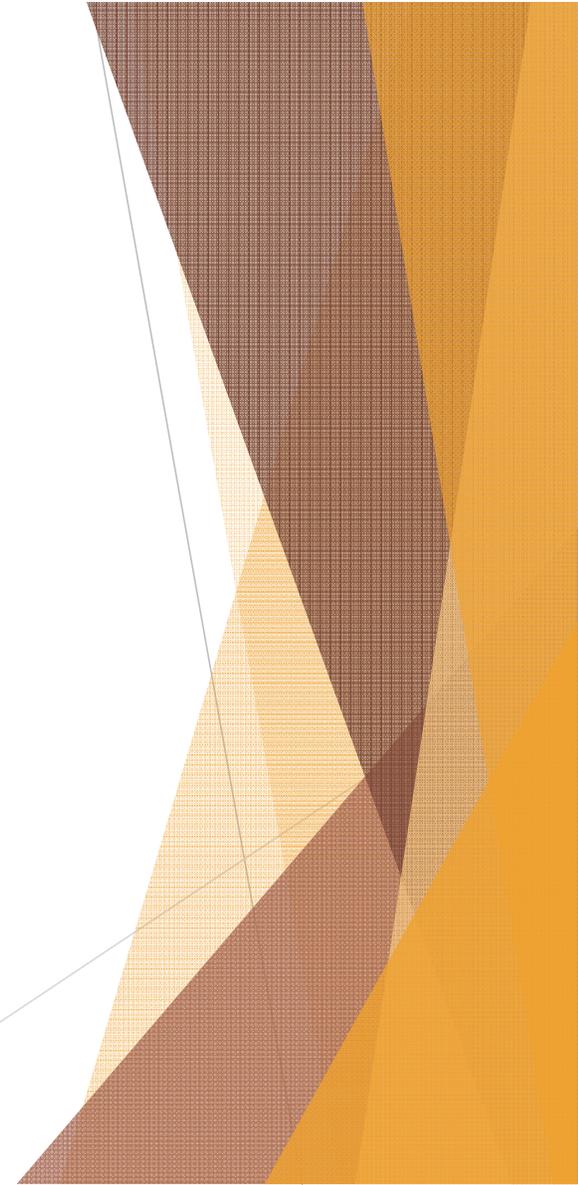


## Excretion

- ▶ Decreased renal blood flow
- ▶ Decreased number of nephrons
- ▶ Decreased glomerular filtration
- ▶ Decreased tubular secretion

*Resulting in....*

- ▶ Biological half-life is affected
- ▶ Prolong and elevated plasma level of drugs
- ▶ Accumulation of drugs leading to toxicity



## Medications....

“Medications are probably the single most important health care technology in preventing illness, disability, and death in the geriatric population.”

(presentation by the American Society of Consultant Pharmacists, at ASA/NCOA 1<sup>st</sup> Joint Conference, 3/9/01)

“Medications may also cause many problems!”

(presentation by the American Society of Consultant Pharmacists, at ASA/NCOA 1<sup>st</sup> Joint Conference, 3/9/01)

# Diseases and Drugs

“ Too often, illness in older people are misdiagnosed, overlooked or dismissed as the normal process of aging, simply because health professionals are not trained to recognize how diseases and drugs affect older people.”

(Washington Post May 30, 1999: Source: Murphy, J. Senate Special Committee on Aging)

