Reducing Polypharmacy In The Nursing Home: An Activist Approach

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Background: **Nursing home patients generally take many medications and are at risk for drug side effects and interactions. These patients are often frail, have multiple medical problems, and many have severe cognitive deficits.**

Methods: **Recommendations for reducing polypharmacy in nursing home patients were formulated based upon a review of the medical literature. In many cases, studies of nursing home patients have not been done, and data are extrapolated from other populations.**

Results and Conclusions: **The family physician should actively attempt to reduce the nursing home patient's drug list to those drugs that are most likely to improve or maintain function. Anticonvulsants and antiarrhythmics often can be withdrawn, and medications for angina and hypertension might be simplified. Drugs used solely for prevention, such as lipid-lowering agents or anticoagulants, might not have a favorable impact on patients with limited life expectancies. Careful review of the medication list could prevent iatrogenic complications and maximize function in nursing home patients. (J Am Board Fam Pract 1995; 8:195-205.)**

There are 1.6 million patients in 20,000 nursing homes in the United States. The average nursing home patient is 78 years old, takes six to eight prescription medications, and is under the medical care of a general internist or family physician.[1,2]

Drug interactions and side effects are common in the elderly.[3] Some authorities have suggested that most of these adverse events are due simply to the number of drugs that elders take.[4] As adverse effects of drugs have historically been assessed in relatively healthy younger patients, we have virtually no information on drug interactions in an 80-year-old nursing home patient who has multisystem disease and who takes eight drugs. Hutchinson, et al.[5] have suggested that drug toxicity occurs in 13 percent of patients who are prescribed 6 to 10 medications during a 1-year period. Blaschke, et al.[6] found that 19 percent of nursing home patients were receiving combinations of drugs with known interactions. Using consensus criteria for appropriate drug use, Beers, et al.[7] documented that 40 percent of nursing home residents in the Los Angeles area were receiving one or more inappropriate medications. It is safe to assume that many of our nursing home patients are suffering from drug side effects, drug interactions, or both.[3,8,9]

The average 78-year-old American has a life expectancy of approximately 5 to 6 years.[10] Nursing home patients are generally sicker than the average elder and therefore have lower life expectancies. For many of them, the years remaining are filled with declining function and increasing dependence on others. Drugs that are used to prevent illness but do not make the patient feel better have increasingly marginal benefit-risk profiles. Further, in the patient with moderate or severe cognitive impairment, prevention of major causes of death, such as stroke or myocardial infarction, becomes increasingly difficult to justify.[11]

There are numerous reviews on the pharmacokinetics and pharmacodynamics of elderly patients. These reviews compare elders with younger patients and make general suggestions for management.[4,12,13] Table 1 offers some general guidelines for prescribing drugs for elderly nursing home patients. The remainder of this article discusses several drugs most commonly prescribed for nursing home patients and suggests individual approaches to reducing polypharmacy, thereby preventing some serious adverse events. Psychotropic medications are not covered here, but their use has received widespread attention since the Omnibus Budget Reconciliation Act (OBRA) of 1987.[14]

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Table 1. General Guidelines for Effective Drug Prescribing for Nursing Home Patients.

1. Start low, go slowly. Generally start at one-half the initial dose for a middle-aged patient.
2. Do not prescribe drugs for every minor symptom or disease.
3. Try not to prescribe a drug to treat side effects caused by another drug.
4. Set priorities in therapy; set reasonable treatment goals.
5. Select a drug that can treat more than one problem.
6. Review drug side effects, interactions, and contraindications.
7. Monitor for compliance (much easier in the nursing home).
8. Periodically review the medication list.
9. Remember that drugs can cause illness.
10. Be wary of using new drugs on sick and frail elders.
11. Collaborate with the facility pharmacist.
12. Write time-limited prescriptions.

Antibiotics

Antibiotics should be prescribed for clear indications and for limited periods.[15,16] Chronic use of antibiotics is rarely indicated in nursing home patients. Unnecessary use is often ineffective, has serious side effects, and allows organisms to develop antibiotic resistance. Aminoglycosides in particular are rarely indicated in nursing home patients, as many safer alternatives are available.[17]

Chronic osteomyelitis, tuberculosis, and endocarditis, all uncommon in the nursing home, are conditions for which long courses of antibiotics could be necessary. Chronic bacterial prostatitis often requires long-term antibiotic therapy, but this diagnosis should be confirmed by persistently positive urine cultures in an elderly man with such signs as fever or irritative urinary symptoms.[18]

Asymptomatic bacteriuria should not generally be treated. In addition, annual or routine urinalyses or urine cultures should not be ordered for nursing home patients. Although treatment of asymptomatic bacteriuria can transiently eradicate the bacteria, recurrence is nearly universal, and treatment has been shown to have no effect on mortality. Up to 40 percent of nursing home patients have bladder colonization by bacteria at any one time. Specimen collection can be difficult, and diagnostic catheterization can itself cause morbidity, especially in men with outlet obstruction.[19]

On the other hand, symptomatic urinary tract infections should generally be treated. Signs and symptoms might include fever, irritative symptoms, incontinence, or change in activity, such as refusal to eat. Incontinence and change in functional status are nonspecific; if the clinician thinks they might be related to bacteriuria, then one or perhaps two courses of antibiotics are warranted. These presumed infections should not be treated unless the patient clearly benefits. Treatment of a symptomatic urinary tract infection should last at least 10 to 14 days, as short courses have not been shown to be effective in eradicating pathogens in the elderly.[20] Parenteral therapy is not necessary unless the patient is seriously ill or cannot take oral medications. Catheters should be removed if at all possible. If a symptomatic infection occurs in a catheterized patient, the organism is likely to be resistant to many antibiotics. Follow-up urine cultures are not routinely necessary.[21]

