

## Prevalence, Costs, and Treatment of Alzheimer's Disease and Related Dementia: A Managed Care Perspective

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**Background:** The number of patients with Alzheimer's disease (AD) and related dementia treated in managed care organizations (MCOs) is increasing, and this trend is expected to continue. Therefore, it is critical that MCOs develop disease management strategies for this population.

**Objective:** To review the literature on the prevalence, costs, and treatment of AD and related dementia.

**Study Design:** Review of published articles from MEDLINE and peer-reviewed journals.

**Results:** Prevalence of AD and related dementia is approximately 5.7% among those aged 65 and older. Prevalence data from claims-based studies of AD in managed care are lower, ranging from 0.55% to 0.83%. Costs for formal care average \$27,672 per patient annually, with long-term care being the most costly component. Annual costs for informal care are estimated to be \$10,400 to \$34,517 per patient. Additional costs associated with AD include lost wages and productivity of patients and caregivers and costs associated with increased morbidity of caregivers. Donepezil treatment is well tolerated and has been extensively tested and evaluated in clinical settings. Early diagnosis and treatment of AD with donepezil has been shown to slow cognitive decline in AD. Although study findings regarding the cost offsets of donepezil-treated patients to date are mixed, there is a growing body of evidence to support the inclusion of this and other therapies into an MCO's AD treatment armamentarium.

**Conclusions:** It is unlikely that MCOs will escape the increased prevalence and costs associated with AD. Opportunities exist through patient management programs targeted toward early diagnosis, effective use of medications, control of comorbidities, and patient and family support to partially offset these costs while providing quality patient care.

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Alzheimer's disease (AD) is a progressive, neurodegenerative disease for which there is currently no cure; it is estimated to cost in excess of \$100 billion per year<sup>1</sup> in the United States and is considered the third most costly disease to treat.<sup>2</sup> Alzheimer's disease attacks persons in the later stages of life and is the leading cause of dementia in the elderly, being responsible for approximately 60% to 70% of all dementia cases.<sup>3,4</sup> In the mild stage of the disease, patients exhibit symptoms of memory loss and impaired judgment. As the disease progresses, patients lose the ability to perform activities of daily living (eg, grooming, eating, and bathing), until they ultimately require constant care. Additional symptoms of the disease include depression, sleep disorders, and emotional disturbances. The life expectancy of a patient with AD after diagnosis is 9 to 10 years.<sup>5</sup>

The prevalence of AD is expected to increase during the next several decades as the general population ages. In addition, there will continue to be a shift toward managed care for the treatment and care of this population. It is likely that as baby boomers age, the proportion of patients with AD being

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served by managed care organizations (MCOs) will increase because many of these people have been cared for by MCOs for their adult life and are likely to continue being treated in this fashion.<sup>6</sup> In addition, both Medicare and Medicaid are increasingly offering managed care options. At the same time, MCOs are increasingly withdrawing from serving the Medicare population through Medicare+Choice plans.<sup>7</sup> The number of managed Medicare recipients grew from 3.1 million at the end of 1995 to more than 6.3 million in 1999.<sup>8</sup> Therefore, it is important that MCOs develop treatment plans for AD. This review focuses on the economics of AD to assist MCOs and other key public and private payers and providers of health-related services for AD in developing disease management strategies.

Many studies cited in this review include individuals with AD and related dementia (ADRD). Specifically, the following *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)* diagnostic codes were used to identify patients with ADRD: 331.0 (AD), all 290 codes (senile dementia), 797 (senility), 292.82 (drug-induced dementia), 291.2 (other alcoholic dementia), 294.1 (dementia in condition classified elsewhere), 294.8 (dialysis dementia), and 331.2 (senile dementia). We use the generic term AD throughout this article. In discussing specific studies and their findings, however, we refer to AD or ADRD when the original study made this distinction.

... PREVALENCE OF ALZHEIMER'S DISEASE ...

According to the US General Accounting Office,<sup>9</sup> in 1995 more than 2 million people in the United

States older than 65 years had AD. A similar estimate of 2.32 million was reached from an analysis of several independently derived AD incidence rates.<sup>10</sup> Other sources cite higher prevalence rates, estimating that more than 4 million patients have AD.<sup>11</sup> This disparity arises primarily from methodological differences in defining cases. In certain instances, lower prevalence estimates can be attributed to an exclusion of mild cases of the disease.<sup>10</sup>

The prevalence of AD is expected to increase 3- to 4-fold during the next 50 years,<sup>9,10</sup> resulting in upwards of 10 million cases by the year 2050.<sup>10,11</sup> It has been estimated that a treatment that delays onset of the disease by just 12 months would decrease the number of persons afflicted with AD by 770,000 more than projected 50 years after initiation of the intervention. The impact of such a treatment on healthcare costs would be enormous, saving as much as \$36 billion per year.<sup>10</sup>

Age is the main risk factor for AD, and the prevalence of the disease doubles every 5 years after age 65 years so that nearly half of all persons older than 85 years might have AD.<sup>11</sup> Although incidence rates continue to increase with age, prevalence peaks in the 8th decade.<sup>10</sup> Nearly 43% of patients with AD are aged 75 to 85 years. Inclusion of undetected mild cases of the disease would tend to shift this peak toward younger ages.