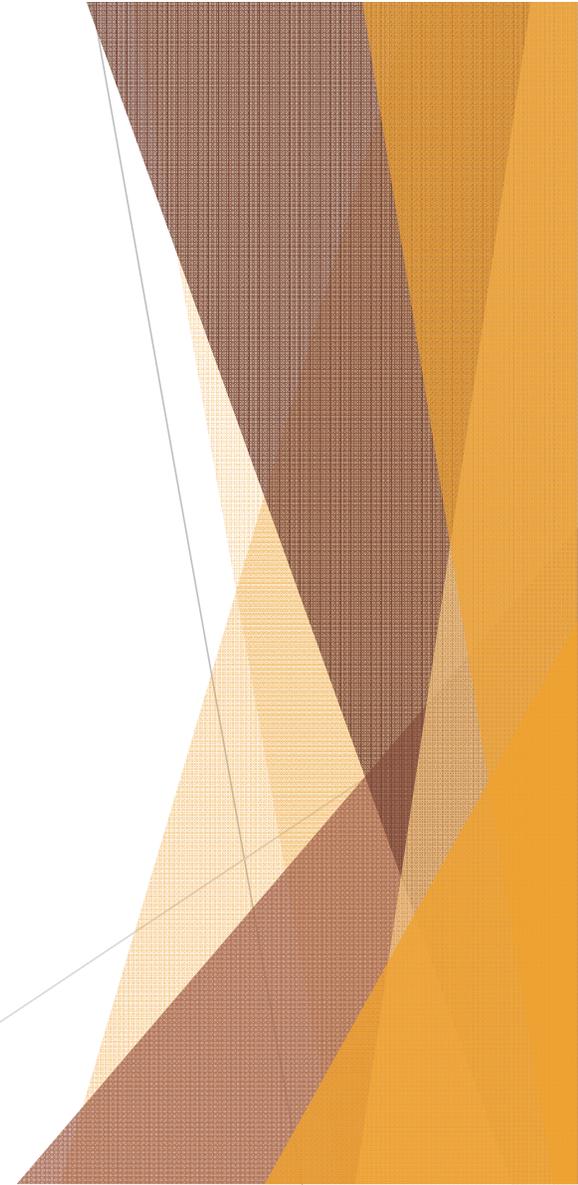
Reasons the older adult is at risk for medication-related problems:

- ▶ Increased consumption of medications
- ▶ Increase use of high-risk medications
- ▶ Change in drug metabolism and elimination

(presentation by the American Society of Consultant Pharmacists, at ASA/NCOA 1<sup>st</sup> Joint Conference, 3/9/01)

## Polypharmacy

- ▶ The use of multiple medications, for multiple chronic diseases
- ▶ A problem for the elderly
- ▶ 13% of the U.S. population, use 40% of the prescription medications, 40-70% of the OTC drugs



# High-Risk Medications

- ▶ Antipsychotic drugs
- ▶ Antihistamines
- ▶ Antianxiety drugs
- ▶ Antihypertensive
- ▶ Antidepressants
- ▶ Anticonvulsants
- ▶ Benzodiazepines-Sedatives-Hypnotics
- ▶ Coumadin
- ▶ Diuretics
- ▶ NSAIDS

(Presentation by the American Society of Consultant Pharmacists, at ASA/NCOA 1<sup>st</sup> Joint Conference, 3/9/01)

(Presentation by Professors Marks &Katz, UNC at Chapel Hill, ASA/NCOA Joint Conference, 3/2009)