Minor upper respiratory tract infections should not be treated with antibiotics; however, empiric antibiotic therapy is indicated early in the patient with a suspected lower respiratory tract infection.[22,23]

Patients with pressure sores should not receive antibiotics unless there is frank evidence of cellulitis, fever, or sepsis. Prophylactic or topical antibiotics are clearly not effective.[24]

Some experts argue that antibiotics are contraindicated in nursing home patients who have acute diarrheal illnesses.[25] *Clostridium difficile* colonization is common among nursing home patients, and infection with this agent carries a high mortality.[26] In some studies of nursing home epidemics of acute gastroenteritis, routine use of antibiotics has been associated with increased mortality.[27]

Finally, in some patients with advanced dementia who are receiving predominantly palliative care, evaluation of fever and treatment with antibiotics might not always improve outcome and quality of life.[28] It is sometimes reasonable, with appropriate input from patients and their families, to withhold antibiotic therapy of bacterial infections in selected patients who are afflicted by severe dementia or other terminal illnesses.

Antiarrhythmic Drugs

Traditional wisdom regarding the use of antiarrhythmic drugs to treat ventricular arrhythmias was challenged by the recent publication of the Cardiac Arrhythmia Suppression Trials. In these studies, subjects who had experienced a myocar-

dial infarction and who had serious ventricular arrhythmias were randomized to drug therapy (encainide, flecainide, moricizine) or placebo. Unexpectedly, those treated with encainide and flecainide had higher mortality,[29] whereas moricizine was simply not effective.[30] For these and other reasons, most experts recommend that only symptomatic patients with life-threatening ventricular arrhythmias should receive antiarrhythmic therapy.[31] For others, the proarrhythmic effects of the drugs make the drugs too risky for routine use.

In the nursing home, many patients prescribed classic antiarrhythmic medications (e.g., quinidine, procainamide, disopyramide) are taking the drug for an indication that does not meet current guidelines for treatment. Some patients might even have been prescribed a drug for asymptomatic premature ventricular contractions found on a routine electrocardiogram (ECG) or because they had premature ventricular contractions following a myocardial infarction. The physician should review whatever documentation is available (frequently there is little or none) and decide whether drug withdrawal is indicated. A base-line ECG is prudent, but Holter monitoring or cardiology consultation can probably be reserved for selected patients.

Antiarrhythmic medications should not be prescribed for asymptomatic arrhythmias. Given the current controversy surrounding these agents, the primary care physician should be reluctant to initiate such therapy without consultation with an expert. The one exception would be the use of β-blockers to treat either supraventricular or ventricular arrhythmias, as this therapy has been shown to decrease mortality, at least in patients who have had a myocardial infarction.[32]

If the physician elects to discontinue an antiarrhythmic drug, it is prudent to taper the drug dosage slowly for several weeks and obtain an ECG after withdrawal is complete. These drugs can often be withdrawn from patients who have moderate to severe cognitive impairment and from those who might be suffering side effects. If the drug must be used, periodic monitoring of the ECG, serum drug levels, and electrolytes is necessary.

Diuretics and Potassium

Chronic hypokalemia is usually due to diuretic use, although other causes are occasionally diagnosed. To prevent the development of hypokalemia, many clinicians include potassium supplements routinely when prescribing diuretics. This routine supplementation is not justified, as most patients will have only mild declines in serum potassium and will then reach a new, nonsymptomatic equilibrium. If serious hypokalemia does occur, then supplements are necessary.[33]

Potassium supplements are much improved over older preparations, but they can still cause gastrointestinal irritation or perforation, and hyperkalemia is always a possibility, especially as renal function deteriorates, or as a result of interactions with nonsteroidal anti-inflammatory drugs (NSAIDs), angiotension converting-enzyme (ACE) inhibitors, β-blockers, or other drugs.

Thiazide diuretics used to treat hypertension can usually be prescribed in very small doses with considerably less risk of hypokalemia. For example, 12.5 mg of hydrochlorothiazide is often effective, and there is no advantage to exceeding a 25-mg daily dosage. Dosage reduction to this range, therefore, can obviate the need for potassium supplementation. If hypokalemia persists despite a low-dose diuretic, it is often wiser to choose another antihypertensive agent rather than add a second drug (potassium) to treat a side effect of the first drug. Further, combining a thiazide with a potassium-sparing diuretic is probably safer than simply adding a potassium supplement.[34]

Peripheral edema need not be treated with diuretics unless it is excessive or represents a clear manifestation of systemic illness, such as heart failure or hepatic cirrhosis. Edema is most often due to venous insufficiency, which does not generally require diuretic therapy. Many patients have had congestive heart failure diagnosed on the basis of peripheral edema and basilar rales on lung examination; both these findings are nonspecific and are often found in normal elders. Withdrawal of diuretics can be considered in selected patients.[35] Tapering the dosage, rather than abrupt withdrawal, can lessen the likelihood of rebound edema.

Hypokalemia can also be a serious problem associated with the loop diuretics, such as furosemide or bumetanide, especially if there are multiple doses per day. These drugs are not first-line agents for hypertension. Their most common use is in heart failure, and as discussed above, this diagnosis is frequently not well documented.