Alzheimer's disease is more common in women than in men. In studies of patients with AD, the percentage of women ranges from approximately 60%<sup>6</sup> to more than 70%.<sup>12,13</sup> Much of this difference can be attributed to lower mortality rates in women at earlier ages compared with men,<sup>10</sup> Unalthough a difference in incidence rates between the sexes has been reported.<sup>14</sup>

**Medicare**

The prevalence rate of AD in a population has a strong influence on healthcare costs. A survey of prevalence rates among major healthcare payers reveals widely varying AD rates in their populations (**Table 1**). Prevalence in 2 studies that analyzed Medicare claims data to identify patients with AD ranged from 0.76%<sup>13</sup> to

**Table 1.** Summary of the Prevalence Rates of ADRD in Persons Aged 65 Years and Older

| Study   | Population | Prevalence of ADRD, %       |
|---|------------|-----------------------------|
| US General Accounting Office, <sup>9</sup> 1998 | General    | 5.7                         |
| Weiner et al, <sup>13</sup> 1998                | Medicare   | 0.76                        |
| Taylor and Sloan, <sup>5</sup> 2000             | Medicare   | 3.1                         |
| Menzin et al, <sup>12</sup> 1999                | Medicaid   | 4.0 (diagnosis of dementia) |
| Linkins and Lloyd, <sup>6</sup> 2000            | MCO        | 0.55                        |
| Gutterman et al, <sup>16</sup> 1999             | MCO        | 0.83                        |

ADRD = Alzheimer's disease and related dementia; MCO = managed care organization.

3.1%.<sup>5</sup> This compares with the US General Accounting Office<sup>9</sup> estimate of 5.7% in persons older than 65 years. These low estimates might be an artifact of using claims data to identify patients. Newcomer et al<sup>15</sup> analyzed this issue by examining claims data of a large group of Medicare recipients whose AD status was known. When these authors applied standard criteria to claims data for identifying patients, they found that this method underestimated the true number of patients with AD by more than 80%. When claims data for at least 2 years is reviewed, the estimates begin to approach, but do not reach, the actual values. In view of these data, the prevalence estimate of 3.1%<sup>5</sup> in the Medicare population is likely to be more accurate than that of Weiner et al<sup>13</sup> because Taylor and Sloan<sup>5</sup> examined 12 years of claims data instead of one. It is important to note, however, that this estimate may still be artificially low because many cases of mild AD will not be included in claims-based studies because patients with mild symptoms are less likely to be coded with a disease subject to ageism and other disabling stigma. Moreover, patients in the early stages of AD may not yet have sought medical help.

#### **Medicaid**

The prevalence of dementia in a Medicaid population was estimated to be 4%, with only 1.1% receiving a direct diagnosis of AD.<sup>12</sup> This estimate is also likely to be low because this figure was based on an analysis of 1 year of claims data. In addition, other studies<sup>3,4</sup> indicate that patients with AD compose 60% to 70% of patients with dementia, whereas in this study, only 28% of this population was specifically diagnosed as having AD.

#### **Managed Care Organizations**

The prevalence data from claims-based studies of AD in MCO populations are even lower, ranging from 0.55%<sup>6</sup> to 0.83%.<sup>16</sup> Aside from the fact that these studies are based on less than 2 years of claims data and are thus likely to underestimate prevalence, there are additional reasons why these numbers might actually be lower in MCO populations. First, the prevalence might be low because a large percentage of patients with AD already reside in long-term care facilities<sup>16</sup> and would thus not be eligible for treatment in these MCOs. Most claims data sets do not include ambulatory care data but only hospital data and therefore would miss most patients until late stages. In addition, even in hospital data sets incorporating diagnosis related groups, most patients are not given a diagnosis related group of AD but rather the comor-

bidity for which they were admitted (eg, aspiration pneumonia or pressure sores). Finally, AD might be undercoded or underreported where reimbursement incentives encourage coding comorbidities associated with AD as the primary diagnosis.<sup>18</sup>

In summary, studies of Medicare, Medicaid, and MCO populations cite prevalence rates of AD in their populations that are much lower than US General Accounting Office estimates. Because these studies use less than 2 years of claims data to analyze prevalence, however, they are likely to underestimate it.<sup>15</sup> This, in turn, results in an underestimate of the total costs of AD treatment, which is of particular importance to healthcare organizations that use claims data to establish capitation rates. Claims data have their limitations, such as limited clinical detail, possible errors in coding, study groups that may differ in health status, and different eligibility and reimbursement practices. Nevertheless, claims data are a relatively inexpensive way to obtain useful data from large numbers of patients during extended periods.<sup>19</sup>

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#### ... COSTS OF ALZHEIMER'S DISEASE ...

The estimated costs for the treatment of AD range from \$50 billion to more than \$100 billion per year, depending on how costs are calculated and how prevalence figures are used.<sup>1,2,20</sup> Costs of care for patients with AD are typically divided between formal and informal costs.

