



A PHARMACY CONTINUING EDUCATION PROGRAM

W-F Professional Associates, Inc. 400 Lake Cook Rd., Suite 207 Deerfield, IL 60015 847-945-8050

Nov 2006 "Geriatrics & Drug Use" 707-000-06-011-H01



THIS MONTH
"Geriatrics &
Drug Use"

CREDIT STATEMENTS FOR THIS YEAR WILL BE MAILED IN DECEMBER. DEADLINE FOR US TO RECEIVE QUIZZES & HAVE THEM APPEAR ON THIS CREDIT STATEMENT IS NOVEMBER 30, 2006.

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QUIZ DEADLINE FOR THIS YEAR IS NOVEMBER 30, 2006.

This is the double lesson for November & December, and it provides 2.50 hours (0.25 CEUs) of credit. It is always a major area of impact when medications are prescribed & dispensed to elderly patients. Not only are compliance issues significant, but the effect that the drug has in typical dosage ranges must be taken into consideration, and often adjusted. This topic & lesson is intended to provide information that can be conveniently shared with patients, and it is intended for pharmacists in all practice settings.

The program ID # for this lesson is 707-000-06-011-H01.

Pharmacists completing this lesson by November 30, 2009 may receive full credit.

To obtain continuing education credit for this lesson, you must answer the questions on the quiz (70% correct required), and return the quiz. Should you score less than 70%, you will be asked to repeat the quiz. Computerized records are maintained for each participant.

If you have any comments, suggestions or questions, contact us at the above address, or call toll free 1-800-323-4305. (In Illinois, Alaska and Hawaii phone 1-847-945-8050). **Please write your ID Number (the number that is on the top of the mailing label) in the indicated space on the quiz page** (for continuous participants only).

The objectives of this lesson are such that upon completion the participant will be able to:

1. Discuss demographics of the elderly in the U.S.
2. List common clinical conditions that are encountered by elderly patients.
3. Describe the physiological, pharmacokinetic & pharmacodynamic changes that are related to age.
4. List & discuss common drugs that are used by geriatric patients.
5. Describe the effects of these drugs on elderly patients.

All opinions expressed by the author/authors are strictly their own and are not necessarily approved or endorsed by W-F Professional Associates, Inc. Consult full prescribing information on any drugs or devices discussed.

BACKGROUND

As the number of persons aged 65 and older is gradually increasing in the U.S., it is imperative that health professionals be sensitive to the drug therapy in elderly patients as well as in improving quality of life of these individuals. It is essential that attention be paid to enhancement of physical functioning that results in increased social activities, and perception of good health. However, drug-related adverse effects may interfere with the quality of life of the elderly patient. There are a number of age - specific factors that have implications on the success of pharmacotherapy. Physiological changes that accompany aging may influence absorption, distribution, metabolism, and excretion of drugs. There are common and specific clinical conditions that are especially encountered in the elderly that require special care. Reduction of drug – related adverse effects is of paramount importance.

Ours is a rapidly aging society. The main reasons for such an increase are a decline in mortality rate and improved elder health (i.e. immunization, improved medical procedures, discovery of new and more effective drugs and healthy lifestyle awareness).

Elderly patients consume more drugs than the general population. Even though patients over 60 years of age and older constitute 17% of the population, this segment uses nearly 40% of all prescription drugs. Those over 65 consume 32% of all prescription drugs. About 90% of individuals 60 years of age and older in the U.S. take at least one prescription drug, and the average outpatient uses 2 - 4 different prescription drugs. It has been reported that over 10 million adverse drug reactions occur annually in elderly patients in the U.S., and such reactions are 7 times more common than in younger adults. The concurrent intake of several medications can increase the risk of such interactions.

