

# pharmacological changes in the Elderly

## PHYSIOLOGICAL CHANGES

**Absorption.** Drug absorption is likely to be most affected by the aging process. Physiological changes such as an increase in gastric pH, prolonged gastric emptying, and decreased blood flow to the gastrointestinal (GI) tract often result in decreased drug absorption.

**Drug Distribution.** The process by which drugs are distributed through the hematological system to the tissues is drug distribution. This process may slow with age due to changes in body composition, which are characterized by an increase in adipose tissue and a decrease in lean body mass. Total body water also declines, decreasing the distribution of drugs that are water-soluble. In addition, highly protein-bound drugs (e.g warfarin) are less likely to bind to proteins due to decreased levels of serum albumin; these agents may remain pharmacologically active.

**Drug Metabolism.** Metabolism occurs through a process in which drugs are chemically changed to enzymes. Metabolism may end drug reaction or lead to further reactions in which the metabolites of some drugs become activated after metabolism. Other drugs may not become active compounds until the body metabolizes them.

**Drug Excretion and Elimination.** The liver and kidneys are responsible for drug excretion and elimination. Decreased drug clearance and decreased half-life occur due to age-related changes in liver metabolism and renal excretion. Decreases in the glomerular filtration rate, creatinine clearance, and renal blood flow cause renal excretion to decline.

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## **DRUGS WITH ADVERSE EFFECTS IN THE ELDERLY**

Although monitoring all drugs with potential adverse effects is important, certain agents are prescribed more often because some conditions are more common in older adults. Decreased renal clearance and drug sensitivities are other factors that necessitate monitoring. The following section lists agents commonly prescribed for elderly patients and side effects often observed with these agents in the elderly.

**Digoxin.** Adverse effects may include significant renal excretion with decreased renal clearance and increased risk of digitalis toxicity due to hypokalemia.

**Beta-blockers.** Side effects may include bradycardia, hypotension, possible exacerbation of congestive heart failure, aggravation of asthma or chronic obstructive pulmonary disease, and hypoglycemia (in diabetic patients on insulin).

**Guanethidine.** Side effects include postural hypotension and impotence.

**Reserpine.** Adverse effects include severe depression, diarrhea, nasal stuffiness, and reactivation of peptic ulcers.

**Warfarin.** Adverse effects include bleeding and drug interactions.

**Cimetidine.** Side effects may include decreased renal clearance and drug-induced confusion.

**Stimulant laxatives.** Adverse effects may include dependency, dehydration, and electrolyte loss.

**Levodopa.** Side effects may include dizziness, postural hypotension, confusion, and psychosis.

**Diuretics.** Adverse effects include dehydration, postural hypotension, potassium and magnesium depletion, elevation of serum albumin, and serum uric acid.

**Anticholinergic agents.** Adverse effects include dry mouth, urinary retention, constipation, blurred vision, drug-induced confusion, and psychosis.

**Corticosteroids.** Long term use may cause osteoporosis, cataract, glaucoma in susceptible patients, potassium loss,

muscle wasting, GI ulceration, and increases in serum glucose with loss of diabetic control.

**Nonsteroidal anti-inflammatory drugs.** Side effects include sodium and fluid retention, exacerbation of hypotension or congestive heart failure, and GI irritation and bleeding. Phenybutazone may cause fatal blood dyscrasias, fluid retention, and GI irritation. Indomethacin may cause headache or feelings of drunkenness or confusion.

**Tricyclic antidepressants.** Side effects may include sedation, postural hypotension, anticholinergic effects, confusion and cardiac arrhythmias.

**Antipsychotic agents.** Side effects may include drug-induced parkinsonism, and tardive dyskinesia.

**Note:** Antipsychotic agents are contraindicated in patients with idiopathic Parkinson's disease.

**Antianxiety agents, sedatives, and hypnotics.** Avoid administering barbiturates, which may cause addiction, paradoxical agitation, sedation, and ataxia. Also avoid diazepam, chlordiazepoxide, and flurazepam, which have long half-lives and long-acting metabolites. Lorazepam, oxazepam, temazepam are safer choices in this classification, but have the potential for addiction, ataxia, and confusion.