#### **Formal Costs**

Formal costs are the dollars spent for care provided in the formal marketplace. Services include physician visits, prescription medication, emergency department visits, acute hospitalizations, and long-term care.<sup>21</sup> In a 1996 cross-sectional study of 679 patients with AD, Leon et al<sup>20</sup> determined the average cost of formal care for patients with AD to be \$27,672 per year. This translates to a total cost for formal care in the US of \$41 to \$81 billion dollars per year. Long-term care is by far the most expensive service in this category. Formal care for persons treated in the community was 4.5 times less than the cost for patients receiving care in residential treatment facilities (\$8196 vs \$36,876).<sup>20</sup> It is estimated that as much as \$209 per person could be saved for each month that institutionalization is delayed. The cost of care in assisted-living facilities is 21% to 30% less than that in traditional nursing homes.<sup>20</sup> Therefore, any intervention that improves the patient's functioning such that he or she could

be cared for in assisted-living facilities as opposed to nursing homes would also lead to substantial cost savings. Medicaid pays for long-term nursing home stays, and 35 state Medicaid programs reimburse or plan to reimburse for assisted-living care.

Another aspect of formal healthcare costs arises from the treatment of comorbid conditions, which can be extremely costly. Results of recent studies<sup>12,16</sup> indicate that patients with AD have increased levels of comorbidities compared with age- and sex-matched controls. Particularly common comorbid conditions include psychiatric disorders<sup>12</sup> and diabetes.<sup>12,13,16</sup> It is estimated that more than 60% of patients with AD have 3 or more comorbid conditions.<sup>22</sup> Comorbidities are a significant source of increased direct costs for AD. For example, Gutterman et al<sup>16</sup> showed that costs of treating comorbid conditions were \$3000 higher for patients with AD than for controls with the same number of comorbidities. Furthermore, an additional comorbidity in the AD patient group increased the cost disparity between patients and matched controls to \$10,000. Incidence of comorbidities increases with the severity of AD.<sup>22</sup> This increase may be a function of more severe cognitive impairment. For example, in advanced stages, patients with AD might underreport symptoms of comorbid conditions, resulting in delayed treatment. Untreated conditions might result in more severe pathologic disorders and ultimately in increased costs of treatment for these conditions. The finding that the incidence of comorbidities is significantly associated with greater cognitive impairment<sup>22</sup> supports this suggestion.

#### **Informal Costs**

Informal costs are defined as the value of unpaid care provided to a patient with AD and are often classified as indirect costs.<sup>21</sup> Informal caregiving accounts for roughly 60% of all care provided to patients with AD.<sup>23</sup> Caregivers are usually spouses or adult children of the patients and spend as many as 70<sup>24,25</sup> hours per week caring for their patient. It is estimated that as many as 39 of these hours per week are spent helping patients with basic (eg, feeding, dressing, grooming, and toilet) and instrumental (eg, shopping, cleaning, laundering, and bill paying) activities of daily living.<sup>24</sup> Estimates for the costs of informal care vary considerably, ranging from \$10,400 (in 1996 dollars)<sup>20</sup> to \$34,517 (in 1990 dollars)<sup>26</sup> per year for patients with AD living in the community. The variance in these estimates primarily depends on the dollar value attached to caregiving (ie, minimum wage vs market rate).<sup>27</sup>

An additional indirect cost of AD consists of the loss of wages and productivity of patients and caregivers.<sup>21</sup> Ernst and Hay<sup>28</sup> estimate loss of lifetime earnings to be \$50,380 per person (in 1991 dollars; discounted at 4%) for patients with AD. It is estimated that caregiver work absences and the associated loss of productivity cost businesses more than \$21 billion per year (in 1995 dollars).<sup>29</sup> In addition, a substantial proportion of caregivers (10%-20%) retire early because of their caregiving burden. When costs of filling vacant positions are calculated, these early retirements cost more than \$3.5 billion per year.

Finally, AD costs could arise from the increased healthcare costs of caregivers due to the burden of providing for patients with AD.<sup>30</sup> Caregivers of cognitively impaired patients are reported to use more sick leave and more healthcare resources than a comparison group of caregivers treating less impaired individuals.<sup>31</sup> Other studies<sup>30,32</sup> report increased physical and psychiatric morbidity in this population.

#### ... IMPACT OF SEVERITY ON COSTS ...

As the disease course progresses and symptoms become more severe, the costs of AD increase. For example, a study<sup>20</sup> of 679 patients with AD showed that healthcare costs nearly doubled in patients with severe disease compared with those with mild disease (\$36,132 vs \$18,408 per year in 1996 dollars). Much of this cost increase is driven by the increased costs of institutionalization. Patients with mild to moderate symptoms can often be cared for at home. However, as the disease course progresses and symptoms become more severe, many patients must be cared for in skilled nursing facilities or nursing homes. In one study,<sup>20</sup> direct healthcare costs and indirect costs increased with severity of disease for patients residing in the community, but total costs for patients in assisted-living facilities and nursing homes remained relatively constant across disease stages. The important differences in costs for residential patients were not differences by disease stage but differences in the basic charges for assisted-living facilities and nursing homes, where assisted-living facility costs were 21% to 30% lower than those for nursing homes.<sup>20</sup> For patients treated in the community by managed care plans, formal care costs increased dramatically with disease severity.<sup>27</sup>

The costs associated with informal care also increase with the severity of disease if the patient

continues to reside at home with the caregiver. O'Brien et al<sup>33</sup> report that in a large population study, caregivers of patients with mild AD spend an average of 69 hours per month engaged in caregiving activities, whereas caregivers of patients with severe AD spend 120 hours per month caring for their patients. Furthermore, the monthly cost of informal care increases by 74% as patients move from mild disease states to moderate or severe disease states. For patients residing in long-term care facilities, the cost of informal care is low (7% of that for patients residing in the community), and it shows a modest decrease (21%) in patients with moderate to severe disease compared with those with mild disease.

