

## Drugs and the Elderly, Part 1: The Problems Facing Managed Care

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### **Abstract**

**Objective:** In part 1 of "Drugs and the Elderly," we review and summarize the vast amount of clinical information on medication use in the elderly for healthcare providers and administrators within managed care. In part 2, we explore the literature on improving prescribing, focusing on those approaches most likely to be useful within a managed care environment.

**Study Design:** We reviewed the general literature on medication use in the elderly, focusing on problems and systems approaches to the improvement of medication use in managed care. We created a topic list of general interest to health professionals within managed care and fit the available information into those topics. Thus, the result is an authoritative review rather than a systematic literature review.

**Patients and Methods:** Nonquantitative evaluation of the medical literature.

**Results:** We identified several hundred articles describing issues related to medication use in the elderly but only a trivial number that in any way addressed the managed care community directly. There is very little literature on how managed care can best incorporate the lessons of geriatric pharmacology and pharmacy.

**Conclusions:** There is a paucity of literature for the managed care community of health professionals regarding pharmacology, pharmacoepidemiology,

drug utilization review, and other issues related to the use of medication in the elderly population.

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Healthcare for the elderly has become an important social, political, and financial issue, in part because of the aging demographics of the United States and the world and in part because of the unique way in which older Americans' healthcare is paid for. Indeed, almost every attempt to create a national system of medical coverage or to reform Medicare has focused on paying for drugs. As government payment for healthcare for the aged moves from a fee-for-service environment to one of managed healthcare,<sup>1</sup> healthcare providers will focus their attention on maintaining the quality of care while controlling the costs of care.<sup>2</sup> The government also will become increasingly interested in ensuring (and monitoring) the quality of prescribing to the elderly in such plans. The quality of medication prescribing and the cost of medication use will be fundamental issues in all debates and initiatives in managed healthcare. Fortunately, both the underlying philosophy and support systems of managed care hold promise for improving the quality of prescribing to the elderly while helping to minimize risk and reduce overall cost.<sup>3</sup>

### ... DRUG UTILIZATION IN THE ELDERLY ...

The elderly are extensive users of both prescription and over-the-counter (OTC) medications. Although only about 13% of the US population is over

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age 65, this segment uses more than 30% of prescription<sup>4,5</sup> and 35% of OTC drugs.<sup>5</sup> The 1987 National Medical Expenditure Survey reported that older women filled more than 16 prescriptions per year and older men filled more than 13 prescriptions per year, a usage pattern that has probably increased since then. In total, older Americans use 5.8 prescription drugs concurrently with another 3.2 OTC drugs.<sup>4,6</sup>

The elderly use different types of drugs than younger adults. The young tend to use medications for a short duration to treat acute illness, namely antibiotics, nonsteroidal anti-inflammatory drugs and other analgesics, and drugs to treat gastrointestinal (GI) complaints.<sup>7,8</sup> When they use drugs chronically, those agents are generally limited to birth control drugs, antidiabetics, and analgesics. The elderly tend to use drugs chronically.<sup>8</sup> The drugs most commonly used by the community-dwelling elderly are analgesics, diuretics, cardiovascular drugs, sedatives, GI drugs, and antidiabetic drugs.<sup>5,7,8</sup> This pattern of use should not be surprising since arthritis,<sup>9</sup> heart failure,<sup>10</sup> hypertension,<sup>11</sup> coronary artery disease,<sup>12</sup> and diabetes are among the most common chronic diseases afflicting the elderly, and GI distress,<sup>7</sup> anxiety,<sup>13,14</sup> and insomnia<sup>14</sup> are common complaints. In some groups of the elderly, such as nursing home residents, psychoactive drugs, including antianxiety, hypnotics, and antipsychotics, are among the most commonly prescribed drugs.<sup>13,14</sup>

The cost of medication use by the 24 million Americans<sup>15</sup> over age 65 is greater than \$25.5 billion

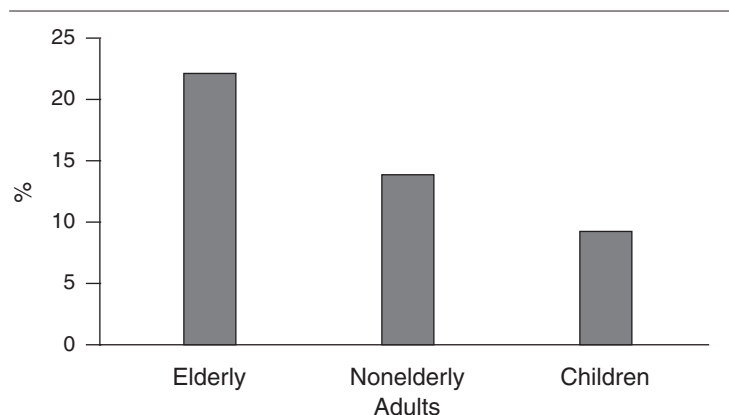
per year.<sup>16,17</sup> Expenditures for drugs account for 23% of the total cost of caring for older persons, largely due to the burden of chronic disease (Figure).<sup>1,2,18-20</sup>