Even if the patients had clear-cut heart failure, it could have been transient (e.g., myocardial ischemia) or is now well compensated. Patients often tolerate a slow tapering of their loop diuretic. If clear signs of heart failure return, then reinstitution of the diuretic can be considered. In this circumstance, a better choice is probably an ACE inhibitor, which has been shown to decrease mortality in patients with heart failure.[36-38] If ACE inhibitors are prescribed for patients already receiving diuretics, tiny initial doses should be selected to avoid profound hypotension. Another advantage of ACE inhibitors is that even when they are used with diuretics, hypokalemia is uncommon, because they decrease the release of aldosterone.

Digoxin

Digoxin is used for two major purposes: to improve ventricular performance in systolic heart failure and to control the ventricular rate in atrial fibrillation.

Elderly patients who have been using digoxin can suffer from cognitive slowing and depressed appetite, even with serum drug levels in the therapeutic range.[39] Proper management of patients receiving digitalis requires periodic serum drug level monitoring, as well as attention to renal function and electrolytes. Digoxin has several important drug interactions.

Heart Failure

The diagnosis of heart failure is sometimes made without clear evidence. Pedal edema and basilar lung crackles are too nonspecific. In addition, many patients with clearly documented heart failure had reversible causes, such as myocardial infarction or dietary salt indiscretion, and they might no longer need digoxin. Further, many nursing home patients no longer need digoxin because their normal activities have become restricted to bed and chair.

If the current diagnosis of heart failure is secure, it is reasonable to try to distinguish between systolic and diastolic heart failure. A patient with systolic failure often has poor myocardial contractility, with a low ejection fraction, and digoxin might help. In diastolic heart failure, which accounts for up to one-half of heart failure in the elderly, diastolic filling is the problem, and the ejection fraction is often normal.[40] Digoxin will not help these patients, but it will expose them to potential toxicity. Unfortunately, it is clinically difficult to distinguish between these types, although techniques such as echocardiography can be helpful.[41,42]

Patients with systolic heart failure sometimes benefit from digoxin. Even in this group, most authorities recommend an ACE inhibitor as first-line drug therapy, because this drug class has been shown to improve mortality.[36-38] Some studies even suggest a worsening of mortality when digoxin is used.[43] Digoxin can be reserved for the systolic failure patient in whom ACE inhibition and diuretics do not afford appropriate symptomatic relief.[44]

Several clinical trials have addressed the withdrawal of digoxin from patients with the diagnosis of heart failure.[45,46] For example, Forman, et al.[45] studied 14 nursing home patients receiving long-term digoxin therapy. All were in sinus rhythm and had normal ejection fractions. All 14 did well when the digoxin was discontinued. Patients withdrawn from digoxin, however, need to be monitored carefully, especially if their systolic function is abnormal.[46,47] Knowing the serum digoxin level can assist the physician in discontinuation. Studies suggest that in patients with normal sinus rhythm, digoxin might be stopped without tapering if digoxin levels are less than 0.8 ng/mL.[48] Patients with a history of supraventricular dysrhythmias might need the drug for episodic rate control.

Atrial Fibrillation

Digoxin is used in patients with atrial fibrillation who have a rapid ventricular response, usually defined as more than 100 beats per minute. Rate control can decrease the symptom of palpitations and often improves cardiac output by increasing diastolic filling. Many elderly patients with atrial fibrillation have concomitant conduction disorders involving the AV node, such that their ventricular rates remain normal. These patients require no medication for rate control except perhaps during times of medical stress.

In those patients with a rapid ventricular response, a calcium blocker, such as verapamil or diltiazem, or low doses of a β-blocker will often control the rate with less toxicity than digoxin. In any event digoxin should not be increased to high doses; if usual digoxin doses with normal therapeutic blood levels are not sufficient, another agent should be added or substituted.[49]

Medications for Hypertension

Several recent trials have supported treating both diastolic and isolated systolic hypertension in the elderly.[50,51] Some experts recommend low-dose diuretics as the treatment of choice for isolated systolic hypertension, but others disagree, citing the potential metabolic complications of diuretics.[52] This argument is academic for some nursing home patients, for whom long-term survival is unlikely.

Assessing whether an antihypertensive drug is causing side effects can be difficult in nursing home patients, who often have multiple diseases and do not communicate well. Drugs that have a high likelihood of causing cognitive impairment include the centrally acting drugs clonidine, methyldopa, and reserpine; β-blockers can also contribute to fatigue and mental slowing. Calcium channel blockers, ACE inhibitors, and low-dose diuretics usually work well with minimal side effects.[52]

Frequently blood pressure is easier to control in the nursing home than in the home setting. One can potentially control sodium intake more reliably, and drugs that can exacerbate hypertension, such as sympathomimetics, NSAIDs, and theophylline, can be discontinued under supervision. The majority of patients can have their blood pressure controlled on once daily medications, usually with one drug or occasionally two. If further lowering of blood pressure causes side effects, it is reasonable to accept less than optimal control.

In patients with moderate or more advanced cognitive impairment, mild hypertension should probably not be treated. These patients are particularly prone to side effects, and there is no compelling reason to prescribe drugs to prevent stroke and myocardial infarction in these patients. Orthostatic hypotension of even a small degree should be avoided, as it can contribute to such serious morbidity as hip fracture.

Medications for Angina

Medications used to treat angina pectoris include nitrates, β-blockers, and calcium channel blockers. The treatment regimen can often be simplified or eliminated in nursing home patients.

Patients whose activity levels have diminished often do not need as much medication as previously prescribed. The patient who formerly lived independently but is now confined to bed and chair does not need the same drug regimen. Further, many patients whose angina pectoris was poorly controlled before admission will have less angina when exposed to the routines of the nursing home.