... COSTS OF ALZHEIMER'S DISEASE BY HEALTHCARE PAYER ...

Who pays for these high healthcare costs of AD? Similar to healthcare costs for the general population, healthcare for patients with AD is paid by Medicaid, Medicare, MCOs and other private health insurance, and out of pocket. Because these patients are likely to require a panoply of healthcare services, including physician visits, acute hospital care, adult daycare, homemaker services, and long-term care, the payment for total healthcare for these patients is largely fragmented by type of healthcare provided. For patients with AD residing in the com-

munity, Medicare covers 12% of formal care, including physician visits and inpatient care.<sup>24</sup> Managed care organizations and out-of-pocket payments also cover a substantial proportion of these costs. Medicaid pays for 31% of formal care for patients residing in long-term care facilities, but formal care for these patients is still paid for largely out of pocket (60%). Medicare and MCOs (including those with Medicare-risk populations) typically do not pay for extended long-term care. Community care such as adult day services and homemaker services are largely paid out of pocket. However, some states have designated programs that offer these services free or for reduced fees. In addition, some Medicaid waiver programs are in place to cover the costs of these services. **Table 2** summarizes the annual per capita costs for patients with ADRD by payer or provider from recent studies compared with costs for control groups of patients without ADRD. The differences in costs are discussed in the following subsections.

**Medicare**

A recent analysis of costs of AD (*ICD-9-CM* code 331.0 only) to Medicare examined a nationally representative sample of people aged 65 years and older who received fee-for-service Medicare. The authors examined claims data for this population for 12 years. The mean costs of healthcare for persons with vs without AD were 2.6 times greater (\$6021 vs

**Table 2.** Summary of Annual per Capita Costs of ADRD by Payer/Provider

| Study                                | Payer/Provider | Treatment Costs       |          | Ratio of ADRD to Controls |
|--------------------------------------|----------------|-----------------------|----------|---------------------------|
|                                      |                | ADRD                  | Controls |                           |
| Weiner et al, <sup>13</sup> 1998     | Medicare       | \$6208*               | \$3267   | 1.9 <sup>‡</sup>          |
| Taylor and Sloan, <sup>5</sup> 2000  | Medicare       | \$6021*               | \$2310   | 2.6 <sup>‡</sup>          |
| Menzin et al, <sup>12</sup> 1999     | Medicaid (CA)  | \$14,488 <sup>†</sup> | \$6799   | 2.1 <sup>§</sup>          |
| Martin et al, <sup>35</sup> 2000     | Medicaid (GA)  | \$14,492 <sup>†</sup> | \$6334   | 2.3 <sup>§</sup>          |
| Menzin et al, <sup>36</sup> 1999     | Medicaid (PA)  | \$20,618 <sup>†</sup> | \$12,455 | 1.7 <sup>§</sup>          |
| Gutterman et al, <sup>16</sup> 1999  | Managed care   | \$13,487 <sup>†</sup> | \$9276   | 1.5 <sup>§</sup>          |
| Linkins and Lloyd, <sup>6</sup> 2000 | Managed care   | \$21,311 <sup>†</sup> | \$8667   | 2.5 <sup>§</sup>          |

ADRD = Alzheimer's disease and related dementia.

\*Alzheimer disease.

<sup>†</sup>ADRD.

<sup>‡</sup>Adjusted for age and sex.

<sup>§</sup>Adjusted for age, sex, and comorbidities.

\$2310 per year).<sup>5</sup> This result is similar to that of others showing Medicare costs for patients with AD to be 1.9 times higher than those for patients without AD.<sup>13</sup> Increased expenditures in several categories of healthcare services account for the increased costs of AD treatment. Costs for inpatient hospitalization are 2.2<sup>13</sup> to 9<sup>5</sup> times higher in patients with AD and account for >60% of total costs of treatment for these patients.<sup>13</sup> Expenditures for skilled nursing facility care (5 times higher),<sup>5</sup> home health services (2.2 times higher),<sup>5</sup> Part B physician services (1.21<sup>3</sup> to 1.8<sup>5</sup> times higher), and Part B ancillary provider costs (3.3 times higher) are all substantially greater for patients with vs without AD.

### Medicaid

Medicaid covers extended long-term care and thus becomes a major payer for AD treatment.<sup>34</sup> A recent study<sup>12</sup> examined treatment costs for ADRD in a random sample (10% of all recipients) of California Medicaid recipients by analyzing 1 year of claims data. Total Medicaid expenditures were 2.1 times higher for patients with ADRD vs matched controls in the Medicaid sample, adjusted for age, sex, and comorbidities (\$14,488 vs \$6799 per year). Expenditures for the ADRD group were greater in every category (ie, hospital care, outpatient care, and nursing home care) except for prescription drugs, for which there was no difference between groups. It is likely that the lack of difference in prescription drug costs between the 2 groups may be attributed to the fact that tacrine was the only prescription drug available for treatment of AD in 1995, but its use was limited because of Food and Drug Administration labeling restrictions. Thus, their higher costs for patients with AD were not reflected in the 1995 prescription costs.

