NR 601

Fundamental Considerations

- Recognize that presenting features of disease/illness may be different and having a greater awareness of the impact of chronic illness on the patient.
- Perspective is different than with younger adults.

Physiological Changes with Aging

- The clinician must be aware that all the systems interact an, in doing so, can increase the older person's vulnerability to illness/disease.
- During the clinical decision-making process, the clinician knowledgeable about physiological changes with aging will be less likely to undertreat a treatable condition. -Example- Use the diagnostic process to differentiate the more benign seborrheic keratosis from actinic keratosis.
- Be informed; do not attribute a finding to the aging process alone. The elder may conclude there is no point in changing behavior, because the process is inevitable.
- *Three primary points:*
1) There is a reduced physiological reserve of most body systems, particularly cardiac, respiratory, and renal.
 2) There are reduced homeostatic mechanisms that fail to adjust regulatory systems such as temperature control and fluid and electrolyte balance.
 3) There is impaired immunological function: infection risk is greater, and autoimmune diseases are more prevalent.

Laboratory Values in Older Adults

- Many factors can influence lab value interpretation in the elderly, including the physiological changes with aging, the prevalence of chronic disease, changes in nutritional and fluid intake, lifestyle (including activity), and the medications taken.
- Reference ranges therefore may be preferable. Reference ranges or intervals, such as age, sex, or race can be defined demographically. For example, the reference range for older adults might be the intervals within which 95% of persons over age 70 fall.
- Further defined physiologically (fasting or activity status) or pharmacologically (medication, tobacco or ETOH use).
- Biochemical individuality is of particular importance in detecting asymptomatic abnormalities in older adults. Significant homeostatic disturbances in the same individual may be detected through serial laboratory tests, even though all individual test results may lie within normal limits of the reference interval for the entire group.
- The clinician must determine whether a value obtained reflects a normal aging change, a disease, or the potential for disease.
- Misinterpretation of an abnormal lab value as an aging change can lead to underdiagnosis and undertreatment in other (anemia or UTI) and overdiagnosis and overtreatment in others (hyperglycemia or asymptomatic bacteriuria).
- At times, the result of a lab value may be within the appropriate reference range yet indicate pathology for the older adult.
- Calculation of creatinine clearance is important in the estimation of renal function.
- Reduced renal function, particularly GFR, affects clearance of many drugs, and creat clearance provides an index of renal function for use in choosing doses of renally eliminated or nephrotoxic drugs (such as dig, H2 blocker, lithium, and water soluble antibiotics)
- The Modiciation of Diet in Renal Disease (MDRD) and Cockcroft-Gault equations both provide useful estimates of the GFR.
- Any risks involved in lab testing must be considered with respect to the patient's clinical condition and weighed

against the test's expected benefits.

Pharmacokinetic & Pharmacodynamic Changes
- Polypharmacy and the potential for an adverse drug reaction (ADR) are major concerns in elders.
- Polypharmacy primary predictor for an ADR (any unwanted response).
- The therapeutic window narrows with age. The potential for benefiting the patient measured against risk of doing harm important.
- Pharmacokinetics (what the body does to the drug) and pharmacodynamics (what the drug does to the body) alter the dynamic processes that drugs undergo to produce therapeutic effect due to the effects of the aging process.

Absorption
- Less impact than distribution, metabolism, elimination.
- Gastric acidity declines with age; offset by the longer contact time that occurs as transit time slows – which is more functional than physiological.
- Presence of food and other drugs in the stomach at the same time affect drug absorption.
- Antacids and Fe can inhibit absorption.
- Anticholinergic meds cause a slowing of colonic motility and can result in greater absorption rates.
- Metabolic diseases, such as thyroid disease/DM can increase or decrease transit time, can cause either increased/decreased drug absorption.
- When the med passes through the esophagus without adequate water, can cause erosion.