Nitrates can be poorly tolerated in the elderly, because their blood pressure and cardiac output are very sensitive to preload. If these medications are used, a nitrate-free interval should occur every day to avoid the problem of tachyphylaxis. β-Blockers can cause fatigue and exacerbate reactive lung disease, diabetes, and peripheral vascular disease. Calcium channel blockers are usually well tolerated.

In the average patient with chronic stable angina, it is reasonable to assess the medical regimen periodically and reduce drug dosages with supervision. If angina recurs, the medications can be resumed.

Histamine (H_2)-Blockers

H_2-blockers are prescribed for patients with peptic ulcer disease, esophageal reflux, and other gastrointestinal diseases.

Patients receiving long-term H_2-blocker therapy should have a clearly documented indication for the medication. Other serious diseases, such as coronary artery disease, can produce symptoms indistinguishable from ulcer pain or reflux. After an appropriate treatment course, patients generally can continue taking a lower maintenance dose of the H_2-blocker. Occasionally, a patient who has peptic disease that recurs with maintenance therapy or a patient with severe reflux will require higher dosages.

The H_2-blockers, particularly cimetidine, interact with other commonly used drugs, such as phenytoin and theophylline, and cause central nervous system side effects. Theophylline can worsen esophageal reflux by relaxing the lower esophageal sphincter.

Peptic ulcer disease often remits after many years, and patients sometimes no longer require therapy. Smoking cessation is very effective in ulcer healing and can eliminate the need for an H_2-blocker. Patients who have been symptom free or nearly so for 1 year or more can attempt a trial off the medication, unless the risk of recurrence seems very high.

In the cognitively impaired patient, symptoms of reflux or dyspepsia can eventually become less

apparent, and the usefulness of H_2-blockers in these patients is minimal.

Theophylline

Theophylline is used in nursing home patients who have chronic obstructive pulmonary disease (COPD). This drug has a narrow therapeutic window, particularly in the elderly and those who have liver disease or congestive heart failure. Theophylline also has several serious drug interactions that increase toxicity, especially with ciprofloxacin, H_2-blockers, and erythromycin.

Ideally, patients taking any of the medications designed for reactive airway disease or COPD will have periodic spirometry to document the diagnosis and effect of treatment. Some patients with COPD feel better on theophylline, even without demonstrable improvement in their pulmonary function studies; this effect could be related to the decreased work of breathing.

Theophylline should no longer be considered a first-line drug in respiratory tract disease.[53] Medications that are delivered topically, such as inhaled β-agonists, cromolyn, ipratropium, or corticosteroids, should be prescribed first before resorting to theophylline preparations. Doing so avoids the systemic side effects of theophylline and the need for serum drug monitoring. Also, in the controlled setting of the nursing home, where medications can be delivered with a high degree of compliance, the need for theophylline often diminishes.

If theophylline must be used, elderly patients often benefit from doses producing serum levels of 8 to 12 μg/mL, below the traditional therapeutic range. A reasonable starting dose is 200 to 300 mg/d, without a loading dose. Serum theophylline levels greater than 15 μg/mL increase the risk of toxic effects in the elderly. Caution is indicated when other drugs are prescribed or when the patient becomes febrile.[53]

Lipid-Lowering Drugs

Drug therapy for selected middle-aged patients with hypercholesterolemia, particular those with high low-density lipoprotein (LDL) cholesterol levels, is advocated by many experts, although there are outspoken dissidents.[54,55] Hypercholesterolemia loses its predictive power for coronary events or mortality in patients older than 70 years.[56] There is scant evidence that lowering serum cholesterol in the elderly is beneficial, and there is no evidence in the very old or frail. In addition, nursing home patients frequently are prescribed low-fat diets or suffer from undernutrition.[57] Lipid-lowering agents in these patients could produce harmful effects. Some of these agents cannot be taken with other medications, making for very complex dosage regimens. Finally, the limited life expectancy of most nursing home patients, combined with their increasingly dependent status, argues against routine prevention of myocardial infarction.

With few data available, lipid-lowering drugs are appropriate only in selected patients whose potential life expectancy is substantial — 10 years or more. These patients should be cognitively intact, without debilitating illness, and with either documented atherosclerotic heart disease or extremely high LDL levels. It is the rare nursing home patient who fits this description.

Pentoxifylline

Pentoxifylline is a rheologic agent used to alleviate the symptom of intermittent claudication in patients with occlusive peripheral arterial disease. Several controlled trials have shown that a small minority of patients with documented disease will have improvement in calf pain or in walking distance while on this drug.[58] Too often the drug is started for nonspecific leg symptoms and then continued indefinitely.

Nursing home patients who are bedridden or minimally ambulatory should probably not receive this drug. Because of the high cost of pentoxifylline (more than $1000/y), the diagnosis of peripheral arterial disease should generally be confirmed by noninvasive testing before a drug trial. If the drug is used, the patient's condition should be reassessed in 4 to 6 months. If there is not clearcut improvement, the drug should be discontinued.

Preliminary evidence also indicates that selected patients with well-documented cerebrovascular dementia can have slowing of the progression of dementia while on pentoxifylline.[59]

Pentoxifylline belongs to the methylxanthine class, along with theophylline and caffeine. A typical adverse effect of methylxanthines is central nervous system stimulation. Such drugs as ciprofloxacin can potentiate the central nervous system effects, potentially leading to overstimulation and increased need for hypnotics or antipsychotics. In

frail nursing home patients, the minimal potential benefits of pentoxifylline seem to be far outweighed by costs and potential side effects.