We know very little about how these patterns may differ in managed care. While there is little direct evidence that either overall use or specific use is different between elderly managed care patients and their fee-for-service counterparts, there are reasons to believe that differences may develop. Since outpatient medications are not covered under standard Medicare coverage, Medicare managed care plans that include drug coverage could lead to increased use of drugs by the elderly. Studies of how drug coverage affects use suggest that such coverage is more likely to lead to greater use of drugs that directly treat disease (eg, antihypertensives, lipid-lowering agents, other cardiac medications) rather than those that treat symptoms.<sup>21</sup> Thus, while increased use might pose financial burdens for the managed care industry, in the long run it may decrease overall costs and improve the quality of care as compliance with prescriptions for disease-preventing drugs increases. Nonetheless, some managed care organizations have underestimated the impact of drug coverage on use and have now rethought their ability to provide such coverage.

The greatest expense in healthcare for the elderly remains hospitalization, which accounts for more than 40% of the cost of care.<sup>2,22</sup> Thus, interventions that reduce hospitalization are likely to be much more cost effective than any other intervention. If improving the use of medications leads to decreased hospitalizations, an effect that some experts have suggested<sup>23</sup> and some data support for select conditions (eg, heart failure,<sup>10</sup> urinary retention,<sup>24</sup> depression<sup>4</sup>), interventions to improve prescribing may achieve billions of dollars a year in savings. Additional cost savings will occur if optimal medication use reduces the use of other forms of care such as long-term care and office visits.<sup>21,23</sup> For plans trying to compute the short- and long-term impact of drug coverage, these potential savings must be included.

Since traditional Medicare does not reimburse for outpatient drugs, many older Americans perceive drug costs as the most significant part of their healthcare expenditures. While most Americans are not aware that a magnetic resonance imaging (MRI) scan costs well over \$1500,<sup>25</sup> they are intimately aware

**Figure.** Prescription Drugs as a Percentage of Health Expenditures



of the price of their drugs (if they pay for them out of pocket) and consider them expensive. On the average, older Americans pay \$324 dollars per year for their medications.<sup>20</sup> Multiple chronic conditions significantly inflate this figure; elderly patients with 3 or more chronic conditions pay an average of \$478 dollars per year.<sup>20</sup> Coverage of outpatient drugs under Medicare managed care is, therefore, an important attraction for enrolling members.

Despite the relatively small percentage that drugs represent in total healthcare expenditures, they are among the most effective therapies.<sup>15</sup> Medications are the sole means of treating most infections and are responsible for the decline of mortality and morbidity related to bacterial infections.<sup>26,27</sup> They are the mainstay of treatment for many other life-threatening acute events common in late life, such as myocardial infarction, bronchospasm, gastritis and peptic ulceration, and deep vein thrombosis, to name but a few. In their role in treating the common chronic diseases of later life, drugs play an even more fundamental part in the care of the elderly. They provide control for hypertension,<sup>11</sup> coronary artery disease,<sup>12</sup> heart failure,<sup>10</sup> chronic pulmonary disease, peptic ulcer disease,<sup>7</sup> Parkinson's disease,<sup>28</sup> hypothyroidism, and diabetes.

The essential role of drugs in treating disorders in the elderly is best highlighted by those conditions for which we do not have adequate medical treatment. For example, the cost of caring for the 4 million Americans with Alzheimer's disease<sup>29,30</sup> (for which there is no good treatment) is almost as great as the cost of caring for the 12 million with coronary artery disease (for which several good treatments exist).<sup>31</sup> It has been estimated, albeit with inadequate data, that if we could delay the onset of Alzheimer's disease by just 5 years, the United States would save \$47 billion per year in the cost of care.<sup>29,32</sup>