Distribution
- Drug distribution is affected by aging, particularly in individuals of smaller body size, decreased body water, higher body fat.
- Drugs distributed in water have a higher concentration in elders, and exert a more profound effect.
- Drugs distributed fat have a wider distribution and a lesss intense effect but a more prolonged action, particularly with more adipose tissue.
- Drugs with a high protein binding rate have a greater potential to cause an ADR in those with less body mass. Fewer receptor sites, less albumin for binding, greater plasma concentration, more free drug is available for processes.
- Protein bound drugs can reach toxic levels if the patient is not monitored closely.
- Drug distribution relies on the bioavailability of the drug.
- Amount of drug that reaches systemic circulation is increased/decreased based on:
1) Route of administration – drugs given IV/topically are more readily available than drugs admin IM/Subq/PO/rectally
2) Soluability of the drug is influential – aqueous solutions are available more quickly than oily ones
3) General circulation to the site of drug administration

Metabolism
Biotransformation occur sin all body tissues but primarily in the liver, where enzymatic activity (cytochrome P [CYP] system) alters and detoxifies the drug and prepares it for excretion.
- Ability of the liver to metabolize drugs does not decline similarly for all meds.
- Liver size and blood flow decrease with age, LFTs are typically normal when no disease exists. Can result in decreased first-pass metabolism.
- Drug activity for some meds is prolonged, because drugs are metabolized and eliminated more slowly.

- Knowing age-related pharmacokinetics of drugs is of utmost importance when determining the initial and maintenance dosages.
- Critical to understand if a drug induces or inhibits the CYP system.

Elimination
- Most profound pharmacokinetic change.
- Most rugs are excreted in the urine via the renal system, some are excreted in the feces via the biliary system.
- Water soluble drugs are excreted directly by the kidneys.
- Fat soluble drugs are concerted to water- soluble drugs by the liver first.
- Changes in the kidney begin in the 4th decade of life, continue to decline with each subsequent decade.
- By 70, and individual may have a 40%-50% decreased renal function, even in the absence of disease – may prolong the half-life of drugs.
- Important in drugs excreted unchanged in the urine and are nephrotoxic: aminoglycosides, radiocontrast materials, NSAIDs, ACEI.

Pharmacodynamics
- Explains the effect at the site of action and the time and intensity of the drug effect.
- Elders have increased effects to drugs that affect the CNS – there is greater tissue sensitivity with aging.
- Elders more likely to have ataxia with opiates.
- Elders taking haloperidol more likely to experience extrapyramidal symptoms.
- Elders may have increased tissue sensitivity for oral anticoagulants.
- May experience decreased, rather than exaggerated response sometimes – i.e. beta blockers. Increasing drug dose may be needed.
- Drug responsiveness may vary depending on the patient's activity, stress level, environment.

Presenting Features of Illness & Disease In The Elderly
- Presenting symptoms can be very different than in younger adults.
- *Four factors affecting illness and disease:*
1) Nonpresentation of illness
2) Multiple complaints
3) Altered pattern of illness
4) Atypical, nonspecific/vague symptoms or signs.
- Underreporting of symptoms by older adults may occur if they attribute the new sign or symptom to age itself. If this is the case, they either fail to present to the health care provider or if they do, fail to challenge that it is normal part of aging.
- Sometimes an acute symptom is superimposed on a chronic symptom, like pain or dyspnea – may not recognize it is as pathological and get treatment.
- Advised to explore the possibility of a constellation of s/s that when analyzed may represent more than one condition/problem.
- Depression should be considered- may manifest atypically – somatic complaints not uncommon.
- Pattern of disease may progress differently (i.e. jaundice – suggestive of viral hepatitis in younger adult, gallbladder disease or malignancy in the elderly; delusions/hallucinations – bipolar disorder in younger individuals but dementia/medication side effects in the elderly).
- Altered presentation is another common feature (i.e. confusion – UTI; depression – agitation and psychotic features; thyroid disease – cardiac symptoms).
- Symptoms can be vague, nonspecific, modest changes should be investigated.