Anticonvulsants

Used primarily in seizure disorders, the anticonvulsants have many serious adverse effects. Phenobarbital and phenytoin are very sedating and can contribute to declining cognitive function in frail elders. Carbamazepine can cause cytopenias, and valproic acid can be hepatotoxic. All of these drugs require serum drug monitoring, and serious drug interactions are common.

Many patients have had anticonvulsants prescribed for obscure reasons or for reasons not widely accepted today. For instance, the patient might have had a single syncopal episode with some convulsive twitching, or the patient might have had clear seizures that were secondary to a reversible cause, such as hyponatremia or drug toxicity. Still yet, the patient might have a well-documented primary seizure disorder but has remained seizure-free for many years. It is safe and appropriate to wean selected nursing home patients from their anticonvulsants. The nursing staff can be involved in the process, monitoring the patient for recurrence. The tapering process should take several weeks or months, as abrupt discontinuation of anticonvulsants can cause seizures. Consultation with a neurologist can be useful in some cases.[60]

Discontinuing anticonvulsants for uncertain indications will not only reduce potential adverse events and drug interactions but can improve cognition and improve the ability of patients to perform activities of daily living.

Anticoagulants

Both the indications for anticoagulation and the complications of such therapy are common in the frail elderly.

Atrial Fibrillation

Atrial fibrillation is common among nursing home patients, affecting up to 15 percent of residents. Both aspirin and especially warfarin have been clearly shown to reduce the risk of stroke in patients with nonrheumatic atrial fibrillation.[61] In the single best trial assessing very old patients (older than 75 years), however, there was minimal reduction in stroke but a clear increase in the risk of major hemorrhage.[62] For frail nursing home patients, warfarin anticoagulation should be attempted only in the most highly selected patients. Nursing home patients fall frequently and are often cognitively impaired; use of warfarin requires close monitoring of coagulation times, hemoglobin, and potential bleeding. In our opinion, most of these patients should take aspirin, if stroke prevention is likely to maintain a good quality of life, but not warfarin. In the moderately to severely demented patient who is dependent in all activities of daily living, stroke prevention might not be an important or humane goal.

Dipyridamole

Many patients have been prescribed dipyridamole, especially following coronary artery bypass grafting, despite numerous clinical trials that show no important clinical effects. Dipyridamole can almost always be stopped without ill effect. It is ineffective, expensive, and it requires multiple daily doses.[63]

Stroke Prophylaxis

Patients with carotid transient ischemic attacks or minor strokes can benefit from aspirin prophylaxis; many studies show that subsequent stroke risk can be reduced by up to 50 percent with such therapy. Dipyridamole is ineffective by itself and its addition to aspirin offers no further benefit.[64] Again, in patients with very poor function, the clinician might decide that stroke prophylaxis is inappropriate.

Other Concerns

Patients recovering from deep venous thrombosis or pulmonary embolism generally are treated for 3 and 6 months, respectively, with warfarin. Because of lower dose requirements in the elderly, side effects, and multiple potential drug interactions, the prothrombin time should be monitored weekly until it is stable, and then at least monthly. One should use the international ratio method of monitoring warfarin therapy and follow current guidelines for anticoagulation, which stress lower doses than previously recommended. Discontinue the warfarin when the appropriate treatment period is finished.[65]

Nonsteroidal Anti-inflammatory Drugs (NSAIDs)

This class of drugs accounts for large numbers of serious iatrogenic complications. Griffin, et al.[66]

found that 30 percent of ulcer-related hospitalizations and deaths in the elderly were attributable to NSAIDs. Most of the morbidity and mortality of these drugs is avoidable.[67] Gastrointestinal bleeding or perforation is often catastrophic and painless. In addition, NSAIDs, through their salt-retaining effects, can worsen hypertension or congestive heart failure in elderly patients.[68]

Most nursing home patients have aches and pains, and most suffer from such chronic diseases as osteoarthritis or osteoporosis. NSAID use should not be routine in these patients. Table 2 lists alternatives to NSAIDs in managing chronic pain in the nursing home patient. If an NSAID must be used, choose one with a relatively short half-life. Although direct evidence is lacking, drugs such as ibuprofen might cause less profound prostaglandin inhibition than drugs with longer half-lives, such as piroxicam. Use of the drug intermittently, for example, just before physical therapy or at bedtime, can be useful and decrease side effects. A drug holiday of 2 days a week might also lessen the risks. For transient pains write a time-limited prescription so that the drug does not continue indefinitely.

In patients who must take daily doses of an NSAID, the co-administration of H_2-blockers, antacids, or sucralfate do not reliably prevent gastric complications. Only misoprostol has been clearly shown to prevent gastrointestinal bleeding in patients taking NSAIDs, but misoprostol is expensive and difficult for elders to take because of a high frequency of diarrhea.[69]

Table 2. Alternatives to Nonsteroidal Anti-inflammatory Drugs in the Management of Chronic Pain in Nursing Home Patients.

1. Make a definitive diagnosis, e.g., osteomalacia, myeloma, compression fracture, tumor.
2. Prescribe drugs judiciously; not every ache or pain requires drug therapy.
3. Consider physical therapy, such as ambulation, range of motion, ice packs, or other treatment modalities, walkers.
4. Consider occupational therapy, such as activities of daily living retraining, assistive devices.
5. Consider surgery, such as hip or knee replacement.
6. Try acetaminophen, up to 2000-2500 mg/d (chronic use of 3 to 5 g/d has caused serious hepatotoxicity).
7. Apply capsaicin (Zostrix) — 0.025% or 0.075% cream to the affected area three or four times a day.