**Narcotics, analgesics.** Side effects include sedation, confusion, respiratory depression, and constipation.

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## **NURSING INTERVENTIONS**

Adverse medication effects are likely to occur in elderly patients. Upon recognizing the increased potential for risk of adverse reactions in the elderly, clinicians should carefully review the medication regimen and reduce the patient's dosage as much as possible. Detecting adverse effects can promote patient health and reduce patient care costs.

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## **PATIENT HISTORY**

Sources of the patient's history include an oral interview with the patient and family members or primary caretakers, the patient's medical record, physician orders, and the pharmacy profile. The patient history may reveal important information such as the current medication regimen, drug allergies, past adverse effects, substance abuse, home remedies, and over-the-counter drugs.

## **DRUG REGIMEN REVIEW**

Be sure to review the medication regimen, the prescription date, whether certain medications should be taken with food, and what times of the day medications should be taken. In addition to noting adverse effects, observe whether the medication is offering the patient any benefits. If changes in the patient's treatment regimen are made, carefully monitor new symptoms and/or changes in the patient's overall condition.

**Note:** Adverse medication effects may be difficult to evaluate in patients taking many agents with the potential for adverse effects or drug interactions.

The patient's care plan should state the goal of administering certain agents; be sure to question whether the goals are being met. For a patient taking an over-the-counter drug, question why the drug was recommended and observe any adverse or positive effects of the drug.

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## **DOSAGE GUIDELINES**

Therapy should aim to maintain the patient's health with as few medications as possible. Administering fewer medications is likely to reduce drug interactions and adverse drug effects. If the patient is taking several medications, consider possible adverse effects. Drugs that exacerbate a chronic disease may be harmful.

In general administer lower doses to elderly patients. Administer small initial doses and use caution when increasing doses; doses are not often increased in elderly patient. When administering medications that affect the central nervous system (e.g., psychoactive medications), use caution and administer smaller doses than younger patients would receive.

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## **DRUG INFORMATION**

It is important to provide drug information to elderly patients who live at home instead of in a long-term care facility. Provide clear, written instructions to the patient who lives at home to reduce the danger of improper medication usage. It may help to review the medication regimen with the patient during each visit.

## **PATIENT TEACHING**

It is important to consider, that psychic changes such as confusion or psychosis may be due to adverse medication effects. Teach the patient and family that such changes may be drug-related and do not occur normally with old age

## **SUMMARY**

Many elderly patients experience adverse medication effects; however, be careful to not consider these as a normal part of the aging process. Many elderly patients

have more than one chronic illness and consequently take multiple medications, some causing adverse effects. Review the patient's medication regimen and monitor for adverse effects carefully

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## **PHARMACOLOGIC MANAGEMENT OF ALZHEIMER'S DISEASE**

The pharmacological treatment of Alzheimer's disease begins with a careful assessment of:

- The patient's medical history and present medical status
- Current medications prescribed for or self-administered by the patient
- Any environmental or social elements that may be affecting the patient

Most patients with Alzheimer's disease present with fairly definitive symptoms: memory disturbances; difficulty in performing activities of daily living; mild language difficulties; problems with visual-spatial relationships; and behavioral abnormalities. This video program focuses on the pharmacological symptoms characteristic of Alzheimer's disease.

Alzheimer's disease patients and patients afflicted with other forms of dementia frequently present behavioral symptoms of:

- Anxiety, agitation, and restlessness
- Aggression
- Delirium
- Impaired cognition
- Memory loss
- Insomnia
- Suspiciousness
- Hallucinations
- Depression
- Apathy

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## **PSYCHOTROPIC DRUGS**

Drugs designated as psychotropic are employed to palliate the direct effects of Alzheimer's disease, the patient's emotional responses, and his or her inability to understand and cope with the environment. Certain classes of psychotropic drugs, however, should be avoided or administered in minimal doses, depending of the patient's particular health status and specific manifestation of dementia.