The role of medication in prevention is essential. As primary prevention, pneumonia vaccine and influenza vaccine can protect the elderly from 2 common and serious infections,<sup>33</sup> which, when not prevented, are costly to the healthcare system. Yet fewer than 52% of older Americans are vaccinated yearly for influenza,<sup>34</sup> and less than 28% have received a pneumonia vaccination.<sup>35,36</sup> Treatment of hypertension and hypercholesterolemia<sup>12</sup> is an important way to prevent coronary artery disease, heart failure, stroke, and peripheral vascular disease<sup>37</sup>—among the most costly conditions afflicting the elderly.<sup>38</sup> The cost of inadequate use of drugs to prevent serious illness dramatically dwarfs many other healthcare expenditures. In one analysis,

increasing the proportion of elderly persons vaccinated against influenza from 20% to 80% would save more than 6000 lives in an epidemic year as well as the cost of caring for tens of thousands of those infected.<sup>33,36</sup>

Underuse of drugs for treatment also can be expensive. Failure to adequately treat depression can lead to large expenditures as depressed older adults experience cognitive decline and reduced function that require increased support services.<sup>39,40</sup> Inadequate treatment of urinary incontinence may require prolonged use of adult diapers while restricting activity for an otherwise-active elder. Urinary incontinence remains one of the major causes of institutionalization in the elderly.<sup>41</sup> Inadequate treatment of heart failure can lead to hospitalizations and a decrease in physical function that requires costly social services.<sup>10,42</sup>

Overuse of medication is also a problem, one that is wasteful of resources.<sup>43</sup> In addition to cost, overuse exposes the elderly to unnecessary risk, leading to iatrogenic diseases and their associated costs. Doses that are too high and administration of drugs at too frequent an interval pose further risk and waste.

The cost of iatrogenesis caused by medication use is extraordinary.<sup>44</sup> Use of medications that pose high risk to the elderly is likely to increase the cost of care while decreasing the quality of care. It has been estimated that more than 10% of all hospitalizations for the elderly are related to adverse drug experiences.<sup>4,15,45</sup> The risk of hip fracture is twice as high in older persons who use long-acting benzodiazepines,<sup>46</sup> drugs that can be more safely replaced with benzodiazepines with a shorter duration of action.<sup>47,48</sup> A hip fracture not only severely compromises an older person's quality of life, but the cost of surgical hip fracture repairs in the United States exceeds \$6 billion per year.<sup>46</sup> Preventing even a small percentage of the more than 227,000 yearly hip fractures in the elderly could prevent considerable healthcare expenditures.

It has been known for many years that anticholinergic anesthesia adjuvants may cause postoperative delirium in elderly patients.<sup>49,50</sup> Despite the high morbidity, cost, and increased length of hospital stay associated with postoperative delirium, these medications continue to be used routinely in many institutions. Anticholinergic medications also can precipitate acute urinary retention in men with prostatism,<sup>4</sup> leading to costly and often unnecessary interventions, including surgery. There are few data to guide any estimate of the cost to society of decreased function and increased dependency due

to medication use. Even small deteriorations in function are often enough to overburden caregivers or force frail elders into institutional care.

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... APPROPRIATE MEDICATION USE  
IN THE ELDERLY ...

In the past, polypharmacy often was identified as the key problem associated with drug use in the elderly. Polypharmacy refers to the use of many drugs, either concurrently or sequentially.<sup>15</sup> Polypharmacy does pose risks. In fact, the risk that an older adult will experience an adverse drug reaction doubles when utilization increases from 1 to 4 drugs used concurrently; the risk climbs 14-fold in elders who use 7 drugs.<sup>51,52</sup>

Yet polypharmacy is a poor indicator of whether drugs are being prescribed well. Many older people have multiple diseases and symptoms that can and should be treated with medication. Thus, polypharmacy does not necessarily indicate that prescribing or drug use is in any way incorrect. That is not to say that some drugs aren't overused, but rather that the total number of drugs used by a person is a poor marker of the quality of care.

The concept of appropriateness is a much better way to evaluate medication use. This concept recognizes that no drug—and in fact, no medical intervention—is without some risk. Appropriate use requires that the potential risk be relatively small in comparison to the likely benefit. Under this definition, the use of a drug can be inappropriate for 3 different reasons: (1) a drug is used when no drug should be used at all (overuse); (2) the wrong drug is used or a drug is used at the wrong dose, at the wrong schedule, or for the wrong duration (misuse); or (3) a drug is not used when a drug should have been used (underuse).