Chronic Illness & Functional Capacity

- Approx 80% of those aged >65 have one chronic disease, 50% have two or more.

- Most common: heart disease, arthritis, respiratory problems, cancer, diabetes, stroke – impair functional capacity and limit ADLs and IADLs.

<mark>Chapter 1: Changes with Aging - Review Questions</mark>

1. Reference ranges or values are those intervals in which 95 % of the values fall within a specific population.

- Reference ranges refer to a specific population (age, gender, etc.), and the majority of individuals fall within that range.

2. All of the following statements are true about renal function in the elderly except: serum creatinine is a sensitive indicator of renal impairment.

- There are no very sensitive indicators of renal impairment. An older adult may have significant renal impairment before changes in the serum creatinine are seen.

- True statements: 1) Reduced renal function affects the clearance of many drugs 2) The modification of diet in renal disease (MDRD) and the Cockcroft-Gault formula both provide useful estimates of the GFR 3) Estimating creatinine clearance is particularly useful when prescribing renally eliminating drugs.

3. Of all the pharmacokinetic changes associated with aging, which is the most significant?

- Drug elimination

4. Esophageal erosions can be caused by drugs when:

- 1) Insufficient fluid is taken with medications & 2) Caustic drugs are taken & 3) Drugs are taken when not in an upright position.

5. Biotransformation of drugs primarily occurs in:

- The liver

- Biotransformation occurs in all of these systems (kidneys, GI tract, CNS), but mostly in the liver, where drugs are detoxified and prepared for excretion.

6. Changes in renal function associated with aging are most likely to result in:

- Prolonged half-life of drugs

- Decreased renal function results in prolonged half-life (time it takes to eliminate the drug by half)

7. All of the following drugs are known to be nephrotoxic except:

- Acetaminophen

- Acetaminophen is known to be toxic to the liver

- Nephrotoxic: NSAIDs, aminoglycosides, ACEI

8. Under reporting of symptoms occurs generally when the elderly:

- Attribute a symptom to normal aging.

- Older adults are less likely to report a symptom (such as pain) when they attribute it to the normal aging process.

9. The most prevalent chronic disease in the elderly is:

- Arthritis

- The majority of the elderly will experience musculoskeletal problems as a result of inflammation and wear and

tear.

- Americans more than 65 years now represent the most rapidly growing segment of the US population.
- These numbers will increase exponentially.
- Anticipate skyrocketing of medical costs for chronic health conditions.
- Lifestyle interventions at any age can mitigate the effects of chronic illness.
- There has been an increase in obesity in older adults, from 22% in 1994 to 38% in 2009-2010.

Available Resources
- Guidelines and position statements from various authorities: AHA, USPSTF, USDHHS, AGS, Healthy People 2020, The White House Conference on Aging in 2005, CDC, AOA, National Institute on Aging, CMM, ACSM, PCNA.

Barriers and Facilitators to Exercise for Older Adults
- Short term interventions, individually and in a group, face to face and by phone, were effective in increasing physical activity when delivered as part of a multifaced program of educational and cognitive behavioral participation.
- Health education alone was not effective in this population.
- Health care personnel recommended physical activity and an exercise prescription were effective in the short term.

Patient Barriers
- Lack of time
- Perceived need for equipment
- Perceived barrier to beginning exercise/physical activity
- Disability or functional limitation
- Unsafe neighborhood/weather conditions
- No parks/walking trails
- Depression
- High BMI
- Lack of motivation
- Interpersonal loss or significant life event
- Ignorance of what to do

Patient Facilitators
- Social support
- Positive self- efficacy
- Motivation to engage in physical activity
- Good health, no functional limitations
- Frequent contact with prescriber
- Regular schedule/planned program
- Satisfaction with program
- Insurance incentive
- Improvement in mobility/health condition
- Staff (of exercise facility) support