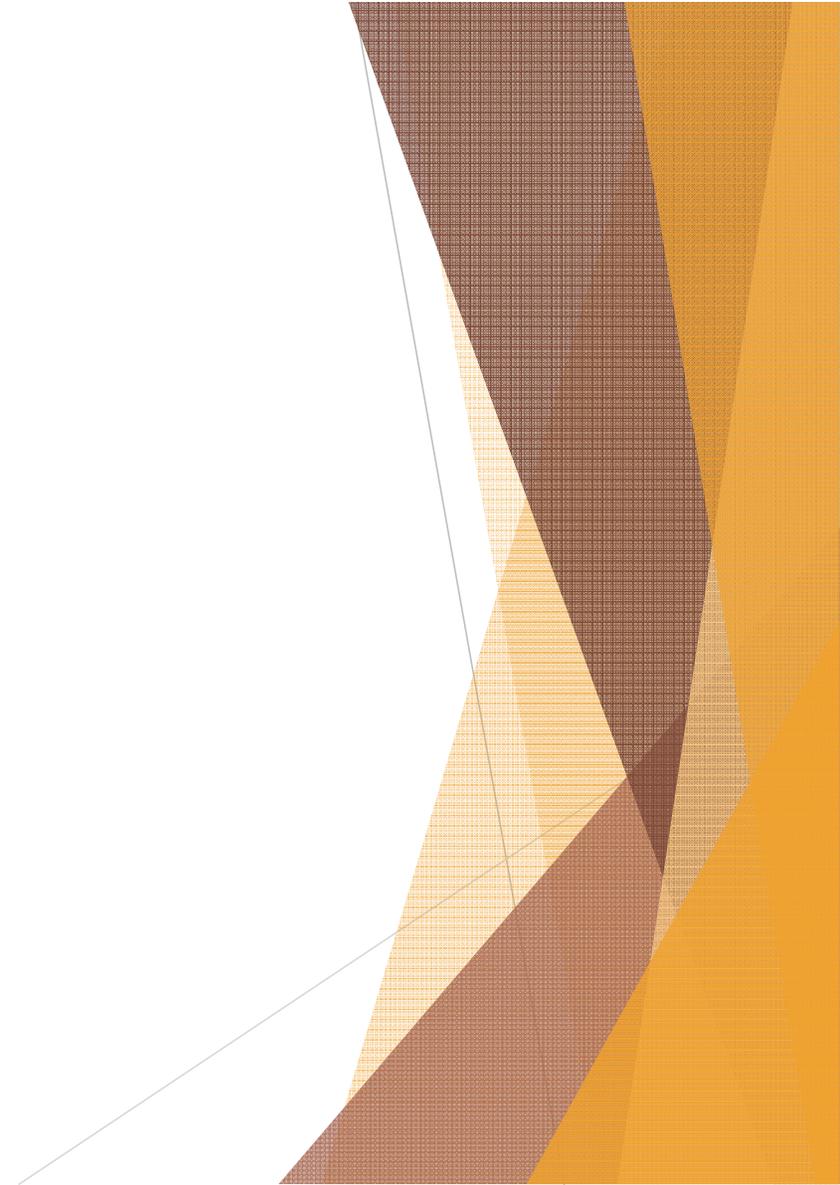
# Medication Use & Reactions

Average Uses;

4.5 Prescription drugs + 2 OTC

Adverse Drug Reaction

- ▶ 2 drugs - 6%
- ▶ 5 drugs - 50%
- ▶ 8 drugs - 100%



## Drug Interactions

Drug Interactions are the leading cause of adverse drug reactions

If adverse drug reactions were classified as a distinct disease, it would rank as the 5<sup>th</sup> leading cause of death in the U.S.

(Alliance for Aging Research, 1998)

Concomitant OTC drug use/ abuse,  
as well as alcohol abuse

## Vitamins and Herbals

Vitamins and Herbals are medications

Food, and supplements have potential for interaction with other medications



# Most Common Adverse Drug Reactions

- ▶ Confusion
- ▶ Dizziness
- ▶ Loss of coordination
- ▶ Fatigue
- ▶ Dry mouth
- ▶ Indigestion
- ▶ Nausea & vomiting
- ▶ Diarrhea
- ▶ Depression

## Most Prevalent Acute Syndromes

- ▶ Confusion or altered mentation
- ▶ Falls
- ▶ Malnutrition
- ▶ Failure to thrive
- ▶ Urinary incontinence

Adverse drug events are among the top five greatest preventable threats to health of elderly (after CHF, Breast Cancer, Hypertension, and Pneumonia).

(JAMA, October 1987)

## Prevention

- ▶ Minimize the number of medications needed
- ▶ Consider alternate drugs (if possible): other drug as effective, with fewer side effects, less frequently, less costly.
- ▶ Start with a low dose and go slow if dose has to be increased ( the lowest possible dose should be used).
- ▶ Titrate therapy to the individual-is the dose appropriate for age, weight, liver, and kidney function?

\* ADJUST DOSE ACCORDINGLY

## Educate

### ▶ Educate the client and family include:

- ▶ Action
- ▶ Name
- ▶ Dose
- ▶ Route
- ▶ Frequency
- ▶ Side effects
- ▶ Adverse reactions
- ▶ Duration of therapy
- ▶ Special precautions
- ▶ **“Any symptom in an elderly patient should be considered a drug side effect until proved otherwise.”**

(Presentation by the American Society of consultant Pharmacists, at ASA/NCOA , Joint conference, 3/9/2001)

# Review

- ▶ Regularly review drugs for effectiveness & side effects
- ▶ A need for education of professionals
  - ▶ Shortage of trained physicians, pharmacists, nurses, physician assistants in geriatrics.

(Alliance for Aging Research, June 1998)

“Overwhelming majority of older people are cared for by health professionals with no formal education or training in Geriatrics.”

(Alliance for Aging Research, June 1998)

Only 11 of the 125 Medical Schools require course in Geriatrics

Only 5 have established Geriatrics Departments.

(International Longevity Center Annual Report 2007)

## Medications

**“Most drugs have been poorly studied in the elderly.”**

(Aging Today, Jan-Feb, 2003)

**“Under-representation of people over age 65....in clinical trials.”**

(Alliance for Aging Research, June 1998)