COMMON CLINICAL CONDITIONS SEEN IN GERIATRIC PATIENTS

Geriatric Dementia

As the number of elderly patients continues to increase, the incidence of cognitive disorders such as dementia will rise. The most common cause of dementia is Alzheimer's disease (AD), also known as primary degenerative dementia. About 50% of patients with dementia suffer from AD. The dementia of the remaining 50% is caused by vascular dementia, Parkinson's disease dementia, pseudodementia and other forms. Alzheimer's disease is characterized by short - term and long - term memory disturbances, deficient language, inability to learn, solve problems or perform mathematical calculations, experiencing poor judgment as well as functional impairment such as activities of daily living (ADL) (i.e. feeding, dressing, ambulating, toileting, bathing and grooming), and instrumental activities of daily living (IADL) (i.e. cooking, cleaning, shopping, using telephone, managing money and medications). Even though there is no accurate universally accepted diagnosis, it is estimated that there are over 5 million persons with AD, causing about 100,000 deaths annually in the U.S.

The precise etiology of AD is unknown. However, immunological factors, genetics, viral infections and brain atrophy are believed to contribute. A wide variety of drugs have been utilized to treat AD. None of these provide an effective treatment. Goals of treatment are: 1) to control undesirable behavior and to maintain ADL and IADL. Such therapy does not stop progression of the disease. 2) To provide medications that either slows

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advancement of the disease or reverses the process that caused the symptoms. Claims have stated that the non-steroidal anti-inflammatory drugs, especially ibuprofen, may provide protection from dementia. Such drugs may improve cognitive functions and reduce risks of AD. Acetyl cholinesterase inhibitors such as donepezil, galantamine, and rivastigmine may help maintain cognitive functions.

Urological Disorders

Sexual Dysfunction: Aging plays a role in a decrease in sexual function. However, frequency of intercourse varies from one individual to another depending on general health and life pattern. Physiological changes, disability, presence of disease, as well as the intake of medications may interfere with sexual activity. Poor health is considered the main reason for a decline in sexual desire in women, while men cited impotence. The decline in estrogen production in postmenopausal woman is associated with physiologic changes that result in loss of activity. Men experience a gradual decline in testosterone at age 50, but the clinical outcomes are not clear. Cardiovascular disease, hypertension, diabetes mellitus, excessive alcohol consumption, brain and spinal cord damage, Parkinsonism, arteriosclerosis, alcohol abuse, and cigarette smoking are examples of diseases that may negatively impact upon males.

Benign Prostatic Hyperplasia (BPH): Benign prostatic hyperplasia occurs as a result of proliferation of the stromal and epithelial cells of the prostate gland which results in difficulty in initiating urination and a decrease in the force of the urinary stream. BPH develops around the age of 40, and it becomes more prominent with advancing age. Practically all man will experience BPH if they reach the age of 80 or beyond. Prostate cancer may occur concurrently with BPH. However, there is no indication that BPH will trigger the development of prostate cancer. Aging and hormonal influence play an important role in causing BPH.

Urinary Incontinence: Urinary incontinence, which is involuntary urination while awake or asleep, is a commonly encountered disorder in elderly persons, affecting 50% of hospitalized patients and about 20% of those who live at home. This condition is more prevalent in females. The risk factors of incontinence include neurological impairment, immobility, atrophic vaginitis, cystitis, and female gender. It appears that incontinence is an inevitable result of advancing age. It may result in pressure sores, perineal irritation, and psychological conditions such as embarrassment, isolation and depression. Urinary incontinence is classified as acute or transient and chronic or persistent. Acute urinary incontinence may occur as a result of cystitis, atrophic vaginitis, delirium, congestive heart failure, restricted mobility, polyuria from diabetes, depression, stool impaction and the side effect of medications such as diuretics, narcotic opiates and calcium channel blockers. Chronic or persistent urinary incontinence is the most common and is mainly due to involuntary voiding preceded by urge for urination of from a few seconds to a few minutes. The urge is characterized by urine leakage. The most common factors that precipitate chronic urinary incontinence include dementia, strokes, involuntary bladder contraction, stress incontinence (common in women and characterized by instantaneous leakage of urine due to stress), urethral obstruction (common in men and occurs as a result of cancer or enlargement of the prostate gland and urethral stricture characterized by dribbling incontinence after voiding), and urge incontinence. Acute urinary incontinence is relieved by elimination of the cause, whereas chronic incontinence may be treated by surgery or pharmacologically. Drugs such as anticholinergics, oxybutynin, dicyclomine, and doxepin may be used. Stress incontinence may be treated by using alpha – adrenergic agonists. Urethral obstruction may be alleviated by surgical decompression or by using alpha – adrenergic agonists or finasteride.