Overuse of drugs is rampant in the elderly but is particularly common for certain classes of drugs, especially those used to treat infections,<sup>53</sup> GI symptoms,<sup>3,54</sup> anxiety,<sup>55</sup> and sleep disorders.<sup>43,55</sup> Overuse occurs because older patients and their families too often demand medication for symptoms that should not be treated and because prescribers tend to prescribe freely, especially when faced with symptomatic complaints. Pharmacists often fail to intervene, either due to lack of information or lack of a workable system in which to intervene. Overuse exposes the elderly to unnecessary risk and wastes limited resources.<sup>1,56</sup>

Yet the problem of misuse seems to be an even more serious problem for the elderly.<sup>43,57</sup> In most cat-

egories of drug therapies, there are riskier and safer choices for the elderly. Too often, prescribers fail to choose the best drug for elderly patients. Additionally, prescribers often fail to adjust the dose and frequency of drug administration in light of the physiological changes of aging.<sup>4,11</sup> Several studies have indicated that nearly 1 in 5 community-dwelling elders receives a drug considered to be inappropriate by experts.<sup>3,57</sup> In the nursing home, 40% receive inappropriate drugs and 10% receive 2 or more inappropriate drugs concurrently.<sup>11,15,58</sup> Such errors occur because prescribers fail to consider the age of patients and often are poorly informed about the specifics of geriatric prescribing. Many OTC drugs are particularly risky to the elderly; warning labels are often inadequate and consumers are often incautious.<sup>55</sup> Pharmacists may not adequately intervene, often because they were not involved in the OTC transaction and therefore were unaware of the patient's complete medication profile.

Misuse of medication by the elderly poses enormous risk. Misuse of medications has been shown to double the risk of falls that result in hip fractures,<sup>46</sup> increase the risk of postoperative confusion,<sup>4,59</sup> exacerbate congestive heart failure,<sup>51</sup> precipitate renal failure,<sup>4,9</sup> worsen depression,<sup>40</sup> cause constipation,<sup>54</sup> and increase GI bleeding.<sup>4,55,60,61</sup> Clinical experience suggests that other common manifestations of toxicity, including impaired gait,<sup>55</sup> reduced energy, difficulty urinating,<sup>25,58</sup> blurred vision,<sup>51</sup> dry mouth,<sup>51</sup> and orthostatic hypotension,<sup>18</sup> occur commonly and affect the function of older adults.<sup>3,9,62</sup>

Underuse of medication by the elderly has not been well studied. Yet there are some areas in which medications are unreasonably underused. For example, research shows that medication for depression,<sup>39,63,64</sup> incontinence,<sup>41,65</sup> and heart failure<sup>10</sup> and preventive treatments such as vaccination against pneumonia<sup>33</sup> and influenza<sup>34</sup> are underused in the elderly. Underuse in these areas does not save money: it results in negative outcomes including the need for more costly medications, hospitalizations, institutionalization, and rehabilitation.

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... PHYSIOLOGY OF AGING ...

Physiological changes of aging that affect medication use begin in early adulthood. However, these changes do not become clinically important in most people until they reach the sixth decade and beyond. From that age onward, losses in homeostatic reserve and changes in fat distribution, sodium

space, hepatic metabolism, renal clearance, and end-organ sensitivity to drugs increasingly affect how drugs can be used safely and effectively.<sup>4</sup>

The younger body has enormous reserve in the function of nearly all organs. As humans age, that reserve declines dramatically. For example, blood flow to the brain in a 30-year-old is approximately 2 1/2 times what is needed to maintain function, yet in a typical 85-year-old, that flow is only 25% greater than what is needed.<sup>66</sup> Thus, minor disturbances in blood pressure or cardiac output can result in syncope.<sup>67</sup> Hepatic mass is over 4 times what is needed in a 30-year-old, but that surplus is halved by age 85.<sup>68,69</sup> As the human heart ages, resting cardiac output changes little, but maximal cardiac output is reduced substantially.<sup>66</sup> Thus, at maximal stress, the heart may not maintain adequate output, resulting in decreased blood pressure or inadequate perfusion.

Not surprisingly, alterations in homeostasis caused by drugs leads to clinically relevant effects more often in elderly patients than in younger patients. While younger bodies are able to cope with rapid changes in blood pressure, cardiac output, vascular resistance, and perturbations of balance, the older body cannot; the result is orthostatic hypotension, syncope, falls (often with resultant fractures), delirium, and so forth. When fluid and electrolytes become unbalanced in young adults, the kidneys are able to rapidly excrete or maximally retain water as needed; the older kidney has decreased diluting and concentrating abilities,<sup>8</sup> so that fluid overload, dehydration, and electrolyte disturbances occur more commonly and are not corrected as quickly.