Allopurinol

Allopurinol, a xanthine oxidase inhibitor, is used to block the production of uric acid. Long-term use is nearly always for the prevention of recurrent gout. Gout is overdiagnosed, however, as crystals are required for definitive diagnosis. Many patients have had gout diagnosed based on nonspecific joint pain combined with an elevated serum uric acid level; rarely do these patients have gout. The first task then is to assess how the diagnosis was originally made.

Even should the diagnosis of gout be reasonable, allopurinol is not usually the treatment of choice. If acute podagra occurs once every few years, no long-term therapy may be needed, and in patients with established gout, the biochemical defect is more likely to be renal underexcretion of uric acid rather than overproduction. Drugs such as probenecid will enhance renal urate clearance, although the efficacy of this drug wanes as renal function deteriorates. Most nursing home patients receiving allopurinol can be safely withdrawn from this drug. If indications for the drug continue, 100 mg once a day is usually adequate.

Conclusions

Family physicians can make a meaningful impact on the quality of life for their nursing home patients by taking an active, aggressive stance toward reducing unnecessary or marginally helpful medications.

Reduction of polypharmacy can lead to improved function and quality of life in impaired elders, but it also has other benefits. Health care costs can be greatly reduced, even more than the obvious direct costs of the pharmaceuticals. McCue and Tessier[70] estimated that each medication dispensed in the nursing home costs approximately $1 to administer. It is possible that professional nursing time spent on drug administration could be reduced, and patients could receive attention to other aspects of care. Rates of hospitalization might be reduced. Up to 10 percent of admissions of elderly patients to general hospitals are due to ill effects of prescribed medications[71]; much of this morbidity is probably preventable.[72] The number of telephone calls from the nursing home can be substantially reduced and care streamlined, because the medical regimen is more straightforward.

It is important to remain vigilant for adverse effects of drug withdrawal and to reinstitute a dis-

continued drug if appropriate.[73] Many patients and families are resistant to proposed changes in drug therapy, even in the presence of overt side effects. One might need to compromise, balancing the science of geropharmacology with the realities of everyday patient care. On the other hand, many nursing home patients have multiple medical problems, and drug treatment of one can potentially exacerbate another. The skilled family physician needs to weigh the pros and cons, take into account demands of the nursing home staff and families, and come to reasonable conclusions.[74]

Summary

Family physicians caring for nursing home patients should actively attempt to simplify their patients' drug regimens. Drugs can be eliminated, reduced in dose, or switched to once-daily doses. Ongoing vigilance is required because the drug list tends to lengthen with time. Nursing home care can be more professionally rewarding when we see our interventions bearing fruit. Careful review and pruning of the medication list could be the single most important service the family physician can provide to his or her nursing home patients.

References

1. Hing E, Sekscenski E, Strahan GW. The nursing home survey. 1985 summary for the United States. Washington, DC: National Center for Health Statistics, Department of Health and Human Services, 1989. Vital and Health Statistics Series 13, no. 97, DHHS Publ. no. (PHS) 89-1758.
2. Wayne SJ, Rhyne RL, Stratton M. Longitudinal prescribing patterns in a nursing home population. J Am Geriatr Soc 1993; 40:53-6.
3. Lindley CM, Tully MP, Paramsothy V, Tallis RC. Inappropriate medication is a major cause of adverse drug reactions in elderly patients. Age Ageing 1992; 21:294-300.
4. Walker J, Wynne H. Review: the frequency and severity of adverse drug reactions in elderly people. Age Ageing 1994; 23:255-9.
5. Hutchinson TA, Flegel KM, Kramer MS, Leduc DG, Kong HHP. Frequency, severity, and risk factors for adverse drug reactions in adult out-patients: a prospective study. J Chronic Dis 1986; 39:533-42.
6. Blaschke TF, Cohen SN, Tatro DS, Rubin PC. Drug-drug interactions and aging. In: Jarvik LF, Greenblatt DJ, Harman D, editors. Clinical pharmacology and the aged patient. New York: Raven, 1981.
7. Beers MH, Ouslander JG, Fingold SF, Morgenstern H, Reuben DB, Rogers W, et al. Inappropriate medication prescribing in skilled-nursing facilities. Ann Intern Med 1992; 117:684-9.
8. Cumming RG, Miller JP, Kelsey JL, Davis P, Arfken CL, Birge SJ, et al. Medications and multiple falls in elderly people: the St. Louis OASIS Study. Age Ageing 1991; 20:455-61.
9. Nolan L, O'Malley K. The need for a more rational approach to drug prescribing for elderly people in nursing homes. Age Ageing 1989; 18:52-6.
10. US Decennial Life Tables for 1979-81. Vol. 1, No. 1. Washington, DC: Public Health Service, National Center for Health Statistics, 1985.
11. Luchins DJ, Hanrahan P. What is appropriate health care for end-stage dementia? J Am Geriatr Soc 1993; 41:25-30.
12. McCue JD, Tessier EG, Gaziano P. Geriatric drug handbook for long-term care. Baltimore: Williams & Wilkins, 1993.
13. Montamat SC, Cusack BJ, Vestal RE. Management of drug therapy in the elderly. N Engl J Med 1989; 321:303-9.
14. Ray WA, Taylor JA, Meador KG, Lichtenstein MJ, Griffin MR, Fought R, et al. Reducing antipsychotic drug use in nursing homes. A controlled trial of provider education. Arch Intern Med 1993; 153:713-21.
15. Zimmer JG, Bentley DW, Valenti WM, Watson NM. Systemic antibiotic use in nursing homes. A quality assessment. J Am Geriatr Soc 1986; 34:703-10.
16. Katz PR. Antibiotics for nursing home residents. When are they appropriate? Postgrad Med 1993; 93:173-80.
17. Yoshikawa TT, Castle SC, Norman DC. Update on infections. In: Ham RJ, editor. Geriatric medicine annual 1989. Oradell, NJ: Medical Economics Books, 1989:73-93.
18. Weidner W, Schiefer HG, Dalhoff A. Treatment of chronic bacterial prostatitis with ciprofloxacin. Results of a one year follow-up study. Am J Med 1987; 82(Suppl 14A):280-2.
19. Abrutyn E, Boscia JA, Kaye D. The treatment of asymptomatic bacteriuria in the elderly. J Am Geriatr Soc 1988; 36:473-5.
20. Gleckman RA. Urinary tract infection. Clin Geriatr Med 1992; 8:793-803.
21. Stamm WE, Hooton TM. Management of urinary tract infections in adults. N Engl J Med 1993; 329:1328-34.
22. Marrie TJ, Durant H, Kwan C. Nursing home-acquired pneumonia. A case-control study. J Am Geriatr Soc 1986; 34:697-702.
23. McCue JD. Pneumonia in the elderly. Special considerations in a special population. Postgrad Med 1993; 94:39-40,43-6,51.
24. Spoelhof GD, Ide K. Pressure ulcers in nursing home patients. Am Fam Physician 1993; 47:1207-15.
25. Bennett RG, Greenough WB. Diarrhea. In: Hazard WR, Bierman EL, Blass JP, Ettinger WH, Halter JB, editors. Principles of geriatric medicine and gerontology. 3rd ed. New York: McGraw-Hill, 1994.
26. Walker KJ, Gilliland SS, Vance-Bryan K, Moody JA, Larsson AJ, Rotschafer JC, et al. *Clostridium difficile* colonization in residents of long-term care facilities:

prevalence and risk factors. J Am Geriatr Soc 1993; 41:940-6.
27. Carter AO, Borczyk AA, Carlson JAK, Harvey B, Hockin JC, Karmali MA, et al. A severe outbreak of *Escherichia coli* 0157:H7-associated hemorrhagic colitis in a nursing home. N Engl J Med 1987; 317: 1496-500.
28. Fabiszewski KJ, Volicer B, Volicer L. Effect of antibiotic treatment on outcome of fevers in institutionalized Alzheimer patients. JAMA 1990; 263: 3168-72.
29. Echt DS, Liebson PR, Mitchell LB, Peters RW, Obias-Manno D, Barker AH, et al. Mortality and morbidity in patients receiving encainide, flecainide, or placebo. The Cardiac Arrhythmia Suppression Trial. N Engl J Med 1991; 324:781-8.
30. The Cardiac Arrhythmia Suppression Trial II Investigators. Effect of the antiarrhythmic agent moricizine on survival after myocardial infarction. N Engl J Med 1992; 327:227-33.
31. Roden DM. Risks and benefits of antiarrhythmic therapy. N Engl J Med 1994; 331:785-91.
32. Yusuf S, Peto R, Lewis J, Collins R, Sleight P. Beta-blockade during and after myocardial infarction: an overview of the randomized trials. Prog Cardiovasc Dis 1985; 27:335-71.
33. Kaplan NM. Our appropriate concern about hypokalemia. Am J Med 1984; 77:1-4.
34. Siscovick DS, Raghunathan TE, Psaty BM, Koepsell TD, Wicklund KG, Lin X, et al. Diuretic therapy for hypertension and the risk of primary cardiac arrest. N Engl J Med 1994; 330:1852-7.
35. de Jonge JW, Knottnerus JA, van Zutphen WM, de Bruijne GA. Review: trials of withdrawal of diuretics. Age Ageing 1993; 22:382-8.
36. The SOLVD Investigators. Effect of enalapril on survival in patients with reduced left ventricular ejection fractions and congestive heart failure. N Engl J Med 1991; 325:293-302.
37. The Captopril-Digoxin Multicenter Research Group. Comparative effects of therapy with captopril and digoxin in patients with mild to moderate heart failure. JAMA 1988; 259:539-44.
38. The CONSENSUS Trial Study Group. Effects of enalapril on mortality in severe congestive heart failure. Results of the Cooperative North Scandinavian Enalapril Survival Study (CONSENSUS). N Engl J Med 1987; 316:1429-35.
39. Eisendrath SJ, Sweeney MA. Toxic neuropsychiatric effects of digoxin at therapeutic serum concentrations. Am J Psychiatry 1987; 144:506-7.
40. Luchi RJ, Taffet GE, Teasdale TA. Congestive heart failure in the elderly. J Am Geriatr Soc 1991; 39: 810-25.
41. Gaasch WH. Diagnosis and treatment of heart failure based on left ventricular systolic or diastolic dysfunction. JAMA 1994; 271:1276-80.
42. Aronow WS. Echocardiography should be performed in all elderly patients with congestive heart failure. J Am Geriatr Soc 1994; 42:1300-2.
43. Muller JE, Turi ZG, Stone PH, Rude RE, Raabe DS, Jaffe AS, et al. Digoxin therapy and mortality after myocardial infarction. N Engl J Med 1986; 314:265-71.
44. Kulick DL, Rahimtoola SH. Current role of digitalis therapy in patients with congestive heart failure. JAMA 1991; 266:2995-7.
45. Forman DE, Coletta D, Kenny D, Kosowsky BD, Stoukides J, Rohrer M, et al. Clinical issues related to discontinuing digoxin therapy in elderly nursing home patients. Arch Intern Med 1991; 151:2194-8.
46. Packer M, Gheorghiade M, Young JB, Constantini PJ, Adams KF, Cody RJ, et al. Withdrawal of digoxin from patients with chronic heart failure treated with angiotensin-converting-enzyme inhibitors. N Engl J Med 1993; 329:1-7.
47. Uretsky BF, Young YB, Shahidi E, Yellen LG, Harrison MC, Jolly MK, et al. Randomized study assessing the effect of digoxin withdrawal in patients with mild to moderate congestive heart failure: results of the PROVED trial. J Am Coll Cardiol 1994; 22:955-62.
48. Johnston GD, McDevitt DG. Is maintenance digoxin necessary in patients with sinus rhythm? Lancet 1979; 1:567-70.
49. Ezekowitz MD, Grauer K. Management of chronic atrial fibrillation. Am Fam Physician Monograph. Kansas City, MO: American Academy of Family Physicians, 1993.
50. SHEP Cooperative Research Group. Prevention of stroke by antihypertensive drug treatment in older persons with isolated systolic hypertension. Final results of the Systolic Hypertension in the Elderly Program (SHEP). JAMA 1991; 265:3255-64.
51. Tjoa HI, Kaplan NM. Treatment of hypertension in the elderly. JAMA 1990; 264:1015-18.
52. Applegate WM, Rutan GH. Advances in management of hypertension in older persons. J Am Geriatr Soc 1992; 40:1164-74.
53. Ferguson GT, Cherniack RM. Management of chronic obstructive pulmonary disease. N Engl J Med 1993; 328:1017-22.
54. Summary of the second report of the National Cholesterol Education Program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (adult treatment panel II). JAMA 1993; 269: 3015-23.
55. Palumbo PJ. Cholesterol lowering for all: a closer look. JAMA 1989; 262:91-2.
56. Krumholz HM, Seeman TE, Merrill SS, Mendes de Leon CF, Vaccarino V, Silverman DI, et al. Lack of association between cholesterol and coronary heart disease mortality and morbidity and all-cause mortality in person older than 70 years. JAMA 1994; 272:1335-40.
57. Keller HH. Malnutrition in institutionalized elderly: how and why? J Am Geriatr Soc 1993; 41:1212-8.
58. Radack K, Wyderski RJ. Conservative management of intermittent claudication. Ann Intern Med 1990; 113:135-46.