The bulk of the group differences in costs are due to differences in use of long-term care: 60% of patients with ADRD compared with 24% of the control group were cared for in nursing homes during the study. This difference in nursing home care accounts for 87% (\$8122) of the disparity in annual costs between the groups. Another key source of the between-groups cost differential is healthcare costs associated with comorbidities. Patients with ADRD have more comorbidities than control patients. When this difference in comorbidities is statistically controlled, the difference in costs between the groups per year decreases by 17% (\$7689 greater for patients with dementia). Patients with ADRD also used significantly more resources

in several other areas, including inpatient hospital days, psychiatric hospitalization, and other medical services.

Similarly designed studies of Medicaid claims data in Georgia<sup>35</sup> and Pennsylvania<sup>36</sup> reveal nearly identical results. In Georgia, Medicaid expenditures for treatment of ADRD are 2.3 times higher compared with an age-, sex-, and comorbidity-matched control group. Expenditures for the ADRD group were 1.7 times higher in Pennsylvania. In both states, expenditures in most categories of service (hospital care, nursing home care, and outpatient care in Georgia) were higher for ADRD. In Pennsylvania, the expenditures for outpatient services were not significantly different between groups, although patients with ADRD did make nearly twice as many outpatient claims as the comparison group (33.3 vs 17.1;  $P < .001$ ). Just as in California, the bulk of the difference in treatment costs between groups for the 2 states is largely due to payments for nursing home care (Georgia: 86%; Pennsylvania: 96%). This is not surprising considering that the number of patients with ADRD residing in nursing homes is substantially greater relative to the comparison group (Georgia: 87% vs 33%; Pennsylvania: 80% vs. 45%). In summary, averaged across 3 states, total Medicaid expenditures for persons with ADRD are 2.2 times higher than those for a matched comparison group. The bulk of these cost differences (90%, average across 3 states) are accounted for by the cost of nursing home care as the number of persons residing in nursing homes is nearly double that of the comparison group (76% vs 34%).<sup>12</sup>

### Managed Care Organizations

Using a retrospective analysis of claims data from a large managed Medicare population, Gutterman et al<sup>16</sup> analyzed the costs of treatment for ADRD (Table 2). This study found that patients with ADRD are 1.5 times more costly to treat than controls, adjusted for age, sex, and comorbidities (\$13,487 vs \$9276). The difference in costs between the 2 groups is explained almost entirely by the setting in which they received their care. Patients with ADRD had nearly twice as many emergency department visits as controls. They also spent an average of 12 days more in the hospital than patients without dementia. This translates into 2.5-fold higher costs for emergency department services and 1.5 times higher costs for inpatient services. The higher costs for inpatient treatment explained 75% of the cost disparity between the 2 groups. Comorbidities were also an important source of the cost differential between the

groups. Patients with ADRD had more comorbidities than controls, and these comorbidities cost more (\$3000 per year) in the patient group. Prescription claims accounted for less than 5% of the adjusted total cost in the ADRD group.

Gutterman et al<sup>16</sup> found that costs of care are higher for patients with dementia, including AD, relative to controls. These findings are consistent with those of a similarly designed study by Linkins and Lloyd<sup>6</sup> of ADRD claims in an MCO. In the latter study, patients with ADRD cost 2.5 times more than the controls, adjusted for age, sex, and comorbidities, and used 2.2 times as many services as controls. Similar to the findings of Gutterman et al,<sup>16</sup> the greatest disparities in service utilization were for emergency department use and inpatient treatment. In the Linkins and Lloyd<sup>6</sup> study sample, care of patients with AD accounted for 3.6% of the health-care costs for the entire MCO, but these patients compose only 0.55% of patients treated. The costs in this study might be higher than those estimated by Gutterman et al<sup>16</sup> because they were not adjusted for comorbidities. Nevertheless, the 2 studies taken together indicate that even in MCOs in which long-term care is not covered, the cost of care for patients with ADRD is disproportionately high compared with age- and sex-matched controls. Although patients with ADRD use more physician services than controls, the greatest source of increased cost for these patients is in emergency department visits and inpatient treatment. Increased emergency department usage in these patients might reflect a poorly managed disease or an inability for these cognitively impaired individuals to recognize other medical conditions before they become emergency situations. Limited evidence that AD is still a poorly managed disease comes from a survey of MCO decision makers.<sup>37</sup> These executives indicated a high level of dissatisfaction with AD patient management, with 60% being "very dissatisfied." Furthermore, these executives were more dissatisfied with patient management for AD than for 5 other major diseases, including depression, osteoporosis, asthma, diabetes, and chronic heart failure.

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#### ... TREATMENT OF ADRD ...

Although there is currently no cure for AD, treatment options do exist. Because a hallmark of the disease is the degeneration of acetylcholine-containing neurons in the basal forebrain,<sup>38</sup> treatments have

focused on increasing acetylcholine levels in the brain. Cholinesterase inhibitors accomplish this by blocking the degradation of acetylcholine, thus increasing the efficacy of the remaining cholinergic neurons.<sup>39</sup>

Cholinesterase inhibitors may improve some aspects of cognitive functioning and slow cognitive decline in patients with AD.<sup>40</sup> To date, 3 cholinesterase inhibitors—tacrine hydrochloride (Cognex<sup>®</sup>, Parke-Davis, Morris Plains, NJ), rivastigmine (Exelon<sup>®</sup>, Novartis Pharmaceuticals Corporation, East Hanover, NJ), and donepezil (Aricept<sup>®</sup>, Pfizer, Inc., New York, NY)—have been approved by the Food and Drug Administration. Tacrine was the first cholinesterase inhibitor to demonstrate statistically significant improvements in cognition. However, increases in serum liver enzyme levels, required monitoring, and cholinergic adverse effects have limited its clinical use.<sup>41</sup>