Accidental Falls & Hypothermia

Musculoskeletal changes that occur due to aging can contribute to restricted mobility that, along with visual and auditory impairment, can place elderly persons at increased risks of accidents, falls, and a decline in physical activity. Death from falls and their complications such as hip fractures accounts for 50% of all accidental deaths among individuals 65 years of age and older.

Hypothermia is encountered when body temperature unexpectedly falls more than 4 degrees F below the temperature of 98.6 degrees F. The main causes of hypothermia are inadequate environmental heating in winter

and diminished perception of cold. Even though it develops slowly and insidiously (from several hours to a few days), it can result in death. Symptoms include: fatigue, drowsiness, mental confusion, pallor, shallow respiration, low pulse rate and blood pressure, and cardiac arrhythmias. Hypothermia is treated by gentle, gradual rewarming to prevent sudden enlargement of blood vessels.

Age - Related Physiologic Changes

The most common physiologic changes associated with aging involve: the cardiovascular, renal, hepatic, endocrine and sensory systems, tissue sensitivity and body composition. In elderly patients without heart disease, no appreciable changes occur in resting cardiac output. Age related physiologic changes in the kidneys contribute to a decrease in renal blood flow, glomerular filtration rate and creatinine clearance and production. Thus, serum creatinine may not be a predictor of excretion of a drug from the kidneys. This must be taken into consideration when determining the dose of drugs eliminated from the kidneys. A significant decrease in hepatic flow accompanies aging, and may worsen in the presence of congestive heart failure. A decline in the activity of certain hepatic enzymes and in hepatic albumin synthesis may occur. The tissue sensitivity to drugs may diminish with aging. Responsiveness of the myocardial, beta- adrenergic receptors and baroreceptors reflect sensitivity decline with advancing age. It has been shown that elderly patients would require more of the calcium channel blocker drugs verapamil and diltiazem to produce PR-interval prolongation due to reduced responsiveness to the depressant effect of these medications on conduction in the myocardium.

Age - Related Pharmacokinetic Changes

The aging process causes changes in the pharmacokinetic parameters of absorption, distribution, metabolism and excretion.

Absorption: Physiologic factors such as gastric pH, gastric emptying time, and intestinal absorption mechanisms may influence the absorption rate from the GI tract. Due to atrophic changes in the gastric mucosa of the elderly, the secretory capacity of gastric parietal cells diminishes, resulting in a decrease in gastric acidity of the stomach. The disintegration, dissolution and subsequent absorption of drugs that require certain acidic environment, maybe affected. The dissolution rate of poorly water - soluble drugs is increased in an acidic environment mainly due to enhanced ionization and solubility. Thus, the efficiency of absorption of such drugs in the geriatric patient, who lacks the proper gastric pH, is diminished. Gastric emptying rate appears to decline with age, primarily due to weakening of both muscle tone and motor activity.

Since the small intestine is the main absorption site of orally administered drugs, any delay in gastric emptying of a drug into the intestine will result in the retardation of the absorption process and increased risk of degradation of acid- sensitive drugs.

The GI tract receives about one third of cardiac output. The decrease in cardiac output, that is usually associated with aging, will result in diminished blood flow in the GI tract, resulting in reduced absorption.

Distribution: Serum albumin level tends to decrease with age, and consequently, concentration of the free form of highly albumin - bound drugs will rise, because these drugs will have fewer sites for binding. Increased levels of unbound drugs will result in adverse reactions. Reduced albumin protein may also occur due to the presence of renal and hepatic dysfunction often encountered in the elderly. The simultaneous intake of several medications by the elderly may lead to competition for the limited albumin binding sites, resulting in a rise in the serum concentrations of the displaced drug(s).