59. Black RS, Barclay LL, Nolan KA, Thaler HT, Hardiman ST, Blass JP. Pentoxifylline in cerebrovascular dementia. J Am Geriatr Soc 1992; 40:237-44.
60. Callaghan N, Garrett A, Goggin T. Withdrawal of anticonvulsant drugs in patients free of seizures for two years: a prospective study. N Engl J Med 1988; 318:942-6.
61. Laupacis A. Albers G, Dunn M, Feinberg W. Antithrombotic therapy in atrial fibrillation. Chest 1992; 102(4 Suppl):426S-433S.
62. Warfarin versus aspirin for prevention of thromboembolism in atrial fibrillation. Stroke Prevention in Atrial Fibrillation II Study. Lancet 1994; 343:687-91.
63. Fitzgerald GA. Dipyridamole. N Engl J Med 1987; 316:1247-57.
64. Sherman DG, Dyken ML, Fisher M, Gent M, Harrison M, Hart RG. Antithrombotic therapy for cerebrovascular disorders. Chest 1992; 102(4 Suppl): 529S-37S.
65. Zamorski MA, Opdycke RA. Advances in the prevention, diagnosis and treatment of deep venous thrombosis. Am Fam Physician 1993; 47:457-69.
66. Griffin MR, Piper JM, Daugherty JR, Snowden M, Ray WA. Nonsteroidal anti-inflammatory drug use and increased risk for peptic ulcer disease in elderly persons. Ann Intern Med 1991; 114:257-63.
67. Armstrong CP, Blower AL. Non-steroidal anti-inflammatory drugs and life threatening complications of peptic ulceration. Gut 1987; 28:527-32.
68. Chrischilles EA, Wallace RB. Nonsteroidal anti-inflammatory drugs and blood pressure in an elderly population. J Gerontol 1993; 48:M91-6.
69. Walt RP. Misoprostol for the treatment of peptic ulcer and anti-inflammatory drug-induced gastroduodenal ulceration. N Engl J Med 1992; 327: 1575-80.
70. McCue JD, Tessier E. Cost containment and oral antimicrobials. Issues for P and T committees. Pharmacol Toxicol 1991; 69:334.
71. Nolan L, O'Malley K. Prescribing for the elderly. Part I: sensitivity of the elderly to adverse drug reactions. J Am Geriatr Soc 1988; 36:142-9.
72. Lindley CM, Tully MP, Paramsothy V, Tallis RC. Inappropriate medication is a major cause of adverse drug reactions in elderly patients. Age Ageing 1992; 21:294-300.
73. Gerety MB, Cornell JE, Plichta DT, Eimer M. Adverse events related to drugs and drug withdrawal in nursing home residents. J Am Geriatr Soc 1993; 41:1326-32.
74. Ashburn PE. Polypharmacy in skilled-nursing facilities. Ann Intern Med 1993; 118:649-50.