Clinical trials<sup>38</sup> show that patients treated with rivastigmine had better cognitive and functional outcomes than those treated with a placebo. A recent study by Hauber et al<sup>42</sup> used data from two 6-month phase III clinical trials and showed that using rivastigmine to treat AD results in a delay in disease progression for patients who begin treatment during the mild or moderate stages of the disease, resulting in potentially reducing institutionalization and the cost of caring for AD patients. A critical review by Linkins et al<sup>43</sup> stated that the study did not consider treatment costs and assessment of costs resulting from the adverse effects of treatment. In addition, the Hauber et al study was based on only 26 weeks of clinical data, a period of time that is too short to predict later clinical benefits. Rivastigmine was approved by the Food and Drug Administration in May 2000; it is too early to assess its long-term impact.

Donepezil is clinically effective, well tolerated, and has been extensively tested and evaluated in clinical settings.<sup>44-47</sup> Early diagnosis and treatment of AD with donepezil can slow cognitive decline in AD. **Table 3** summarizes several studies assessing the effects of donepezil treatment on the cost of AD. Findings regarding the cost offsets of donepezil treatment are mixed. In 3 of the 5 studies cited in **Table 3**, costs of the drug were completely or partially offset by a reduction in costs of care; the other 2 studies reported that treatment costs were higher for the donepezil-treated group. In addition, the studies that measured caregiver burden showed that stabilization of donepezil-treated patients at higher functioning levels can reduce caregiver burden.

... IMPLICATIONS FOR MANAGED CARE ...

In summary, AD is an extremely costly disease to treat regardless of healthcare payer. The sources of these costs differ between payers because different services are covered. For example, nursing home care is easily the most costly aspect of AD care; however, Medicare and private insurers do not typically cover this service. Therefore, patients with AD living in nursing homes actually cost Medicare less than patients with AD living in the community.<sup>5</sup> Nursing home care, however, is not the only source of the cost disparity between patients with and without AD. Patients with AD are more costly to treat for both Medicare and MCOs, primarily because of increased resource utilization, especially in the areas of emergency department and inpatient services. Many of these hospitalizations occur in patients who are institutionalized in nursing homes, emphasizing the continuing ongoing medical management of patients in nursing homes who remain

members of the MCO and continue to generate costs for which the MCO is at risk. In addition, cognitive impairment associated with ADRD seems to complicate the treatment of coexisting comorbid conditions, resulting in higher resource utilization.<sup>16</sup> Managed care organizations should realize that these costs exist independent of increased enrollment of the elderly with ADRD into their existing plans. This alone should raise the level of concern to implement patient management programs addressing the needs of the population.

The likely addition of an outpatient prescription benefit under Medicare will also create additional pressures on MCOs to provide comprehensive AD treatment interventions for its enrollees. Performance standards for accreditation set by the National Committee on Quality Assurance and the Health Care Financing Administration Quality Improvement System for Managed Care will bring additional pressures on managed care to address issues related to the elderly and those with chronic diseases such as AD.

**Table 3.** Summary of Studies Assessing the Effects of Donepezil Treatment on the Cost of ADRD

| Study                            | Type of Cost    | Method  | Findings  |
|----------------------------------|-----------------|---|---|
| Small et al, <sup>48</sup> 1998  | Direct          | Longitudinal survey of caregivers   | 50% less institutionalization in donepezil-treated patients; cost of drug was completely offset by savings in treatment costs   |
| Fillit et al, <sup>49</sup> 1999 | Direct          | Retrospective claims analysis of managed care organization patients       | Total treatment costs were \$1.37 per day higher for the donepezil-treated group  |
| Fillit et al, <sup>50</sup> 2000 | Indirect        | Longitudinal survey of caregivers   | Significantly less emergency department use in the donepezil-treated group compared with controls (28.8% vs 20.1%); caregivers of donepezil-treated patients reported less caregiver burden but no less time engaged in caregiving activities |
| West et al, <sup>51</sup> 2000   | Direct          | Retrospective claims analysis of Veteran's Health Administration patients | Total treatment costs were \$58 per year higher for the donepezil-treated group   |
| Neumann et al <sup>52</sup>      | Direct/indirect | Markov model using longitudinal databases                                 | Donepezil costs were partially offset by a reduction in costs of care; if the drug effect exceeds 2 y, donepezil would pay for itself in terms of cost offsets for patients with mild AD  |

ADRD = Alzheimer's disease and related dementia.



Effective utilization and disease management programs that address the short- and long-term needs of this population will help meet those standards as outcomes become a standard accreditation requirement. Managed care stands at a pivotal junction to impact the short- and long-term outcomes of individuals with AD.

The costs of treating ADRD have probably been underestimated by healthcare payers because of methodological issues in calculating prevalence estimates. Costs of treating ADRD will continue to increase as the population ages, plausibly increasing several-fold within the next 30 years. Moreover, healthcare trends predict that a higher proportion of elderly patients will receive their treatment in a managed care setting,<sup>6</sup> implying that MCOs will be treating an increasing proportion of patients with ADRD. To manage these patients effectively, it is essential that cost-effective treatment options are developed.