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### **NEUROLEPTICS**

When a dementia patient presents with agitation, the attending physician must first determine its origin: does the agitation result from external (social, environment) stimuli or does its etiology derive from cognitive disturbances? If the latter is the cause of the patient's behavior, neuroleptics (antipsychotics) are often prescribed. Neuroleptics are generally only prescribed as short-term interventions due to their tendency to produce Parkinsonian symptoms and tardive dyskinesia. It must be remembered, however, that most of the symptoms of Alzheimer's disease are transitory and short-term interventions may be all that are required.

Improper dosing is a potential problem with neuroleptics. Required in smaller doses, higher-potency antipsychotics are generally preferred in the treatment of aged patients because elderly patients may be sensitive to anticholinergic effects, sedation and postural hypotension. Haloperidol (Haldol) is one such antipsychotic with vitually no life-threatening side effects and minimal negative drug interactions. Haloperidol may be administered intravenously or intramuscularly. Like other antipsychotics, haloperidol has been shown to produce Parkinsonian symptoms and tardive dyskinesia in some patients. In order to minimize the occurrence of these secondary symptoms, haloperidol is usually administered in very small doses. Less potent antipsychotics, such as thioridazine (Mellaril),

specifically for use with Alzheimer's disease. Tacrine is an orally bioavailable, centrally active, reversible inhibitor of cholinesterase available for patients with mild-to-moderate Alzheimer's disease.

Tacrine acts by elevating acetylcholine concentrations in the cerebral cortex by slowing the degradation of acetylcholine released by intact cholinergic neurons. The positive effects may lessen as the course of the disease advances; there is no evidence that tacrine alters the course of the underlying disease process.

The patient must undergo monitoring of liver enzyme levels while taking the medication. Tacrine is

contraindicated in patients with known hypersensitivity to tacrine or acridine derivatives and in patients previously treated with the medication who developed treatment-associated jaundice.

Studies show that tacrine improves memory and function for some patients; moreover, for those who do not improve, tacrine may act to slow the progression of dementia.

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### **ANTIMANICS**

When Alzheimer's diseased patients suffering from severe agitation or mania do not benefit from the administration of neuroleptics, antimanic agents become the second line of therapy. Such antimanics include lithium carbonate and carbamazepine (Tegretol). Carbamazepine is an anticonvulsant drug which may be combined with lithium to reduce rapid cycling, or it may be substituted for lithium in elderly patients with CHF and hypertension who require high-dose diuretics.

### **AGE-RELATED CONSIDERATIONS**

When treating patients with Alzheimer's disease, certain age-related physiological changes must be considered. These changes involve the absorption, distribution, hepatic metabolism, and renal excretion of drugs and the sensitivity of receptors and neurotransmitters.

Concomitant use of anticholinergic drugs may reduce gastrointestinal motility and consequently reduce the rate of absorption. Antacids and calcium may also delay the absorption of psychotropic drugs by decreasing their ionization.

The aging process causes lean muscle mass and body water to decrease while overall body fat increases. Most psychotropic drugs are lipophilic and thus will be more widely distributed throughout the elderly patient's body. Lithium carbonate, however, is not so widely distributed due to the reduced body water content. Because renal function diminishes with age, lithium carbonate must be reduced in dosage by about 30%.

Decreased cardiac output may compromise hepatic blood flow which will, in turn, decrease hepatic detoxification and elimination. An additional consideration is the decreased levels of dopamine and acetylcholine in the brain which may result in increased susceptibility to the side effects of dopamine blockers and anticholinergic agents that cross the blood-brain barrier.

## **SUMMARY**

Physicians have available many effective drugs that may be used to ameliorate emotional responses and behaviors related to Alzheimer's disease. Because these medications are simply treating symptoms of a disorder, it is difficult to find an effective agent for one symptom that does not complicate other symptoms. The dosage of these medications depends in part on the patient's health status and manifestations of the illness. In addition, the physiological changes which occur due to the natural aging process, affect the efficacy of certain psychotropic drugs.