Changes in body composition due to aging can affect drug distribution. Water constitutes the largest single component of body weight. The proportions of lean body mass and water content to total body weight decreases with age, whereas that of body fat content increases. About 82% of the ideal body weight of adults is composed of lean body mass, while that of an elderly person is 64%. The percentage of fat tissues increases from 18% to 36% in men, and from 36% to 48% in women. This gradual change that begins at adulthood appears to be due to muscular atrophy and increased formation of connective and fatty tissues.

Metabolism: The rate of metabolism depends on hepatic blood flow, the extent of liver impairment, and the magnitude of cytochrome P-450 activity. Age-related reduction in hepatic blood flow falls to a rate of 40 to 50% of that of healthy younger individuals. Consequently, the rate of metabolism in the elderly is significantly reduced. A decrease in liver clearance results in increased plasma concentration of a drug that may reach toxic levels, in particular in the presence of congestive heart failure.

Renal excretion: Drugs that are chemically altered in the liver are excreted mainly in the urine. Some medications are minimally metabolized in the liver and are eliminated practically unchanged. A significant decline in the glomerular filtration rate and renal blood flow occurs with advancing age. It has been estimated that by age 70, a person may experience a 40 to 50% reduction in renal function. Such declines result in many adverse reactions in elderly patients due to inadequate elimination of drugs.

AGE - RELATED ADVERSE DRUG REACTIONS

Drug interactions, drug errors and noncompliance play important roles in causing adverse reactions among the elderly. Because of the physiological as well as pharmacokinetic changes that occur as an individual ages, adverse drug reactions are twice as common as in young adults. The most commonly encountered reactions in the elderly include: confusion, drowsiness, memory loss, dizziness, nausea, constipation, incontinence and extra pyramidal syndromes. It is essential that the patient be counseled properly by the pharmacist. Most adverse drug reactions occur as a result of the simultaneous intake of several medications by the patient. As the number of diseases that affect the elderly increase with age, so does drug utilization. While the use of these drugs has improved the quality of life and functional capacity of patients, it results in an increase in drug interactions, noncompliance and costs.

Drug interactions may result from multiple pharmacological effects of drugs, visiting multiple physicians who may prescribe medications having similar or antagonistic pharmacological actions and concurrent use of prescription and nonprescription medications. Unintentional misuse of medications is an important factor in causing adverse drug reactions. Medication errors occur more frequently in elderly patients who suffer from vision, hearing or physical impairment, or from forgetfulness. In some instances, misuse may result from lack of information regarding the proper use of the medications. Some patients may place multiple medications in the same vial, making it difficult to select the right one. Noncompliance also can contribute to adverse drug reactions. It appears that there is no definitive evidence to indicate that the elderly are more noncompliant than other population groups. However, because the elderly require more drugs than young adults, it seems that there are greater risks. Many factors contribute to noncompliance: lack of understanding of prescription directions, limited information given to patients about the drug and its use, memory loss, decreased hearing and vision, premature discontinuation of therapy by the patient because of improvement in the ailment, reduction in dosage or discontinuation of therapy due to bothersome adverse reactions, the perception that the drug is not needed, difficulty in opening containers and cost of drugs.

DRUGS USED IN GERIATRICS

Lipid – Lowering Drugs: Occurrence of hyperlipoproteinemia is higher among the elderly than in young adults. While diet can help in lowering fat –carrying protein, drugs are often used for much more reliable and better results.

Oral hypoglycemics: Incidences of diabetes mellitus are approximately 1.6 per 1000 for individuals less than twenty- five years of age, and about sixty- five per 1000 for patients between the ages of 65 and 74. It has been postulated that the higher incidence of diabetes among the elderly may be due to decreased peripheral responsiveness to insulin, decreased utilization of glucose due to a decline in physical activity, and increased percentage of fatty tissue that requires lesser amounts of glucose than lean body mass. The advantages of the use of hypoglycemics include: convenience of administration, relative safety, and ease of compliance. The adverse reactions of oral hypoglycemics include: decreased efficiency with time, interaction with other drugs and hypoglycemia, especially in patients who have irregular meal times. Elderly patients, who have renal dysfunction,

should use short-acting oral hypoglycemics. The dose of these agents in the elderly should be based on clinical response and the degree of physiological changes in the liver and kidney.