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... REFERENCES ...

1. **National Institute on Aging.** *Progress Report on Alzheimer's Disease.* Bethesda, MD: National Institute on Aging; 1998.
2. **Meek PD, McKeithan K, Schumock GT.** Economic considerations in Alzheimer's disease. *Pharmacotherapy* 1998;18:68-73; discussion 79-82.
3. **Hendrie HC.** Epidemiology of dementia and Alzheimer's disease. *Am J Geriatr Psychiatry* 1998;6:S3-S18.
4. **Cummings JL.** Alzheimer's disease management. *J Clin Psychiatry* 1998;59(suppl 13):4-5.
5. **Taylor DH, Sloan FA.** How much do persons with Alzheimer's disease cost Medicare? *J Am Geriatr Soc* 2000;48:639-646.
6. **Linkins KW, Lloyd JR.** Treatment of Alzheimer's disease patients in a managed care organization: A descriptive study of costs and utilization. *Drug Benefit Trends* 2000;12:6bh-12bh.
7. **Gold M, Justh N.** *Forced Exit: Beneficiaries in Plans Terminating in 2000: Monitoring Medicare+Choice Fast Facts.* Vol 3. Washington, DC: Mathematica Policy Research Inc; 2000:1-2.
8. **US Dept of Health and Human Services.** *Medicare+Choice: Changes for the Year 2000: An Analysis of the Medicare+Choice Program and How Beneficiaries Will Be Affected by Changes.* Washington, DC:Health Care Financing Administration; 1999.
9. **US General Accounting Office.** *Alzheimer's Disease: Estimates of Prevalence in the US.* Washington, DC: US General Accounting Office; 1998.
10. **Brookmeyer R, Gray S, Kawas C.** Projections of Alzheimer's disease in the United States and the public health impact of delaying disease onset. *Am J Public Health* 1998;88:1337-1342.
11. **Evans D.** Estimated prevalence of Alzheimer's disease in the United States. *Milbank Q* 1990;68:267-289.

12. **Menzin J, Lang K, Friedman M, Neumann P, Cummings JL.** The economic cost of Alzheimer's disease and related dementias to the California Medicaid program ("Medi-Cal") in 1995. *Am J Geriatr Psychiatry* 1999;7:300-308.
13. **Weiner M, Powe NR, Weller WE, Shaffer TJ, Anderson GF.** Alzheimer's disease under managed care: implications from Medicare utilization and expenditure patterns. *J Am Geriatr Soc* 1998;46:762-770.
14. **Fratiglioni L, Viitanen M, von Strauss E, et al.** Very old women at highest risk of dementia and Alzheimer's disease: Incidence data from the Kungsholmen Project, Stockholm. *Neurology* 1997;48:132-138.
15. **Newcomer R, Clay T, Luxenberg JS, Miller RH.** Misclassification and selection bias when identifying Alzheimer's disease solely from Medicare claims records. *J Am Geriatr Soc* 1999;47:215-219.
16. **Gutterman EM, Markowitz JS, Lewis B, Fillit H.** Cost of Alzheimer's disease and related dementia in managed Medicare. *J Am Geriatr Soc* 1999;47:1065-1071.
17. **Welch HG, Walsh JS, Larson EB.** The cost of institutional care in Alzheimer's disease: Nursing home and hospital use in a prospective cohort. *J Am Geriatr Soc* 1992;40:221-224.
18. **Paul JE, Melfi CA, Kalasinski LA.** Use of large databases for outcomes research. *Curr Opin Orthoped* 1994;5:75-79.
19. **Birnbaum HG, Cremieux PY, Greenber PE, LeLorier J, Ostrandrand J, Venditti L.** Using healthcare claims data for outcomes research and pharmacoeconomic analyses. *Pharmacoecon* 1999;16:1-8.
20. **Leon J, Cheng CK, Neumann PJ.** Alzheimer's disease care: Costs and potential savings. *Health Aff* 1998;17(6):206-216.
21. **Max W.** The economic impact of Alzheimer's disease. *Neurology* 1993;43:S6-S10.
22. **Doraiswami M, Leon J, Marin D, Neumann P, Gardner E.** Prevalence and impact of medical comorbidity in Alzheimer's disease [abstract]. *Neurology* 1999;52:A126-A127.
23. **Sano M.** Pharmacoeconomics: Determining the value of functional independence and quality of life in Alzheimer's disease. *Mediguide® Geriatr Neurol* 1998;2:1-8.
24. **Rice DP, Fox PJ, Max W, et al.** The economic burden of Alzheimer's disease care. *Health Aff* 1993;12(4):164-176.
25. **Arno PS, Levine C, Memmott MM.** The economic value of informal caregiving. *Health Aff* 1999;18(2):182-188.
26. **Max W, Webber P, Fox P.** Alzheimer's disease: The unpaid burden of caring. *J Aging Health* 1995;7:179-199.
27. **Leon J, Neumann PJ.** The cost of Alzheimer's disease in managed care: A cross-sectional study. *Am J Manag Care* 1999;5:867-877.
28. **Ernst RL, Hay JW.** The US economic and social costs of Alzheimer's disease revisited. *Am J Public Health* 1994;84:1261-1264.
29. **Koppel R.** *Alzheimer's Cost to US Business.* Washington, DC: Alzheimer's Association; 1998.
30. **Schulz R, O'Brien AT, Bookwala J, Fleissner K.** Psychiatric and physical morbidity effects of dementia caregiving: Prevalence, correlates, and causes. *Gerontologist* 1995;35:771-791.
31. **Moritz DJ, Kasl SV, Ostfeld AM.** The health impact of living with a cognitively impaired elderly spouse. *J Aging Health* 1992;4:244-267.
32. **Kiecolt-Glaser JK, Dura JR, Speicher CE, Trask OJ, Glaser R.** Spousal caregivers of dementia victims: Longitudinal changes in immunity and health. *Psychosom Med* 1991;53:345-362.
33. **O'Brien BJ, Goeree R, Hux M, et al.** Economic evaluation of donepezil for the treatment of Alzheimer's disease in Canada. *J Am Geriatr Soc* 1999;47:570-578.
34. **Bartels SJ, Colenda CC.** Mental health services for Alzheimer's