Pharmacokinetics refers to the way drugs are absorbed, distributed, metabolized, and eliminated from the body. Aging affects each of these to varying degrees. Absorption is the least affected.<sup>4,18</sup> Decreases in gastric acidity and motility can affect absorption,<sup>18,67</sup> especially of some enteric-coated pills,<sup>70</sup> and enhance the absorption of some acid-unstable compounds. Distribution, however, is dramatically altered.<sup>67</sup> As humans age, they become proportionally more fat<sup>67</sup>: a man's proportion of body fat increases 25% and a woman's over 35% between ages 35 and 75. The sodium space or volume of distribution—the area into which most drugs distribute—decreases proportionately.<sup>18,67</sup> A decreased volume of distribution leads to higher blood levels. The increased fat acts as a larger storage area for lipophilic drugs, thus prolonging their biological half-lives.<sup>18,67</sup>

Hepatic mass and blood flow and some hepatic enzymatic capacity decrease with aging.<sup>67,70</sup> The

decreased blood flow affects first-pass metabolism, especially of those drugs whose metabolism is flow limited.<sup>8,18</sup> In such cases, peak blood levels are greatly increased.<sup>18</sup> The decrease in enzymatic activity is most notable in the P-450 enzymatic system.<sup>71</sup> Although the overall speed of enzymatic conversion is not affected by aging, the enzymatic reserve is, due in large part to the decrease in hepatic mass; and the system is easily overwhelmed by pharmacological doses of drugs that require extensive hepatic degradation.<sup>8,69</sup> Thus, metabolism is slowed, and the duration of effect is prolonged. Blood levels of some drugs also may increase.<sup>69</sup> The glucuronyl transferase system is not substantially altered with age, however.<sup>18,67</sup> Thus, drugs that do not require oxidative metabolism but only the addition of a glucuronic acid moiety are not affected by age-related changes in the liver.

On average renal function declines linearly with age.<sup>67,72</sup> Creatinine clearance when a person reaches age 75 is about half of what it was at age 35 in most people.<sup>72</sup> This decline in function is not indicated by serum creatinine levels, which remain stable at about 1.0 mg/dL<sup>73</sup>; the decrease in muscle mass and muscle turnover compensates for the change in clearance.<sup>73-75</sup> The clearance of all drugs eliminated by the kidneys is decreased in the elderly.

In addition to pharmacokinetic changes, the older body often has altered sensitivity to drugs at the cellular level (pharmacodynamics).<sup>55</sup> For example, cardiac tissue is less responsive to the effects of  $\beta$ -blockers and  $\beta$ -agonists,<sup>18</sup> and brain cells are more sensitive to the effects of benzodiazepines.<sup>18,55</sup> Smooth muscle in bladder, the intestines, and the intima of blood vessels is more sensitive to anticholinergic drugs.<sup>65</sup> Thus, even when drug dosing is altered to compensate for changes in pharmacokinetics, the effects of drugs may be enhanced or diminished due to changes in pharmacodynamics.<sup>18,67</sup>

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... ADHERENCE ...

Even when drugs are prescribed appropriately, they are not always taken properly. Adherence, also called compliance, can dramatically affect the outcomes of medication use. It has been estimated that 25% of all prescriptions are not filled and that another 35% are not taken as prescribed.<sup>76,77</sup> Although age, per se, does not affect compliance, certain factors do affect compliance more significantly in the elderly.<sup>76,77</sup>

The number of drugs used concurrently is one of the most powerful influences affecting compli-

ance<sup>67</sup>; since the elderly tend to use more drugs than the young, their compliance tends to decrease.<sup>77</sup> Additionally, the cost burden of medication use is proportional to the number and type of drugs used.<sup>23</sup> Traditional Medicare reimbursement does not cover outpatient medications, so older Americans tend to focus on the cost of their drugs, too often trying to save money by not taking medication or taking less than prescribed. Adherence with instructions for drugs used to treat conditions without symptoms is generally less than that for drugs used to treat symptoms, so that the elderly are at risk for improper use of critical drugs, such as those that treat heart disease and hypertension. The less older patients understand about their drugs and the necessity to use them as directed, the less they adhere. Finally, if the elderly do not understand or forget directions or cannot read the labels on drug bottles, they are prone to poor adherence and errors in administration.

... CONCLUSION ...

The physiological changes of aging along with the disease burden facing older people complicate the prescribing of medication to all older people. The information regarding drug utilization, polypharmacy, appropriateness, and adherence in the elderly is critically important to managed care as it strives to increase the quality of care while holding down costs. Indeed, the comprehensive care provided by managed care and its focus on prevention and wellness make it uniquely suited to take the lead in improving the quality of drug use in the elderly.

Part 1 of this article is meant to serve as a basis for understanding the problems facing managed care regarding the use of drugs in the elderly. Part 2 will examine approaches for improving the use of medications in the elderly from a managed care perspective.

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