Nonsteroidal Anti-inflammatory drugs (NSAIDs): The presence of degenerative diseases, whose incidence increases with age, is a major cause of pain in the elderly. Most degenerative diseases are accompanied or caused by an inflammatory process. NSAIDs act by inhibiting the synthesis of prostaglandin, a chemical responsible for initiating pain. These medications have an inhibitory effect on both the peripheral and central levels, whereas acetaminophen acts on central prostaglandin. The inflammatory process causes pain by releasing chemicals at the site of inflammation and by irritating the nerve endings due to swelling. Caution should be exercised when using NSAIDs in geriatric patients. The side effects usually depend on the dose, frequency and duration of treatment. Gastrointestinal disturbances are the main side effects. GI bleeding may occur following their administration. Such side effects may take place less with enteric-coated aspirin, naproxen, sulindac or ibuprofen. To minimize GI disturbances, these medications should be taken with food.

Diuretics: Edema occurs as a result of abnormal retention of salt and water. In congestive heart failure (CHF), edema is precipitated by compensatory reactions to insufficient cardiac output. Diuretics are used as an adjunct to digoxin and vasodilators in the treatment of CHF and hypertension. Thiazide diuretics are used frequently for CHF, although they are less effective than furosemide and bumetanide in the elimination of water and sodium. Potassium-sparing diuretics may be used, but such agents may lead to hyperkalemia, especially if ACE inhibitors and potassium supplements are taken concurrently. The frequent use of diuretics in the elderly is due mainly to the high incidence of CHF and hypertension. The most common adverse reactions from diuretics are hypokalemia, hyponatremia, hyperglycemia, dehydration, and elevation of BUN and creatinine. Hypokalemia should be prevented, since it may cause cardiac toxicity. Potassium supplements and potassium-sparing diuretics are recommended. Dosage of oral hypoglycemics and insulin should be adjusted in diabetics who are taking diuretics.

Beta-blockers: Beta-blockers should be used with caution in patients with CHF and chronic obstructive pulmonary diseases, such as chronic bronchitis, bronchial asthma, and emphysema, due to the likelihood of triggering bronchospasm. These agents may precipitate a hypoglycemic episode in diabetic patients. Studies have shown that elderly patients experienced a two to three fold increase in average peak blood concentrations when given propranolol, metoprolol, and labetalol. This increase occurred due to changes in first-pass metabolism. Because of this discrepancy, patients in their sixth decade may be more prone to experiencing side effects than younger patients. To minimize the rise of such reactions, a reduced starting dose should be initiated. Since the beta receptor's sensitivity and responsiveness decreases with increasing age, the beta – blockers are generally less effective in elderly hypertensive patients. The use of long – acting beta blockers such as nadolol or atenolol may reduce the risk of side effects and enhance compliance. Therapy with beta-blockers should not be discontinued abruptly, especially when used in treating coronary artery diseases due to increased sympathetic sensitivity.

Calcium channel blockers: This group of medications is used in the elderly mainly for treating hypertension and coronary artery diseases such as angina pectoris. These drugs have a direct effect on coronary smooth muscle, producing vasodilatation and prevention of vasospasm. Side effects include headache and dizziness due to vasodilatation. Because of impaired renal elimination in the elderly, clearance of verapamil is delayed. Likewise, metabolism of this drug is reduced in the presence of liver disease. Patients over 60 years of age have been shown to respond to the blood-pressure – lowering effects of calcium channel blockers to a greater degree than younger patients. Due to the decreased responsiveness of the elderly to calcium channel blockers, proper dosing must be followed. Verapamil produces greater changes in myocardial contractility than diltiazem and nifedipine. Thus, care must be exercised when using beta-adrenergic blockers concurrently with verapamil, since this combination may reduce cardiac output in patients with CHF. However, calcium channel blockers, especially nifedipine, can improve cardiac output by reducing after load.