disease: Current trends in reimbursement and public policy and the future under managed care. *Am J Geriatr Psychiatry* 1998;6:S85-S100.

35. **Martin BC, Ricci JF, Kotzan JA, Lang K, Menzin J.** The net cost of Alzheimer disease and related dementia: A population-based study of Georgia Medicaid recipients. *Alzheimer Dis Assoc Disord* 2000;14:151-159.

36. **Menzin J, Lang K, Friedman M.** The economic cost of Alzheimer's disease to a state Medicaid program [abstract]. Presented at the American Academy of Neurology 51st Annual Meeting, Toronto, Ontario, Canada, April 17-24, 1999.

37. **Stubbings J, Sharpe KS.** Unmet needs in the management of Alzheimer's disease: A managed care perspective. *Drug Benefit Trends* 1999;11:6-11.

38. **Rosler M, Anand R, Cicin-Sain A, et al.** Efficacy and safety of rivastigmine in patients with Alzheimer's disease: International randomised controlled trial. *BMJ* 1999;318:633-638.

39. **Whitehouse PJ, Price DL, Clark AW, Coyle JT, DeLong MR.** Alzheimer disease: Evidence for selective loss of cholinergic neurons in the nucleus basalis. *Ann Neurol* 1981;10:122-126.

40. **Rogers SL, Yaminishi Y, Yamatsu K.** E2020: The pharmacology of a piperidine cholinesterase inhibitor. In: Becker RE, Giacobini E, eds. *Cholinergic Basis for Alzheimer's Therapy*. Boston, MA: Birkhäuser; 1991:314-320.

41. **Sramek JJ, Cutler NR.** Recent developments in the drug treatment of Alzheimer's disease. *Drugs Aging* 1999;14:359-373.

42. **Hauber AB, Gnanasakthy A, Snyder EH, Bala MV, Richter A, Mauskopf JA.** Potential savings in the cost of caring for Alzheimer's disease: Treatment with rivastigmine. *PharmacEcon* 2000;17:351-360.

43. **Linkins KW, Lloyd JR, Hjelmstad GO, Strausbaugh HJ.** Potential savings in the cost of caring for Alzheimer's disease: Treatment with rivastigmine [letter]. *PharmacEcon* 2000;18:609-612.

44. **Schachter AS, Davis KL.** Guidelines for the appropriate use of cholinesterase inhibitors in patients with Alzheimer's disease. *CNS Drugs* 1999;11:281-288.

45. **Winblad B, Engedal K, Soininen H, et al.** Donepezil enhances global function, cognition, and activities of daily living compared to placebo in a 1-year, double-blind trial in patients with mild to moderate Alzheimer's disease [abstract]. Presented at the 9th Congress of the International Psychogeriatric Association, Vancouver, British Columbia, Canada, August 15-20, 1999.

46. **Rogers SL, Friedhoff LT.** Long-term efficacy and safety of donepezil in the treatment of Alzheimer's disease: An interim analysis of the results of a US multicentre open label extension study. *Eur Neuropsychopharmacol* 1998;8:67-75.

47. **Pratt RD, Geldmacher D, Perdomo CA.** An evaluation of the long-term efficacy of donepezil in patients from a phase III clinical extension trial. [abstract]. Presented at the American Academy of Neurology 51st Annual Meeting, Toronto, Ontario, Canada, April 17-24, 1999.

48. **Small GW, Donohue JA, Brooks RL.** An economic evaluation of donepezil in the treatment of Alzheimer's disease. *Clin Ther* 1998;20:838-850.

49. **Fillit HM, Guterman EM, Lewis B.** Donepezil use in managed Medicare: Effect on health care costs and utilization. *Clin Ther* 1999;21:2173-2218.

50. **Fillit HM, Guterman EM, Brooks RL.** The impact of donepezil on caregiving burden for patients with Alzheimer's disease. *Int Psychogeriatr* 2000;12:387-399.

51. **West W, Prashker M, Merriman L, Miller D, Anderson J.** Donepezil use and impact on cost among patients with Alzheimer's disease in the Veteran's Health Administration [abstract]. *Value Health* 2000;3:51.

52. **Neumann PJ, Hermann RC, Kuntz KM, et al.** Cost-effectiveness of donepezil in the treatment of mild or moderate Alzheimer's disease. *Neurology* 1999;52:1138-1145.