ACE Inhibitors: Captopril, enalapril, fosinopril, ramipril and other ACE inhibitors are increasingly used in the treatment of severe CHF. They are more effective than digoxin, with fewer side effects. However, in preserving the renal function in patients with diminished renal perfusion pressure, compensating mechanisms are mediated by prostacyclin and angiotensin II to change the vascular tone of the glomerular afferent and efferent arterioles.

Consequently, caution must be exercised when using ACE inhibitors in such patients to avoid the risk of inducing renal failure.

Sedatives and Benzodiazepines: There are a number of medical and nonmedical problems common in the elderly that may interfere with normal sleep patterns. Bronchial asthma may cause nocturnal dyspnea; pain caused by arthritis appears to be more intense at night; diabetes may cause glucosuria and nocturia; urological problems can lead to nocturia; hyperthyroidism can cause insomnia and nervousness; intake of sympathomimetics such as pseudoephedrine or phenylpropanolamine may cause insomnia; lack of physical activity in the elderly and daytime naps can contribute to insomnia. As many as half of the patients in nursing homes receive sedative - hypnotics in order to manage insomnia. Benzodiazepines such as oxazepam, lorazepam and temazepam are recommended in the elderly. Long - acting benzodiazepines may have residual cognitive effect in elderly patients and may increase the risk of falls and bone fracture. It should be kept in mind that the regular use of benzodiazepines in the elderly is not recommended. Abrupt cessation of use of these medications may result in withdrawal symptoms such as tremor, rebound insomnia and agitation. Nonbarbiturates and nonbenzodiazepines, such as the antihistamine diphenhydramine or chloral hydrate, are often used in the elderly. Most OTC sleep products utilize diphenhydramine as the active ingredient. When taking sedatives – hypnotics, the elderly should use less than one half the usual adult dose.

Psychotropic Agents: Drugs such as the phenothiazines, haloperidol and loxapine are commonly used in nursing homes and in geriatric patients with psychosis, behavioral manifestations of dementia such as impaired cognitive functioning, anxiety, agitation and hallucinations. The phenothiazines produce adverse drug reactions such as orthostatic hypotension and extra pyramidal symptoms, probably due to a decline in the capacity of liver enzymes to metabolize the drugs. A lower dosage should be used at the start of therapy, which may be increased in accordance with response to safety of the patient. The concurrent intake of some antiparkinson drugs may cause an increase in the anticholinergic activity of the phenothiazines.

Tricyclic Antidepressants: This group includes agents such as desipramine, nortriptyline, imipramine and amitriptyline. They have varying degrees of anticholinergic, cardiovascular and sedating adverse reactions. The initial doses should be lower than those of young adults due to slow metabolism and excretion. The therapeutic plasma level and patient response should be monitored.

Warfarin: Warfarin is an oral anticoagulant that is highly bound to plasma albumin. Due to the decline in the plasma protein level in the elderly, a larger than normal portion of the administered dose will be present in the unbound (free) form, increasing the risk for hemorrhage. Elderly patients who take warfarin should reduce the dose by 30 to 40%. Furthermore, hematuria, prothrombin and partial prothrombin times should be monitored.

Digoxin: CHF is a condition that is often encountered in elderly patients over 60 years of age. Because of age - related renal dysfunction, renal clearance of digoxin is decreased significantly. Additionally, changes in body composition in the elderly and the reduction in lean body weight must be taken into consideration while calculating digitalization dose. Most geriatric patients may require a daily maintenance dose instead of a loading dose, which may trigger digoxin toxic manifestations such as nausea, anorexia and vision disturbances.

Narcotic Analgesics: Elderly patients are more sensitive to the analgesic effect of narcotic drugs, and consequently, may require lesser doses than younger adults. Furthermore, geriatric patients are more prone to experiencing narcotic side effects such as constipation, mental confusion, and respiratory depression. When administering narcotics, the patient should be given a minimal effective dose that should be gradually increased until pain is reduced for a few hours. A reduction in narcotic dose may be achieved if given concomitantly with non - narcotic analgesics such as aspirin, and NSAIDs.

SUMMARY

Individuals 65 years of age and older comprise about 13% of the population. This percentage is expected to increase. In 25 years, persons 85 years and older will account for 2.5% of the population. Age-related physiological and pharmacokinetic changes may cause adverse drug reactions. Additionally, the simultaneous intake of several medications may trigger harmful drug interactions. As the number of ailments increase with advancing age, so does drug utilization.

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THIS IS THE FINAL DOUBLE LESSON FOR 2006. THIS YEAR'S DEADLINE FOR US TO RECEIVE QUIZZES (AND HAVE THEM APPEAR ON YOUR DECEMBER 2006 CREDIT STATEMENT) IS NOVEMBER 30, 2006.

QUIZZES RECEIVED BETWEEN DECEMBER 1, 2006 & DECEMBER 31, 2006 WILL COUNT FOR 2006 CREDIT, BUT STATEMENTS FOR THAT CREDIT WILL NOT BE MAILED UNTIL AFTER JANUARY 1ST.

Fill in the information below, answer questions and return **Quiz Only** for certification of participation to:
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LESSON EVALUATION

Please fill-out this section as a means of evaluating this lesson. The information will aid us in improving future efforts. Either circle the appropriate evaluation answer, or rate the item from 1 to 7 (1 is the lowest rating; 7 is the highest).

1. Does the program meet the learning objectives?

Discuss the demographics of the elderly in the U.S.	Yes	No		
List the common clinical conditions that are encountered by elderly patients	Yes	No		
Describe physiologic, pharmacokinetic & pharmacodynamic changes related to age	Yes	No		
List & discuss common drugs that are used by geriatric patients	Yes	No		
Describe the effects of these drugs on elderly patients	Yes	No		

2. Was the program independent & non-commercial?

	Poor		Average		Yes	No
					Excellent	
3. Relevance of topic to your practice

	1	2	3	4	5	6	7
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4. What did you like most about this lesson? _____
5. What did you like least about this lesson? _____

(WATCH OUR WEBSITE FOR RESULTS OF PARTICIPANT EVALUATIONS)

Quiz—Please Select the Most Correct Answer

- | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> 1. Which statement is true regarding BPH? <ol style="list-style-type: none"> A. No indication that BPH will trigger development of prostate cancer B. BPH develops around age 20 C. BPH occurs as result of proliferation of cancer cells D. BPH is caused by viral infection 2. Gastric acidity of stomach increases with age. <ol style="list-style-type: none"> A. True B. False 3. NSAIDs <ol style="list-style-type: none"> A. Are CNS depressants B. Inhibit prostaglandin synthesis C. Stimulate prostaglandin synthesis D. Reduce epinephrine release 4. Which factor does not contribute to noncompliance? <ol style="list-style-type: none"> A. Lack of understanding of prescription directions B. Memory loss C. Decreased hearing D. Gender 5. An increase in lean body weight occurs as a person becomes older. <ol style="list-style-type: none"> A. True B. False | <ol style="list-style-type: none"> 6. With increasing age, the sensitivity & responsiveness of beta-receptors <ol style="list-style-type: none"> A. Increase B. Decrease C. Remain the same D. Are unpredictable 7. The higher incidence of diabetes among the elderly may be due to increased peripheral responsiveness to insulin. <ol style="list-style-type: none"> A. True B. False 8. Beta blockers should be used with caution in patients with obstructive pulmonary diseases. <ol style="list-style-type: none"> A. True B. False 9. Age-related blood flow falls 40-50% in elderly versus in healthy young individuals. <ol style="list-style-type: none"> A. True B. False 10. Common physiologic changes associated with age include: <ol style="list-style-type: none"> A. Body composition B. Endocrine system C. Sensory system D. All of these |
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Contributing Author

Farid Sadik, Dean Emeritus
University of South Carolina
College of Pharmacy
Columbia, SC

Executive Editor

William J. Feinberg,
BS Pharm, MBA



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Pharmacists completing this course by November 30, 2009 may receive full credit. This program has been approved by the State Boards of Pharmacy in Alabama and Oklahoma.

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